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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Gestão Industrial, realizada sob a orientação científica do Doutor Henrique Manuel Morais Diz, Professor Catedrático do Departamento de Economia, Gestão e Engenharia Industrial da Universidade de Aveiro

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Palavras-chave Inovação, Indivíduo inovador, ambiente inovador, ecossistema de inovação, mudança linear e não linear, gestão e inovação, sistema nacional e regional de inovação, sistemas auto-organizados e auto-produtivos, sistema de inovação

Keywords Innovation, innovative individual, innovation environment, innovation ecosystem, linear and non-linear change, management and innovation, national and regional innovation system, self-organising and self-productive system, system-of-innovation.

Abstract This thesis examines innovation-individual-context relation within the framework of systems theory. The purpose of this study is to explore the sustainable performance of innovation ecosystem where many controversial realities take place simultaneously. The first part of the thesis is a conceptual analysis on innovation, individual and innovation environment. The second part considers the qualitative Grounded Theory method and research material consisting from innovation experiences of creative and entrepreneurial forerunners of various professions. The empirical research in the third part explores innovation-individual-context related experiences. As the result of the continuous comparative analysis of the empirical research findings and previous research, an ideal model of Virtuous Innovation Circle in Self-organising and Self-productive Systems is established.

The findings indicate that apart from the visible and hard side of the innovation ecosystem also the invisible and soft side is pivotal for sustainable performance in generation of incremental and radical innovation. An autonomous innovation ecosystem, which is self-organising and self-productive relies on individuals'
intellectual and emotional capacity. System (like individual, organisation, region or nation), successfully generating incremental and radical innovation, perceives holistically and, apart from being differentiated, utilises interaction in order to complement the specialized knowledge.

Deviating from previous research this study discovered the emotional capacity embedded in individuals as a prerequisite for innovation. This study indicates that human capacity to tolerate inconveniences and frustration together with the capacity to generate cognitive and emotional energy for the system are the mechanisms behind innovation and systems' self-renewal. It is due to these capacities that the reconciliation of innovation related controversial realities in the system turns possible and the system can be at the same time both productive and creative and it can simultaneously generate both incremental and radical innovation. Hence, the permissive, decentralised, human-centric, energizing, and bottom up management (called management in autonomous innovation ecosystem) triggers both system's self-renewal and innovation.

Sumário	A presente dissertação examina a relação inovação-indivíduo-contexto sob o ponto de vista da teoria de sistemas. O propósito do presente estudo é explorar a "performance" sustentada do ecossistema de inovação onde diversas realidades controversas surgem simultaneamente. A primeira parte da dissertação é uma análise conceptual da inovação, do indivíduo e do ambiente de inovação. A segunda parte considera o método da "Grounded Theory" e o material de investigação obtido das experiências de empreendedores de várias profissões. A investigação empírica da terceira parte explora as experiências relacionadas com inovação-indivíduo-contexto. Como resultado da análise comparativa e contínua dos resultados da investigação e de investigação anterior, um modelo ideal de Círculo Virtuoso de Inovação em Sistemas auto-organizados e auto-produtivos é estabelecido. Os resultados indicam que, apara além da parte visível e tangível da inovação, também a parte invisível e intangível é fundamental na "performance" sustentada da geração de inovação radical e incremental. Um ecossistema de inovação autónomo, que seja auto-organizado e auto-produtivo depende da capacidade intelectual e emocional dos indivíduos. Desviando-se de investigação anterior, o presente estudo descobre a capacidade emocional embebida nos indivíduos como pré-requisito para a inovação. O presente estudo indica que a capacidade humana para tolerar as inconveniências e a frustração, em conjunto com a capacidade para gerar energia cognitiva e emocional para o sistema são os mecanismos que suportam a auto-renovação dos sistemas. È com base nestas capacidades que a reconciliação das realidades controversas relacionadas com a inovação que o sistema é ao mesmo tempo produtivo e criativo e pode simultaneamente gerar inovação incremental e radical. Assim, a gestão permissiva, descentralizada, centrada na pessoa, produtora de energia e da base para o topo resulta na auto-renovação no sistema e a inovação.

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SUMMARY

This study explores *innovation-individual-context related experiences*, concerning the dilemmas of the many realities the innovative knowledge worker, and visionary manager or politician faces, when dealing with different type of innovation in organisations or in the wider system-of-innovation. The phenomena in concern are explored both conceptually and in real-life.

In order to empirically explore the innovation-individual-context related experiences, the literature review provided a *conceptual guideline, in the form of propositions*. As a result of the empirical data, analysed by the qualitative Grounded Theory method, the study discusses the tangible findings concerning the three main aspects of the study, namely

1) the innovations and creativity,
2) innovative individuals and
3) contextual requirements for innovations in various levels of the system-of-innovation (from the micro, to the meso and most macro levels).

The micro level refers to individual and organisational contexts, whilst the meso level refers to regional and macro level to the national and global economical, political and cultural context. The general composition of the study is based on this holistic, three level contemplation, of the innovation phenomenon as illustrated in figure 1.

The more abstract result of the study, namely *The Grounded theory on Virtuous Innovation Circle* is anchored into the innovative knowledge workers' and visionary managers' experiences on innovation. Based on the inductive analyses of the data on innovation-individual-context related experiences, the *reconciliation and management of the simultaneous controversial realities emerged as the core category*. The core category and its subcategories demonstrate the paradoxes, cohesions and tensions that the system faces at all

levels (that is the individual, organisation, region, nation), when aiming at top performance in a complex and fast changing environment. The *middle-range Grounded Theory* was then deduced from the findings and the propositions composed based on the literature. Researcher's professional observations from the real-life cases and ongoing discussions in international seminars and newspapers were utilised to test the evolving Grounded Theory.

The theory called *Virtuous Innovation Circle in self-organising and self-productive systems* suggests that the reconciliation of many controversial realities can turn into a positive innovation circle in organisations, regions and societies in a process, which is relatively autonomous and grounded on the soft side of the system. The theory suggests that a system can be both self-productive and self-organising due to the capacity embedded in the system's invisible side, namely in individuals' intellectual and emotional capacity. That is to say, *holistic approach and complementary interaction* in innovation management together with *tolerance of inconveniences* and positive *generation of energy* were the key actions to distinguish the top performers in demanding conditions.

It is due to the dynamic nature of these soft elements that the suspicious idea of controversial realities being simultaneously possible in organisations and wider systems-of-innovation turns possible. The ideal model of Virtuous Innovation Circle, hence, integrates the invisible to visible side of the system, and allows simultaneous efficiency and creativity whenever incremental innovations are needed together with the maximal performance of the mainstream. That is the autopoiesis (self-production) of the system. Similarly Virtuous Innovation Circle suggests, that together with the radical innovation any system goes through a bifurcation zone (related to self-organisation) in order to make the frog leap to the next level of order.

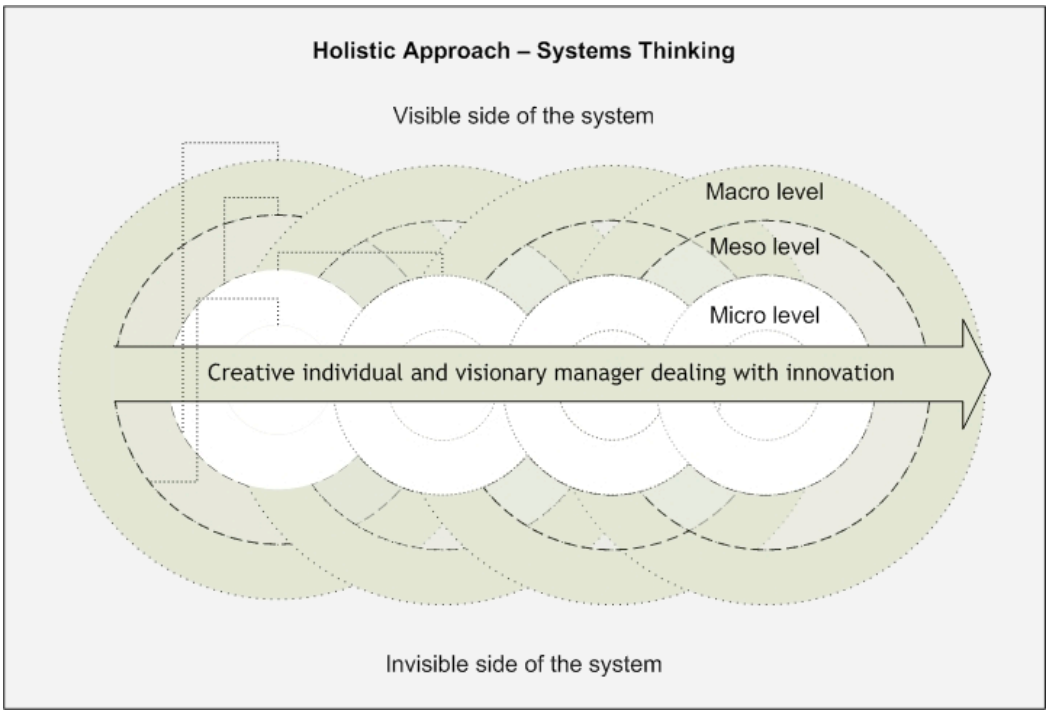


Figure 1 General composition of the research. Contextual requirements for successful innovation encompass connection (the dotted line connectors) among the various levels and subsystems of the visible and invisible side of the system.

Figure one illustrates the holistic approach of this study into the individuals' experiences on innovation related interaction with the macro, meso and micro levels of the system-of-innovation environment. Different Systems Theory (ST) approaches have been used in order to review the visible and invisible (hard and soft) aspects of the systems, and their relations to each other and to the entity.

Due to the general composition of the study, the data formed a cross-section of innovation, and hence manifested the richness of innovation types and the stages of innovation maturity and radicalism. This study recommends specificity into innovation management; that is because it was found, that there seems to be no one universal logic, or set of rules and values behind all innovations, but innovation management depends on the type, maturity and radicalism of innovation in concern. However, irrespective of the innovation, one common nominator of all the explored innovation-individual-context experiences was

found, namely the need to reconcile multitude contradictory realities and paradoxes of cohesions and tensions.

Paradoxes, contradictions and tensions are often a subject of avoidance in an organisational context. However, they were all found to belong as natural elements to the system's life and they were related to all type of innovation. Some scholars have even proved them useful, Doz and Kosonen (2007), for example, emphasised strategic sensitivity as a prerequisite for companies operating in the fast changing and complex environment. That is to say, sometimes, tension, contradictory goals and paradoxes can help to keep on ones toes in what concerns the intellectual mind, and, thus, they can help to force innovations that shatter the conventional wisdom (ibid.).

The following type of paradoxes, tensions and incompatibilities epitomize the found relation to the core category of the study, namely to the reconciliation and management of the many, innovation related, and controversial realities at the same time:
1) chaos vs. order – change vs. maintenance of the existing system, 2) creativity vs. efficiency, 3) tangible vs. intangible – visible vs. invisible system, 4) linear vs. nonlinear development – incremental learning vs. learning about unknown, 5) market vs. curiosity driven problem solving and exploration of what is possible, 6) open access to knowledge vs. intellectual property rights and patents, 7) incremental vs. radical innovations, and their opposite fit with rules, organisations, processes, and values, 8) sensation of flow vs. pain, 9) subconscious vs. conscious working methods – intuition and emotions vs. explicit knowledge, 10) approved excising knowledge vs. controversial paradigms of new knowledge, 11) short term vs. long term management horizons and contradictions related to the investments, and 12) higher education institutions role and function as a fosterer of civilisation vs. short term economical profit.

The discovery of the informants coping with the previous mentioned paradoxes formed consequently the starting point for the middle-range Grounded Theory

building. The found paradoxes, together with the propositions emerging from the literature review, led to the integration of various theories and approaches, in order to create the ideal model of the Virtuous Innovation Circle. The ideal model abandonees the simple “either-or” approach, but underscores the “both and” managerial approach into innovation.

In order to explore the rationale behind the paradoxes, it has been kept in mind what Timo Airaksinen, the researcher’s professor at philosophy, thought for decades ago: “One should look at the extreme in order to see more clearly the true nature of the phenomenon under exploration.” - The advice has hence been followed, when deciding which theories should be introduced from the richness of innovation, management and organisational theories. Hence, whenever possible, those theories, providing a framework for the analysis of the best performance versus failures in the worst versus best conditions, were chosen to the theory building. Another selection criterion for searching the literature was whether it had looked at the factual difficulties of fitting new radical ideas to the top performer whose entire system has effectively adopted the rules and values of the existing mainstream or knowledge paradigm. It was however found that innovation literature often bypass or does not perceive these “extremes” and tipping points, which however seem to be part of the reality whenever system goes through a transition phase related to radical innovation.

The emerging theory on Virtuous Innovation Circle, based on the reconciliation of many simultaneous and controversial realities, related to innovations, claims for a special attention to the interaction between the visible and invisible sides of the system-of-innovation. It opens up the window to the invisible side of the system, all the way to the subconscious of the individual, helping to get in touch with the creativity. The ideal model of Virtuous Innovation Circle encourages the creative use of different management and *Systems Thinking* (ST) approaches.

Moreover, the theory on Virtuous Innovation Circle also engages the conventional management and organisational thinking. The conventional organisational and management theories of the industrial era have been successful, in order to create an understandable framework for the efficiency of the visible and tangible side of the system. However, when dealing with the tangible factors of the economic and organisational realities, the individual has often been seen as a human resource, an input ingredient of the system. Deviating from that, the Virtuous Innovation Circle sees the *individual as human capital of the system-of-innovation*.

Florida (1995) in Toward the Learning Region and Saarinen & Hämäläinen (2004) in their Systems Intelligence approach have referred to *human capital* in order to stress the importance of knowledge, creativity and values embedded in the individual. Moreover, the notion of human capital has provided an opportunity to approach the system-of-innovation from a new perspective, namely from the more invisible and intangible side of the system.

In the more macro level, one of the implications of the theory is the suggestion that the notion of *national and regional innovation system* could be completed with the more dynamic notion of *innovation ecosystem*. Use of *Innovation ecosystem* would hence foster the management, innovation policy and scientific discourse towards the immanence of individual, the invisible side of the systems and, consequently, it might help to enlarge the needed requirements for the creative development of knowledge, the core of creativity and experience era.

Since the *Virtual Innovation Circle* is highly conceptual, it should be regarded as an opening for further theoretical discussions and as a subject for further empirical studies.

This study has relayed on the more recent developments (studies discussing self-productive and self-organising systems) of the system's thinking, which have reflected the transformation of the societies and organisations, and has thus developed during the last decades. By integrating the visible and invisible side of the system and by paying attention to the perquisites of innovation and creativity, the theory on Virtuous Innovation Circle lays ground for the understanding on how to cope with the paradoxes related to the innovations.

From the viewpoint of the paradoxes (related to the short term versus long term, incremental versus radical innovation, or the systemic continuation versus systemic transformation), a vital element of the development of systems thinking has concerned *systems tendency to maintain balance (steady state) versus systems tendency to move over between equilibrium and non-equilibrium*. Studies related to these questions have been found useful when exploring the simultaneous controversial realities in order to generate the theory on Virtuous Innovation Circle.

The theory on Virtuous Innovation Circle has its foundation on the assumption that, in systems there resides at the same time capacity for self-productive processes, which keep the system in balance throughout minor incremental innovations, and for self-organising processes derailing the old system in order to let the new system to emerge. Most of the time the self-productive systems are ruling, whereas during the major crises, e.g. when an old era changes to a new one, or a paradigm brakes, or when a firm goes through a bankruptcy, it is the self-organising functions that will make the difference. The used theories related to this phenomenon will be shortly introduced in the following paragraphs, in order to lay ground for the understanding of how the ideal model of Virtuous Innovation Circle in self-productive and self-organising systems operates.

Based on Systems Thinking, most of the time, systems generally manage to create the needed incremental change and hence maintain the relative

equilibrium in the system. In this study, this type of reconciliation of mainstream and incremental change was found as an elementary part of innovation, and it was associated with the *self-production (autopoiesis)* of the systems.

However, it was furthermore found that, in extreme conditions, the very same systems had to cope with fundamental transformations and chaos, and they had to create true radical innovations. According to Hamel (2002), sustainably successful companies have proven that, radical strategic measures are occasionally needed, if a company wants to be among the most successful. Sometimes, a radical change in the environment can force all the elements of a system to create a series of both radical and incremental innovations. That can be seen, for example, in connection with the global economical history. The bankruptcy of the Lehman and Brothers on the 15th of September 2009, for example, indicated the system wide crises in global financial system, which has then forces all nations and organisations to rethink their operational logics and services. That is to say, we have all been forced to generate different type of innovations to survive in the changing economical environment.

In the same way, the system wide industrial transformation in Finland due to the economical regression in early 1990s epitomizes the self-organising innovation ecosystem, and how the opportunity to utilize the advantage of the *edge of the chaos* has actualized and subsequently has created an all-embracing transformation. Statistics and literature concerning the earlier financial crises from Finland has shown that that transformation throughout the chaos is possible and can be successful.

Apart from reacting to the transformation, it appeared based on the data, that systems can be proactive, and create the conditions for *the edge of the chaos,* in order to help the system first to create and then to utilize the discontinuations. Previous research supports this finding (Hamel (1994, 2002, 2003), Doz and Kosonen (2007), and Ståhle (1998, 2004, 2007)). The found proactive transformation phenomenon during the non-linear phase or

discontinuation in a system has been associated with notion of *self-organising system*.

It was furthermore and confusingly, found that, ***both creativity and efficiency*** were stressed as the key elements of success for system-of-innovation. The confusion was for the reason that these notions are often regarded as incompatible. However, with the help of Maula's (2006) theory on Organisation as Living Compositions the compatibility of creativity and efficiency was made understandable. Namely, based on the complexity theory, Maula's (2006) study shows a way to use autopoiesis (self-productive system) and to explain how the systems *sensing and memory systems* (mechanisms of the formal/visual side of the organisation) function and create balance between efficiency and creativity. Based on the findings of this thesis, it can be suggested that, the balance is furthermore possible due to the invisible human side of the system. That is because the human intellectual and emotional capacity makes the system more dynamic and capable to cope with contradictions.

Again, Virtuous Innovation Circle puts forward the importance of combining the top down and bottom up approaches in systems-of-innovation. In this study it was found important to pay attention into the managerial innovations which might facilitate bottom up approaches. Putting the individual to the centre and providing the floor for staff members, citizens, or clients was found most obviously in user driven innovations. Furthermore, the bottom up approach was stressed in connection with the development of innovation friendly environment, namely due to the diffusion of innovation into the market or the adoption of a social innovation among citizens.

Some of the literature supports the idea of a bottom-up system-of-innovation based on empowered individuals. Based on his experiences on executive work in various companies Bergqvist (2007) stressed the development of both the strategy (involving mainly the visible side of the system) and Superproductivity. With Superproductivity he refers to the invisible side of the system and to the

individual's systemic intelligence and wish and opportunity to give his contribution to the change of the system. That is to say, in the system-of-innovation, in individual there resides unused potential to create the so called *Lorenzianinan butterfly effect (1963).*

Virtuous Innovation Circle claims that the visible (tangible) and invisible (intangible) side of a system goes hand in hand when exploring the innovation winners in difficult conditions. That is to say, innovation was found to emerge as a consequence of conscious management efforts, and, radical innovation was found to have started as a butterfly effect, when individual with minor resources start a bottom up transformation process. Furthermore, Virtuous Innovation Circle suggests that both systemic equilibrium and disequilibrium are present in system-of-innovation and they are vital in different contextual situations.

According to the established interpretation, without the superiority of the tangible side of the system over the rivals**,** any system-of-innovation, company, organisation or region, will run into trouble. As Hamel (2002) puts it; sometimes, the system's radical transformation is a prerequisite in a revolutionary environment. Hamel discusses the importance of the radical innovation concerning the companies' strategies and management in the revolutionary era. In systems language, Hamel stresses the importance of *conscious management efforts in the visible side of the system*. Thus, in order to be distinguished as a top performer among the superior companies, Hamel (ibid.) stresses the need to generate *managerial innovations*. Managerial innovations are as seem as the future mode of operation to activate the entire systems and to facilitate the various types of innovations.

Christensen (2003), provides a concrete framework for fitting innovation requirements with the organization capabilities. His model provides tools for differentiating the conditions for the innovation based on the innovation fit with the existing values and processes of the organisation. If there is a poor fit between the innovation and the values (e.g. what comes to breakthrough

innovation), and the processes of the organisation, the need for an autonomous management has been verified to be important. According to Christensen, the so called *autonomous heavy weight teams* will foster possible decisions for the innovation to occur.

Hamel's and Christensen's discourse about success and innovation provide useful management frameworks and tools for the rational and tangible side of the system. In systems language, they both stress the role of conscious management efforts in order to maintain the equilibrium between the system and its environment. Based on Christensen's model it can be interpreted, with systems thinking, that if the new assignment has a poor fit with organisations values, the autonomous teams (subsystems) will take care of the transformation in a self-productive and bottom up process.

As mentioned earlier Virtuous Innovation Circle encompasses also the idea of disequilibrium as a part of system-of-innovation. According to the chaos theory, the equilibrium is not pivotal for success, since *the edge of chaos can also be utilized by the systems*. Ståhle (1998, 2004) discusses the notions of *autopoiesis, self-renewal and self-organising*, based on the chaos theory. She (ibid.) provides an explanation on how the system can utilize the opportunity to real radical change throughout chaos and self-organisation. That model has been used in Virtuous Innovation Circle in its attempt to construct the connection between radical innovation and self-organisation.

However, like the previous scholars, neither does Ståhle (ibid.) explain the role of individual in her model. Hence, it is the role of this study to suggest that, *it may be that it is the human embedded characteristics and qualities which turn fundamental for the system-of-innovation both what comes to self-organisation and self-production*. It was namely found, that in harsh innovation conditions the invisible, hidden side of the system turns important and only then turns more visible.

In Virtuous Innovation Circle, the rationale behind the human side of system and its connection with the self-organising and self-productive system-of-innovation has been explained with the help of The Systems Intelligence approach, which is based on a variety of philosophical and organisational theories and models. Especially Lorenzo's (1963) "butterfly effect", Scharmer's (2006) U-learning curve and Bergqvist's (2007) Superproductivity were found important from the point of view of innovation in a systemic context, and therefore they have laid ground for the theory on Virtual Innovation Circle.

Overall, based on the empirical data, it can be said that no single expedient will alone improve the innovation generation or innovation diffusion, instead the *improvement of system-of-innovation claims for the holistic and systemic approach*. The so-called butterfly effect epitomises this finding as explained in Systems Intelligence (SI). It stresses *the role of small interventions* (the Lorenzianian butterfly effect) in creating radical changes into an entire system. However, according to SI, there resides a "maybe" concerning the establishment of the butterfly effect. If the system does not encourage the individual to *trust the system to take the risk embedded in his or her intervention*, the initiative and actions will not be taken. Consequently, the potential innovation will not get the opportunity to become visible, or it will not turn to a subject of assessment in the formal innovation processes. Without the systemic and all-embracing trust generation, the system-of-innovation can lose its opportunity for innovation based on butterfly effect.

Based on the results of this study, there are many lost opportunities for radical innovation due to various reasons; the lack of the credible trust in the system is one of them. It is most obvious that all the pieces has to fall into their places before a potential radical innovation, which most probably will break all the existing knowledge categories, believes, rules and values of the system, can and will come into the world. That is due to the fact that, in organisations and societies there still seems to be a tendency to "kill the messenger," and it more that obvious that many innovator try to avoid that position.

As the data showed, the invisible, soft side of the system is important for innovation, both in macro systems and in individual level. Hence, Scharmer's (2006) work was used to understand what might be the mechanism behind the soft side of the system-of-innovation. Scharmer's (ibid.) Theory U demonstrates the *importance of encouraging conditions* from the point of view of learning. According to Scharmer (ibid), it is important to create a proper mental environment, conductive to creativity and profound insight generation, to sense the hidden sources of idea. The U-curve is not about the conventional incremental learning from mistakes, but it is about learning from the future as it emerges. It is about approaching the previously unknown knowledge, often needed, e.g. for radical innovations. Scharmer (ibid.) claims that we are often prisoners of our blind spots, preventing both individuals and communities diving deep down enough to the unknown (by questioning the existing categories of knowledge and then *letting them to go*), in order to *let* the new ideas *come* and be crystallised into new knowledge. The theory of the U-curve encourages the connection with our authentic Self in the deep realm of *"presencing" (combining the concept of presence with sensing)*. From the point of view of the Virtual Innovation Circle, the theory on U-learning curve has been considered as a promising way to foster the individual mind and organisational culture in order to develop self-organising and self-productive systems-of-innovation.

Generation and description of the ideal model of Virtuous Innovation Circle in self-productive and and-self-organising systems. With the help of the previous literature all the categories found from the data and the relation among them were integrated, to form an overall picture of the essence of the reconciliation of the many, controversial, innovation related realities, at the same time. Therefore, the ideal model illustrates how the reconciliation processes can turn to a virtuous circle in innovation ecosystem. *To sum up, the ideal model of the Virtuous Innovation Circle can be put forward as follows:*

The reconciliation of controversial realities resides in *conditions* where the essence of innovation *is* regarded as a comprehensive, complex, paradoxical and controversial phenomenon, and the innovation relies on the human side of the system, namely on individual's intelligence, characteristics, emotions and actions (referred as the immanence of individual). Innovation takes place in *structural conditions (context)* where both cohesions and tension resides in self-organising and self-productive systems.

The *reconciliation process* of many controversial realities takes place in micro and macro levels, and it is a trajectory which has been broken down to the following four elements: the holistic approach, complementary interaction, tolerance of inconveniences, and generation of energy, which all refer to interrelated strategies, to the flow of action, interaction and emotions of individuals and groups of people. As a *consequence* of the inter/actions and emotional responses, there emerges and evolves an innovation related phenomenon, which is here called V*irtuous Innovation Circle* and it is founded on *management <u>in</u> innovation ecosystem*. Management in innovation ecosystem refers to the capacity for self-management (the innovation related subsystems' autonomous and permissive management), which promotes incremental and radical innovation. It keeps the creativity and productivity in balance during the incremental innovation and the self-productive processes. All together, it allows the old to go and the new to emerge, when the time is mature for the radical innovation and the self-organisation process to evolve.

The ideal model of the Virtuous Innovation Circle claims for creative use of different management approaches for the different circumstances and during the various phases of the innovation ecosystem's the life-span.

1 BACKGROUND AND PURPOSE OF THE STUDY

In the fast changing global environment, organisations, regions and countries are facing an increasing challenge of creating fruitful environments and circumstances to facilitate economic development, wealth and wellbeing in their organisations and territories. At the same time, these actors face pressures from the many simultaneous realities, related to theirs subsystems whose lifecycles are in different phases and position in the transformation – permanency continuation vary. In the different realities there are several rationales and operational principles which require different type of support and circumstances. Due to this variation, holistic approach has been used to explore the innovation – context related challenges in this study.

The holistic approach of this study encompasses innovation ecosystem, innovation and creative professional. It applies the theoretical and analytical framework of systems thinking to discuss the management challenges related to simultaneous realities of the existing mainstream versus innovation generation, short-term versus long-term growth, as well as incremental versus radical innovations. The discussion about the management challenges is based on empirical data consisting from creative professionals' experiences and professional opinions about how the innovation ecosystem serves and could better serve the innovation generation and diffusion. Grounded Theory (GT) method has been applied to analyse the empirical data and to discuss it together with the innovation literature.

This study furthermore makes an attempt to develop a human centred, bottom-up perspective on innovations ecosystem. Knowledge, education and research are the fundamental elements in the reproduction and renewal of the innovation ecosystem. Following from that, the leading question has been put forwards: How to create fruitful circumstances for learning and human development as the

key drivers for the creation and diffusion of innovation which promote both wealth and social wellbeing for the societies?

During recent years, the question, both in higher education institutions (HEIs), as well as in the interaction among HEIs, companies, organisations and institutions (that is to say in the regional and national innovation system, RIS and NIS), has arisen: How can they together create favourable circumstances for innovation. Creating fruitful environment is a difficult, time consuming and an outlasting endeavour, and it could hence be compared to gardening.

That is to say, when the gardener faces a challenge of cultivating new plant species, knowledge about the growing circumstances and the plant species is a prerequisite for successful cultivation. However, for the best possible circumstances, the gardener has to do experiments to gain the needed experience, and persistence is a prerequisite for the experimentation. He or she simply can't dig up the seeds to revise whether they have germinated, but the seeds have to be left to the soil to mature. In the same way, the process from idea to innovation is long-lasting and there resides phases which are hidden for the observer. Knowledge, experiments and persistence provide the needed understanding for any leader who pursuits the challenge of creating the best possible circumstances for innovation. To increase understanding about the visible and invisible side of innovation resides at the heart of this study.

Given that the individual creates the innovation, the crucial question is, does the environment provide them and their innovation the best possible support? If it doesn't, the option of finding a better environment becomes a distinct possibility for many. For those who can't change the environment or move to another, the real challenge is to develop their own working strategies or to mature as human being so that their creativity and innovativeness wouldn't die in spite of the harsh circumstances.

A leader of any kind of organisation, institution or wider societal system who is concerned about future wealth and wellbeing of those involved with the system is asking him or herself whether everything possible has been done to develop the innovation environment or ecosystem (ES) as fruitful as possible for innovation. What are then the criteria for a fruitful innovation ecosystem is not an easy question to be answered.

For the purpose of this thesis, a pre-understanding on how an innovation ecosystem operates in micro, meso and macro level, was originally (between the years 1997-2003) gained throughout an analysis of statistics and innovation strategies related to the Finnish national innovation system (NIS) and Helsinki metropolitan region innovation system (RIS), and by interviewing 35 business unit leaders from various companies as well as by participating to the innovation strategy process of Helsinki region (http://velo.laurea.fi/inno/).

To go deeper on the understanding, a new orientation concerning an innovation-context relationship was established in 2003. The creative professionals, innovators, visionaries and forerunners of various fields, as well as the creators of the innovation ecosystems were then approached, and hence used as "a litmus test", in order to better understand the true nature of innovation and innovation ecosystem, and their relationships. Mechanisms and factors reinforcing or deteriorating innovation where specifically explored.

At that point, one purpose of this research was set: *to clarify how innovative people experience innovation and the circumstances where innovation takes place, what are the factors inhibiting or facilitating innovation*. The present research is based on in-depth interviews and conversations with creative professionals who have long experience on innovation in public and private organisations. It was explored how they experience innovation in their organisations and in the surrounding society (that is to say in the innovation system (IS) or innovation ecosystem (IES)). Experiences concerning the creative work or innovation management have been used to find out which aspects of

organisational and societal life have impact on the emerging innovation and innovation diffusion. Furthermore, with this study we expect to increase understanding about, how the innovators own working strategies impact on the innovation process and the innovation ecosystem. During the analysis, it has been kept in mind, how all that might have a connection with the competitiveness of the organisations and national innovation systems. However, this study is not a description of the weaknesses and strengths in various innovation ecosystems, neither is it an innovation strategy guideline. But, it is a study about the deeper meanings behind those experiences, and *the aim is to build a Grounded theory about the congruities and discrepancies concerning how innovation and its relationship with the circumstances have been perceived from the different fields and levels of the system-of-innovation*.

Consequently, a qualitative approach was selected for this study, and the words of the individuals have been used to surface issues present in the field of innovation. Previous research has led to growing knowledge about innovation and innovation systems; however, the core of the complex and creative nature of innovation and its relationship with the circumstances has still remained fuzzy. Based on their study on senior management support for innovation Gomes et al (2001) suggest that studies often seem to forget how *main actors feel about the innovation environment* and that leads to an incomplete picture of the phenomenon of innovation and the innovation ecosystem. Keeping that proclamation in mind, the qualitative Grounded Theory approach was selected to gain knowledge and to understand how the main actors, namely the innovators and leaders, in innovation ecosystem feel and think about innovation, and based on that knowledge to analyse the relationship of various determinants in innovation ecosystems, and how they reinforce or deteriorate innovation.

The Innovation ecosystem is the context where innovation takes place, it is a relatively recent and non-established concept which has been used, and e.g., to describe the dynamic and fruitful nature of those local environments where new *creative and systemic innovations* are boosted. In the US, the concept of

innovation ecosystem has been used to describe the nationwide systems enhancing welfare and generating wealth (Wessner (2005)). In this study, the aspects and different levels of innovation ecosystem have been used and described to better understand the dynamic interaction between innovation, innovator, and innovation environment.

In literature and in everyday discursion, *innovation* appears as a broad topic. In science, a variety of disciplines address various aspects of innovation. From the everyday life point of view, innovation is a wide-ranging phenomenon and it affects individual and organisational as well as socio-cultural and political life in its different stages, from *ideation to innovating, and verification and diffusion of innovation* (Runco (2007); Davila et al. (2006)). Innovations are both the reasons and reactions to the continuous minor and major changes in our environments. Innovation has its' origin in creativity and thinking but it is also strongly related to the persistent, long term and hard working of doing and implementing (Cooper (2005), West (2002)). Throughout this study, part of the literature's numerous innovation definitions have been introduced and compared with the innovation described by the informants to draw attention to the richness of innovation.

Research on innovation is rich and it involves most of the scientific fields. The ontological aspects of innovation have been studied in philosophy, the creative aspect of the phenomenon has been studied in psychology, the societal aspects, especially the national and global innovation systems have been explored in social sciences and, finally, the commercial and organisational aspects have been dealt with in business studies. Since, the purpose of this study is to discuss the understanding of the fundamental aspects related to innovation and ecosystems; it is a natural consequence that also *the approach in this study is multidisciplinary*.

Why is it then important to understand the fundamental nature of innovation and its relationship to the circumstances where innovation takes place? From the

scientific point of view, the multidisciplinary study on the topic provides a contribution to the ongoing discussion concerning the elements and dynamics of innovation, by approaching the phenomenon throughout the creative professionals in organisational and societal settings and by reviewing the phenomenon of innovation and its relation with circumstances. It is hoped, that the study will also be of value to organisations looking to build effective collaboration with innovators and fruitful innovation environments, as well as for decision makers responsible for national and regional innovation systems, e.g. the national innovation strategy renewal processes. The competitiveness of organisations and wider innovation ecosystems, namely national innovation system, is in the interest of both business studies and the actors of real life.

Understanding the *innovation ecosystem is the core question of national innovation strategies*. The Nordic countries and their welfare systems have led most of the competitive and innovativeness indexes during last years. The Finnish National Innovations System (NIS) progress in these indexes can be considered successful if taking into consideration the poor preconditions in the country after the Second World War and the depression in the beginning of 1990s. However, the problem with the innovation and competitive indexes is, that they are mainly based on input and output variables, and they seldom provide understanding on how the actual throughput process of innovation system works. When looking at our common future challenges, like globalisation, ageing of population or global warming, no nation or organisation can rest on its laurels, but should analyse the national innovation system and subsystem and their preparedness for both short and long term challenges. From the point of view of business studies the competitiveness of innovation ecosystem is of main interest.

Understanding the innovation ecosystem provides knowledge on how to transfer research results through processes, products and business ideas or how to co-create and adopt new knowledge and innovation in close collaboration among academia, public and private organisations, and individuals to enhance welfare

and wealth. Or, as the Committee on Comparative Innovation Policy (Wessner (2007), 5) puts it: “Beyond merely focusing on increasing inputs (such as more funds for basic research), on one hand, or setting output targets and mandating results on the other, the innovation ecosystem approach examines the complex processes through which innovations emerge through a variety of collaborative activities to become commercially valuable products.”

Conventionally, in innovation policy papers innovation ecosystems capture actors like large and small businesses, universities, and research institutes and laboratories, intermediating organisations, as well as venture capital firms and financial markets, actions like creating knowledge and innovation and bringing innovation to market, public policies improving innovation-led growth by strengthening links within the innovation ecosystem. Also rules and regulations and incentives and shared social norms and value systems are crucial variables of innovation ecosystems. (Wessner (2005))

Self-management and self-organising are the more resent features which have been associated with the innovation environments. For example, research carried out in organisational level from the point of view of new product innovators has shown that *organic, self-organising working structures* enable creative commercial innovations more easily than hierarchical settings. (Cooper (2005))

To sum up, the purpose of this study is to generate a Grounded theory of an individual’s experience on innovation and innovation ecosystem, and to reveal the core process of innovation and the innovation ecosystem by a qualitative research method. Consequently, the developing theory should later be tested by other research methods. The rationale is that, throughout a better understanding of the complex nature of innovation and the differences among specific innovations, we can lay foundation for the development of quality and practices concerning innovation ecosystem and the partnership with innovators, that is to say, for a better innovation management.

Individuals' (innovators, pioneers and leaders) experiences are utilized as a litmus test to make the invisible innovation processes and the hidden "black box" of the innovation ecosystem more visible and tangible. Hence, the study obtains information on the experience concerning innovation and the impact of constructive versus harsh circumstances on innovation to detect the concepts describing that experience, and to analyse how these concepts are related, and, finally, to clarify the core process of innovation and how the function of the innovation system appears on that process. In additions to the research interviews, the public discussion in seminars, strategy papers and newspapers, as well as the information from statistics has been used to enrich and validate the core and main categories arising from the discussions with the informants. So, ultimately, the purpose of this study is, by carrying out the qualitative Ground Theory method (GT), to generate a theory on innovation-individual-context relationship.

1.2 Structure of the study

In view of the fact that, a Grounded Theory study is based on induction; the architecture of this thesis has been composed to reflect that methodological principle. Therefore, the previous literature and actual results of this study form pairs of chapters, which reflect each others, whilst the methodological starting points forms the bases of the structure of this study, as illustrated in figure 2.

The main elements of this study, innovation, individual and context (IES) are discussed in both theory and praxis, that is to say, at the literature review and in the chapters regarding the results of this study. Hence, the literature chapters (subchapters of chapter two) mirror the corresponding result chapters (subchapters of chapter five) as following:

1. Literature on innovation and creativity in chapters 2.1 mirror the corresponding results related to the main category of “Innovation and creativity” as described in chapter 5.2,
2. Individual in chapter 2.2 stands for the “creative and entrepreneurial professional” and in chapter 5.3 for the main category of the “proactive innovation intellect”,
3. Context in chapter 2.3 stands for the “Circumstances and environments where creativity and innovation take place” and in chapter 5.4 for the main category of “innovation ecosystem”

Moreover, another pair of chapters goes hand in hand, namely the chapters discussing the system’s theoretical framework (chapter 2.4.) and the final result of the study, Grounded theory on innovation-individual-context relationship, namely the Virtuous Innovation Circle in self-productive and self-organising systems (in chapters 2.4.2.2 and 5.5). These chapters furthermore connect the previous paring chapters.

The methodological considerations are penetrating all the chapters, however the main questions are discussed in chapters 3 (Research task), 4 (Research material and methods) and 6 (Discussion). Consequently, the architecture of the thesis can be illustrated with a transparent cube (figure 2), where there resides altogether four layers, each of which integrate the theoretical and practical aspects of the phenomenon in concern.

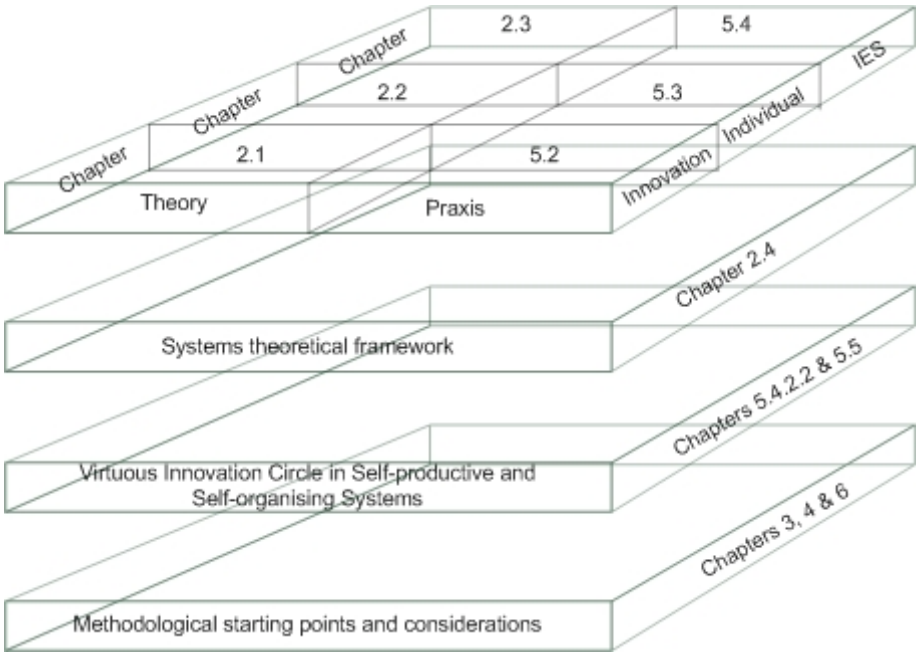


Figure 2 The architecture of the key phenomena and related chapters of the thesis

Since, some of the readers may be interested only on some of the earlier mentioned topics; most of the main chapters have been written so that they can also independently serve the reader. Due to that, repetition of some of the basic ideas continues throughout the main chapters.

2 THEORETICAL PREMISES OF THE STUDY

Theoretical premises and analytical frameworks are discussed in this part of the study to prepare the ground for subsequent empirical study on the innovation-individual-context related phenomenon and for the Grounded Theory building. The guidelines of systems thinking have been introduced to facilitate the holistic understanding of the phenomenon in which all the parts affect each other. This chapter will discuss the key concepts of 1) innovation and creativity, 2) creative individuals, and 3) innovation context, namely the innovation environment and circumstances especially. Special attention has been paid on the successful innovation in demanding circumstances, challenges and tensions. This study has is a bottom-up approach on systems-of-innovation. The empirical study concentrates on individual level, namely on innovators' and other innovation stakeholders' perceptions on the systems-of-innovation at micro, meso and macro levels.

The idea is firstly to introduce (section 2.1) the general discussion about the importance and meaning of creativity related to professional work. The notion of creativity will be then expanded towards the concept of innovation and to the various nuances and dimensions of innovation. Secondly, this chapter will introduce the human perspective of innovation; therefore, the focus of section 2.2 is on the creative professionals in charge of innovation. Finally (section 2.3), the development of the systems-of-innovation approach in science and innovation policy will be discussed, and that discussion will take us to the introduction of system theory (section 2.4).

The discussion of ideas and thoughts about the concept and nature of creativity and innovation may additionally throw light on how to bridge the gulf between the aims, regulations and principles of the mainstream and management of productivity, on one hand, and the creative development of new breakthrough goods, services, processes and businesses on the other hand.

Nevertheless, there are many paradoxes and dilemmas relating to the innovation-individual-context relation. It is, for example, necessary to realise that creativity is not the same thing as intelligence, originality, innovation, or invention (Runco (2007), Stefik and Stefik (2004)). Moreover, in order to capture the true nature of the phenomenon under inspection, it is essential to conceptualise and identify what lies behind the innovation: the concepts and ideas behind the innovation, the creative process, the creative individuals themselves, and the environment in which these generations interact**.** Finally, it is necessary to be able to have a clear overall view of what is important in the (organizational, regional, national) development process to let everything fall into its proper place. All these matters will be outlined and discussed in different chapters of this study in order to create as clear understanding as possible of the innovation and its relation with environment and circumstances, which will be referred to as *system-of-innovation and innovation ecosystem* in this study (as will be clarified in sections 2.3 and 2.4).

2.1 The concepts and ideas related to creativity and innovation

In the innovation context there are different ways that scholars have referred to the meaning of the words "innovation" and "creativity". There resides *specificity in the notion*, since all these definitions and references of the terms *depend on the context or the grounds* of which the innovation or creativity applies. From the point of view of innovation-individual-context relation, it of the interest of this study to ask whether that specificity exists in general innovation rhetoric, or has the innovation has turned to an umbrella-like layman-term. In this study *innovation is explored in business context*, furthermore, its connections to creativity and innovation in society in general will be examined.

In business perspective, the significance of the companies' long-term viability is important. When aiming at viability in the global economy, the importance of innovation and creativity are stressed (Florida (2002); (2005)). Based on an

empirical international research (Wolpert ((2003)) 87% of companies (n=842) said that *innovations are most crucial when aiming at growth and profitability*. Less important were concentrating on core competences, networking or cutting down expenses. The same research compared the best and most important quarter of companies in each sector. At top innovator companies, the share on new products of turnover was 2,5 times higher than those belonging to the worst quarter. With reference to the United States, Wolpert ((2003), 53) points out that, "nearly 50% of the U.S economic growth came from the businesses that had not existed in the decade before". This portrays the *essence of the exploration of insights and radical innovation*, as well as applying the needs for external perspectives in nurturing one's business.

Innovation has a *challenging nature due to the many scientific and practical ways of approaching the phenomenon* of innovation in fields such as economy, technology, social systems or in policy. Despite its challenging nature, innovation processes are stressed as important in the global economy (Porter (1990); Florida (2002), (2005)) and especially when aiming at the growth of profitability. Notwithstanding, the importance of innovation is mainly concentrated in the aspects of wealth and wellbeing of individuals in the system, since through innovation the economy will be well positioned (i.e. innovation acts as the driver of economy)

In addition, innovation is viewed as a key interest in many different studies, such as economics, business, technology, sociology, and engineering. It is also critical to policy makers. Innovation may be *linked to performance and growth through improvements in efficiency, productivity, quality, and competitive positioning and market share*. It is through the earlier mentioned dimensions, and nature that the need for the innovation research becomes apparent in different occasions.

2.1.1 Development of the innovation concept

The development of innovation *concept has presented its heterogeneity according to time, sectors and countries* (Bruland and Mowery (2005)). This regard renders the understanding that the changes in environment and circumstances generate continuous change of the meaning of the notion. In innovation literature, there is, however, one problem: a great deal of the research has been focusing on technology; whiles there is a need to address the research results for other types of innovations, like service, business or management innovation.

Innovation research originates in the early 1900's. Neoclassic economy had explained the economic growth throughout market competition and monetary and human capital inputs. As early as in the 1920's, Joseph Schumpeter (1927) had already suggested that innovations based on the development of the technology were crucial interpretive factors in long-term economic growth. In the 1960's, technology was considered to be an important interpreter of economic growth in developed economies (Perez (2003)).

In the 1970's, the key interest of research was weather *science push* or *market pull* better explained development and success of innovation. Nevertheless, that phrasing of the question was finally abandoned as conceptually impermanent and empirically fruitless. In the 1980's, the sources of innovation were considered diverse and varying. Long-term creative dialog or interaction among science, technology and market were underlined. (Miettinen et al. (2006))

Since the 1960s, when it was established, the OECD played a crucial role in the discussion about innovation, science and commercialization of knowledge. In 1971, the report *Science, Growth and Society* (OECD (1971)) paid attention to the *role of science in society* and the increasing need to plan and steer. How to reconcile science inner need of autonomy with the society wish to enjoy the fruits of science was a matter discussed in the report. The balance between

funding of basic and applied research and the cost-benefit analysis were suggested. Attention was drawn to the *connection between science and technology and economy, quality of life and societal problems, such as health, urban development and environmental problems*. This report conveyed the emphasis from knowledge creation to commercialization of knowledge. The OECD innovation policy stressed that linear innovation was to be replaced by interactive or systemic innovation (Miettinen et al. (2006))

According to Miettinen et al. (2006*), innovation research is becoming differentiated* according to concrete problem areas and it is investigating innovation conditions in many levels. Firstly, innovation research is analyzing changes in innovation activities caused by scientific-technical development, globalization, and breakthrough of information technologies and diversification of needs of the end users. Secondly, research is analyzing the specific conditions for innovation in different fields of technology, line of production and different markets. Thirdly, innovation research is analyzing innovation activities as local and regional phenomena.

In the 1990s and 2000s, *new concepts* have been used and developed in innovation policy and in research on innovation. Most of the concepts examine knowledge creation and learning, or the role of universities, companies, consumers and public institutions. The recent development includes the flowing concepts:

- Innovative milieu (Camagni (1991), 3),
- Social capital (Putman (1993), 167),
- Knowledge Mode2 (Gibbons et al. (1994)),
- Learning and creative regions (Florida (1995), 528),
- Learning networks (Powell et al (1996)),
- Learning economy (Lundvall and Borrás, (1999) 29),
- Triple Helix (Etzkowitz (2002)),
- Open innovations (Chesbrough (2003)),
- Open source innovations (Weber (2004)),

- End user innovations (von Hippel (2005)),
- Modular development of complex products (Foray (2005)),
- Innovation ecosystem (Wessner (2005) and Hämäläinen (2006),(2007)) and
- Living Laboratories (by Professor William J. Mitchell, of the MIT Media Lab and School of Architecture)

Innovation and paradox. The fact that the definition of innovation is slippery encourages the investigation of the paradoxical nature of transition. (For deeper philosophical analysis, see e.g. philosopher Ischazo (1982) (in Thompson (1988)) who claims that the higher order thinking of "trialectic", in addition to "formal logic" and "dialectics", can be applied for dealing with problems and situations. Ford and Backoff (1988) illustrate the academic concepts like dualities and paradoxes in order to discuss how trialectics might help in viewing transition in management of change.)

What is a paradox then? The simple definition, based on Latin origin, says that a paradox is an apparent contradiction. *A paradox is an observation in which two apparently contradictory elements are seen as present or operating at the same time but about which we do not have to choose*. However, not all the authors agree on the definitions of paradox or use the term in the same way (Quinn and Cameron (1988), 290)).

Van de Ven and Poole ((1988), 21) write "[A] a paradox, also called antinomy, is a real or apparent contradiction between equally well-based assumptions or conclusions. When considered separately, the arguments supporting paradoxical propositions appear sound. However, considered together, the arguments appear contrary or even contradictory."

For Ford and Backoff ((1988), 82) paradoxes are important what concerns organisational transition, since they "reflect the underlying tensions that generate and energize organisational change." According to them (Ibid. (1988), 89) paradox is "something that is constructed by individuals where oppositional

tendencies are brought into recognizable proximity through reflection or interaction."

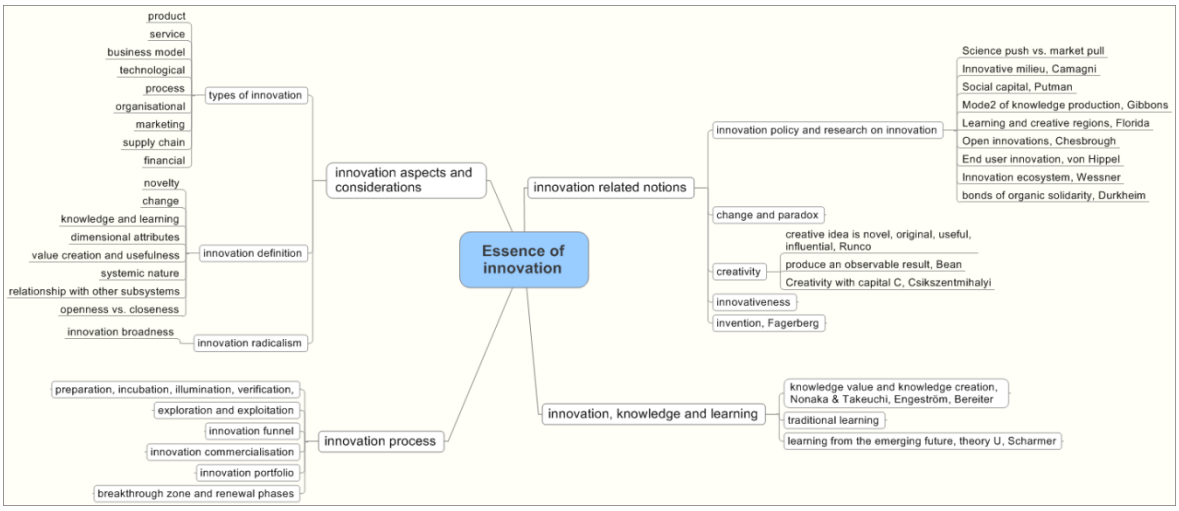
Furthermore Ford's and Backoff's meta-theoretical guide to avoid traps of common thinking ((1988), in Thompson (1988), 125) illustrates how human cognition and behaviour is based on the way we "*construct reality*" linguistically and make sense of events and things in relation to organisational transitions. Making distinctions and assigning labels in order to define, identify and evaluate things and people is a prerequisite for organisational work. *Distinctions lead to dualities, whereas dualities create a sense of tension and paradox, which furthermore can create and provide much energy needed for organisational growth and change*. "The additional energy comes from the higher order multiple systems in which the organisation is embedded." Both external and internal sources cause these changes, but the locus of control is internal. Thompson ((1988), 125-126) highlight Ford's and Backoff's idea of the nature of reality as a social construction and write: "Change is manifest as a new frame or paradigm – a different way of construing the world. […] That new frame is established through language, specifically through argument-dialogue and monologue-and is rooted in the actual metaphors and metonomies that members of the organisations invent. Argument is the engine of organisational change."

2.1.2 Different aspects related the concepts of creativity and innovation

Creativity and innovation are both rich and *multi-perspective words* that have a powerful role in the knowledge era. Numerous schools of thoughts have defined these concepts and the sub-concepts related to them. Most of the concepts are still developing and cause confusion among managers, laymen and researchers. Words like creativity or innovation can be ambiguous, depending on the context or the background of the professional using them. For example, for an artist, creativity may have a different connotation than for a business manager or a

lead user of an innovation. The different type of innovation and realted notions discussed in this section can be grouped as in table 1.

Table 1 Type of innovation and innovation related notions



Despite of the fact that creativity and innovation are different notions, they emerge side by side through the process of innovation. This is because an innovation is fulfilled only after the creative ideas (which often are new and valuable) have been realized, and the idea of mixed views is been seen as a seed for the innovativeness (Johansson (2004), 14-18). Furthermore, creativity for organizations and teams has been seen as a starting point for innovation, despite the fact that it is not sufficient for the innovation results (Amabile et al (1996), 1154-1155).

Creativity. In everyday language, creativity has many different meanings and connotations, hence the meaning of the world is elusive like a piece of soap - if you try to grab it, it slips away. According to Johansson ((2004), 15) creativity does appear when people act in concert with the surrounding environment, and within society. Creativity has been seen in distinction to intelligence, originality, innovation, or invention as well as adaptability and discovery (Runco (2007)). In an attempt to stress its meaning, a *creative idea* has been defined as something that is *novel or original as well as useful or influential* (Flaherty (2005)). An

additional component of creativity was added by Andreasen (2005), stressing that it has to lead to a product of some kind. - “Even though creativity begins as an inner process - a feeling or an idea - it must also *produce an observable result*” (Bean (1992)).

The major thoroughfares to creativity are through the person (or personality), process, product, or place, persuasion and potential (Rhodes (1962), Richards (1999), Runco (2004), Simonton (1990)).

In the modern era, with growing emphasis on utility, the distinction between creativity and innovation is relevant. One way to distinguish creativity and innovativeness was suggested by Bandura (1997), 239): “creativity constitutes one of highest forms of human expression. *Innovativeness largely involves restructuring and synthesizing knowledge* into new ways of thinking and of doing things. It requires a good deal of cognitive facility to override established ways of thinking that impede exploration of novel ideas and search for new knowledge. But above all, innovativeness requires an unshakeable sense of efficiency to persist in creative endeavours.”

Runco (2007) attempted to encompass both *originality and effectiveness* in his work on innovation and creativity. He proposed a continuum in terms of the balance between originality and effectiveness in creative efforts. “Truly creative products and behaviours reflect balance, meaning that they are somewhat in the middle of the continuum. They therefore have some originality but also some effectiveness; often the effectiveness of an innovation is obvious to some public or business or audience. The effectiveness of creative things, on the other hand, may be personal and a matter of self-expression” (Runco (2007), 386). Runco (2007), 386) refers to March ((1978) when arguing that this view is consistent with theories of organisational creativity that contrast creative organisations with efficient organisations.

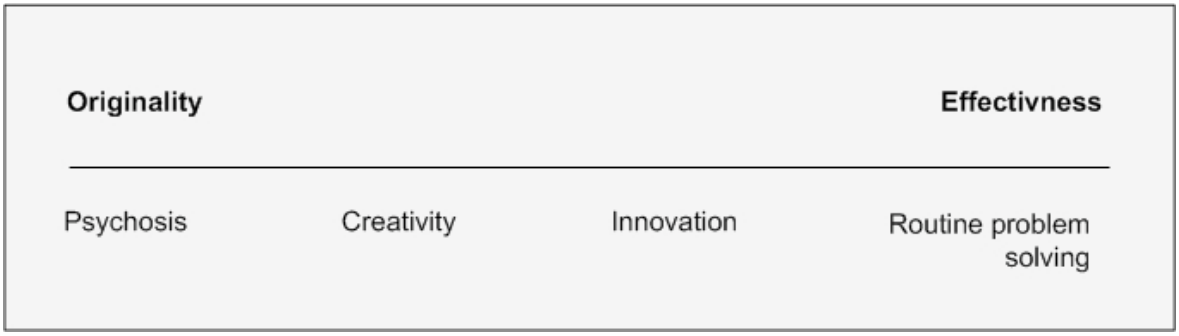


Figure 3 Proposed continuum allowing a balance of originality and effectiveness in Creative Efforts (Runco (2007), 386)

From the point of view of this study and the analysis of innovation-individual-context relation, it is important to pay attention to the interaction between individual thoughts and the social cultural context, which assists in generating creativity. *Creativity written with the capital C*, refers to notion which is not only in the mind of the person, but is a type of creativity that changes the aspects of culture in the domain where creativity takes place (Csikszentmihalyi (1997), 23). ***This study is about creativity with capital C***, since it aims to explore and portray radical innovation in making changes in the domain in challenging situations.

Csikszentmihalyi ((1997), 314-333) wrote about *creativity based on systems view* (figure 4). For creativity to occur, a set of rules and practices must be transmitted from domain (culture) to the Individual. The individual produces a novel variation in the content of the domain. The variation then must be selected by the field (society) for inclusion in the domain.

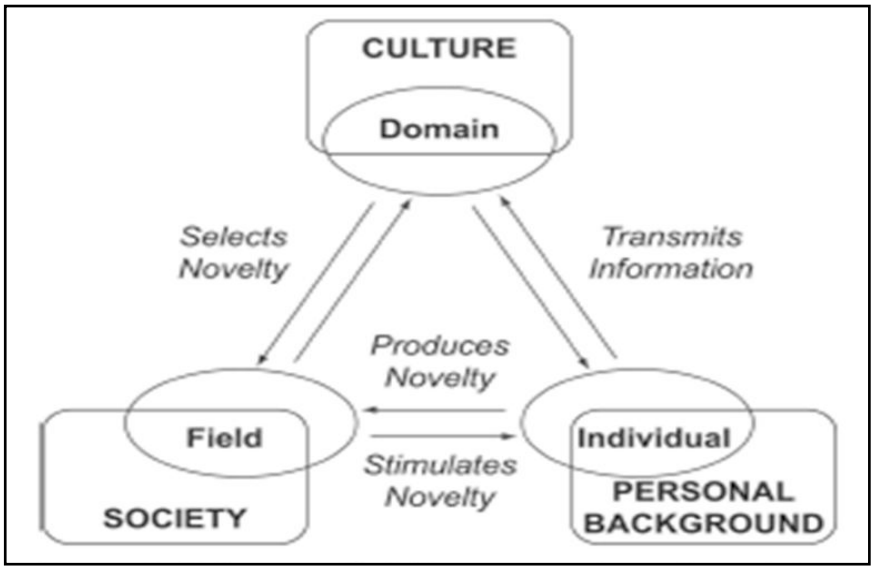


Figure 4 The system view of creativity (Csikszentmihalyi in Steinberg (1999), 315)

The domain is a necessary component of creativity, because it is impossible to introduce a variation without reference to an existing pattern. *New is meaningful only in reference to the old. Original thought does not exist in a vacuum*. That is to say, creativity must operate on a set of already existing objects, rules, representations, or notations. *Creativity occurs when a person makes a change in a domain, a change that will be transmitted through time*.

Most novel ideas will be quickly forgotten. Changes are not adopted unless they area sanctioned by some group entitled to make decisions as to what should or should not be included in the domain. These gatekeepers are the actors (like teachers, critics, journal editors, museum curators, agency directors, and foundation officers) who decide what belongs to a domain and what does not.

Creativity can be seen as a special case of evolution. Specifically, it is to cultural evolution what the mutation, selection, and transmission of genetic variations are to biological evolution. *In order to be called creative, a new meme must be socially valued*. As long as the idea or product has not been validated, we might have originality, but not creativity. Creativity is much the result of changing

standards and new criteria of assessment, as it is of novel individual achievements.

A society that enjoys a material surplus is in better position to help the creative process. However, it is not enough to have material resources to implement new ideas – it is also important to be interested in them. What kinds of societies or social organizations are then open to novelty? Are they top-down or bottom-up managed systems? Are they societies and organisations where wealth and power is in a few hands and it is easier to use part of it for risky or "unnecessary" experiments? Or, are they societies and organisations, which are located at the confluence of diverse cultural streams and can hence benefit from that synergy of different ideas (such as centres of trade like the Renaissance Florence)? External threats often mobilize society and organisation to recognize creative ideas. The complexity of system also bears on the rates of innovation it can tolerate.

This study is based on an assumption that an i*deal condition for creativity would be a social system that is highly differentiated into specialized fields and roles, yet held together by what Durkheim (1873-1917)) called the bonds of organic solidarity*. To put it in another way, systems that are highly differentiated, yet based on complementary interaction, is where creativity and innovation takes place.

Invention and innovation. Sometimes *invention and innovation* are closely linked, to the extent that it is hard to distinguish one from another. Invention is the first occurrence of an idea of a new product or process, while innovation is the attempt to put it into practice with the objective of increased efficiency, competitiveness, and returns (Fagerberg (2004), 4). To be able to turn the invention into an innovation, however, a firm needs to combine several different types of knowledge, capabilities, skills, and resources. The role of the innovator, responsible for combining the various above factors, may be quite different from that of the inventor (Stefik and Stefik, (2004), Fagerberg (2004)).

Another set of complicating factors is that invention and innovation are continuous processes, and innovations do not take place in a vacuum. This work stresses the systemic nature of innovation, since it characterises the collective achievement from the invention to the innovation. (Fagerberg (2004))

In the knowledge society, organisational success or competitiveness is more often based on innovativeness and capability to learn than on other aspects. Innovating is an interactive process between different actors and is based on diverse sources of information and flows of knowledge between individuals and organisations.

Innovation. It can be assumed that Csikszentmihalyi's definition of creativity with the capital C has closer connotation to the notions of innovation. In this respect, the balance between creativity and commercialization is a prerequisite for the successful innovation (Davila et al. (2006), 90) (Figure 5). Companies have their own internal mechanisms or "market places that weigh, select and prioritise innovation for their creativity and inherent commercial value or worth to the company" (ibid. 89). According to Davila et al. this balance is changing in accordance with the natural evolution from emerging to mature company.

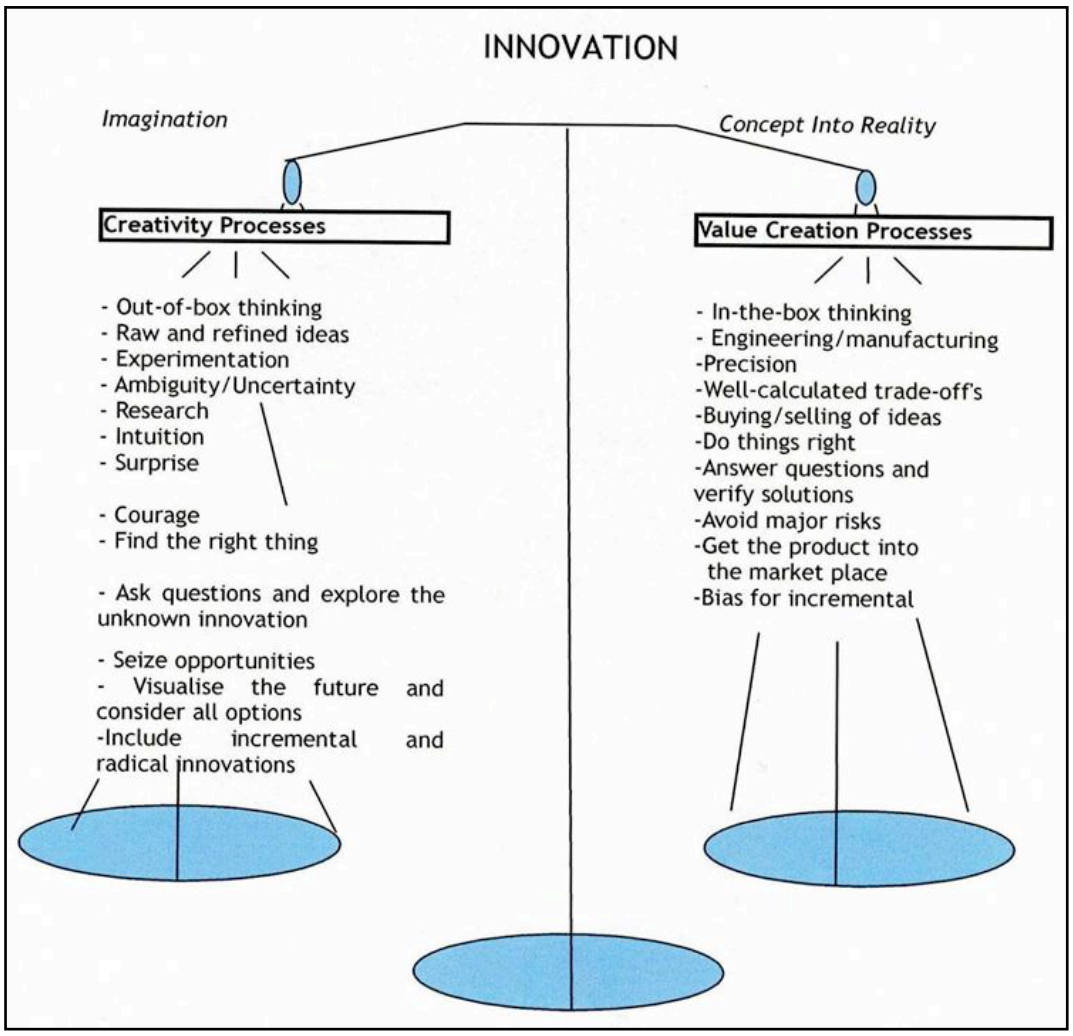


Figure 5 Innovation requires a balance between creativity and commercialization. (Davila et al. (2006), 90)

In the business context, innovation can be combined with various aspects, namely, development of products, technology, organization, and management, among others. Thus, different types of innovations can be classified in various forms such as: Product innovation (Cooper (2005)), business model innovation (Hamel (2007), technological innovation (Katz (2004), or social innovation, process innovation, marketing innovation, organizational innovation, service innovation, supply chain innovation, or financial innovation. (Apilo (2007)) Since innovation acts as lifeblood of the organization, it is a key element for the company's increase of the bottom line results through the aggressive top line growth (Davila et al (2006), 6).

The classic definitions of innovation stress different aspects such as

- *novelty* (Runco, ((2007), 382); Kautonen ((2006), 52); Rogers ((2003), 12); Amabile (in Lam (2005), 123)),
- *change* (Mezias ((2005), 123); Christensen ((2000), xvi); Mezias and Glynn (1993) in Oxford handbook of innovation ((2005), 123)),
- k*nowledge and learning* (Fagerberg, J.et al. ((2005), 123); Hautamäki ((2007), 7); Dundon, (2002); Miller and Morris (1999); Carrero et al. ((2000), 508); Luecke and Katz ((2003), 2); March (1999); Brown ((2003), 132), and
- *dimensional attributes* (Cooper (1998), in Saarikoski ((2006), 23); Tidd (1997); Afuah (1995), in Saarikoski (2006), 23),

Innovation definitions furthermore discuss aspects, like

- *how to react to the variation of the intensity and the speed of the change in environment* (Ståhle ((2000), 194), ((2004), 48); Hamel (2000); Thomke in Apilo, ((2007), 29); Doz and Kosonen (2007)),
- *individuals* (Florida ((2005), 26); Miettinen (2002)),
- *management* (Davila et al (2006); Hamel (2000)),
- *usefulness* (Davila et al ((2006), 2 & 6); West and Rickards ((1999) in Runco (2007), 381); Runco ((2007), 382, 386); Saarikoski ((2006), 23); Harvard business review ((2003) 29,113,125, 160), and
- *technology improvement* (Smith (2005), 164).

In addition to the innovation descriptions, scholars such as Carrero et al (2000) and Jackson ((2005), 122) have outlined the *essence of chaos in enhancing creativity* and innovation potentials, whereas Apilo et al ((2007), 15) highlighted *efficiency* in making the innovation successful. Other considerations that can be taken into account while dealing with the innovation matters can be through considering

- its *systemic nature* (Oxford handbook of innovation ((2005),12, 14); Ståhle and Grönroos ((2000), 129, 130); Prigogine ((1967) and (1976) in Ståhle (2004), 38); Apilo et al ((2007), 26, 27)),
- its *dimensions* (Cooper (1998) in Saarikoski (2006), 23); Davila et al (2006); Afuah (1995); Tidd, (1997); Christensen (1997); Carrero et al (2000); Hargadon ((2003) in Apilo (2007)); Tidd et al. (2005) in Apilo (2007)) and
- *its differences or relationships with other matters such as invention vs. innovation* (Cooper ((2005), 525); Steffik et al ((2004), 27, 69), Apilo ((2007), 22, 228)).

With regard to *novelty*, which is the core meaning of innovation, scholars have considered novelty in diverse perspectives such as *new for domain vs. new to an individual*. Rogers ((2003), 36), for example, referred to innovation "as an idea, practice or object perceived as new by an individual or other unit of adoption". Whereas Schumpeter (1934) regarded innovation as new products, new methods of production, new sources of supply, the exploitation of new market, and new ways to organize business: That is, innovation is new combinations of existing resources. (Fagerberg et al. (2006), 6)

Schumpeter (ibid.) also stressed the *difficult change* as a core characteristic of innovation. Moreover, Rogers ((2003), 36) refers to *complexity* as one of the attributes of innovation that can be perceived by the members of the social system. Other attributes are: *relative advantage, compatibility, trialability and observability* (Rogers ((2003), 36).

Many scholars refer to the u*sefulness*, advantage, or benefit of innovation. For example, West's (in Runco ((2007), 381)) definition refers to the *intentional nature and benefit in context*. Moreover, Drucker ((2003), 114) stressed the effort to create *purposeful, focused change* in an enterprise economic or social potential. In addition, *value creation* for the customers and potential customers has been outlined (Pearson (2003), 29).

Furthermore, innovation can create value in short term or in long term. Some scholars of the 1960s, such as Levitt ((2003), 155-179), had taken the usefulness aspect to the extreme, with an emphasis of success on the cost of creativity; in this regard, one can ask whether there is any novelty left in the innovation. However, other scholars (Davila et al (2006), 2), Hautamäki, (2006)) have discussed the *social value* of innovation relating to, for example, philanthropy and micro credits with the Grameen Bank. Another recent example is the gift economy and open source that are related to the development of software programs; for example, Mårten Mickelson, CEO of MySQL, compares the user driven innovations related to software programming with a Finnish word "*Talkoot*". According to Mickelson, the software community is providing help for each other by improving the software program and allowing all the other community members to utilise those improvements.

"Systemic nature of innovations" refers to the idea of the collective achievement of innovation through interlinking actors, activities and innovation system (Fagerberg (2006), 12-13). The systemic innovation refer to innovation that has been co-created by several companies and which is not only about technological innovation, but includes other elements such as process and organizational innovation (Apilo (2007), 26).

Innovation is referred to as *learning new and useful knowledge*. Hautamäki ((2007), 7) also studied how it benefits learning. In *discontinuous innovation* (Dundon (2002)), organisation is surpassing its existing knowledge, but in *continuous innovation* and in *fusion innovation* (Miller and Morris 1999), organisation rests on the previous knowledge and its development. In addition, Luecke and Katz ((2003), 2), refer to innovation as an introduction of a new method from the synthesis of knowledge in original and relevant valued new products or services.

Since learning and knowledge are important aspects of innovation, a more detailed discussion will be done later in chapter 2.1.3.1 and 2.1.3.2; however, other important aspects of innovation, namely radical vs. incremental will be discussed in detail in the following sections, because most of the tensions related to innovation are related to this distinction.

Incremental vs. Radical Innovation. Innovation can be divided into radical and incremental innovation. The benefit from incremental improvement is instant, while radical changes are rare and more difficult to achieve. In fact, the more radical an innovation is, the more it affects the system. To succeed, a radical innovation often requires infrastructural, organisational and social changes. However, the influence of existing organisational and institutional patterns creates inertia and makes changes difficult. (Stefik and Stefik (2004); Fagerberg (2005))

Saarikoski (2006) argues that breakthrough, disruptive or radical innovation means launching an entirely novel product or service, rather than providing improved products and services along the same lines as those currently supported. The uncertainty of breakthrough innovations means that companies seldom achieve their development goals this way; but, when the breakthrough innovation comes, the rewards can be tremendous. Disruptive or radical innovations involve larger leaps of understanding, perhaps demanding a new way of seeing the whole problem, probably taking a much larger risk than many of the people involved would wish to take. There is often considerable uncertainty about future outcomes, possibly leading to significant opposition to the proposal, and questions about the ethics, practicality or cost. People may question whether this is, in fact, an advancement of a technology or process. That is the reason why those working outside the mainstream industry and existing paradigms create radical innovations, which involve considerable change in basic technologies and methods. (Stefik and Stefik (2004); Davila, Epstein and Shelton (2006))

Since this research is more about the fuzzy front end of innovation and the radical thinking behind emerging radical innovations, as well as the interaction with the components of the innovation ecosystems, the concept of radical innovation is handled in considerable depth. In addition, breakthrough and disruptive innovation have been discussed with those radical changes that affect, or will most probably affect, the existing paradigm in the field of those interviewed.

Radical innovations involve exploration of new possibilities and require new knowledge. It can be an entirely new technology, product, system, service, and/or a new business concept that requires synthesizing new knowledge (Ahmed, Nonaka & Smith (1999)).

In this study, radical innovation refers to all type of innovations resulting from radically improved performances or growth (technological innovations, process innovation including business models, social innovation, etc). It is accepted that *all organisations can innovate*, including, for example, hospitals, educational institutions, and local government institutions. In this definition, *radical innovation emerges as a non-linear process*.

Similar broad definitions can be found from the literature. Hargadon (2003) points out that, radical innovations can be created by combining existing observations and by bridging the gap between industries. Rogers' definition for radical innovation, "*a new paradigm for carrying out some tasks*", allows for a broad set of different contexts (e.g. technological, company-wise, institutional, societal and one which challenges existing institutions) argues Saarikoski (2006). Hargadon (2003) has defined radical innovation through its impact on industry.

In the literature, the notion of *radical innovation* often refers to scientific and technological innovation. Radical innovation has frequently and considerably reduced the costs of key economic inputs and has, therefore, been widely adopted and become the catalysts for major structural changes in the economy.

Steam power, electricity, motorization, synthetic materials, radio communication and ICT are examples of innovations that have caused huge leaps in performance in specific fields (Pavitt (2005)). One of the most cited authors is Christensen (1997); he defines *disruptive technologies* as technologies that disrupt an established trajectory of performance improvement.

Nevertheless, according to Davila, et al. ((2006), 51-55)), radical innovation, is a significant change that simultaneously affects both the business model and technology of a company. Radical innovation usually *brings fundamental changes to the competitive environment* in an industry. Often, radical innovations have not only changed industry, but have led to a series of cascading semi-radical and incremental innovations (Davila, Epstein, and Shelton ((2006), 52)). First, a risky, time consuming, and sometimes very hard journey has been undergone.

With regard to Hautamäki ((2007), 7), "*radical innovation* provides *dramatically improved performance along an established performance trajectory*". "It's important to note that radical and disruptive innovations are emerging mainly form exploration of new alternatives." However, he (ibid.) warns that the organizations tendency to substitute exploitation of known knowledge and alternatives will increase a risk of adaptive processes becoming self-destructive in the long run.

Radical innovations are often connected to simultaneous changes of business models. According to Hamel (2002), "[R]radical innovation is innovation that *has the power to change customer expectations, alter industry economies and redefine the basis for the competitive advantage*. […] By definition, a bona fine competitive advantage is both unique and difficult to duplicate. A central goal for radical innovation is the invention of new sources of competitive advantage" (Hamel ((2002), 62)). He (ibid.) furthermore highlights the extensiveness of innovation together with its radicalism (Figure 6): "Every new idea can be judged in terms of these two criteria: To what degree does the idea depart from industry norms (*how radical is it*)? And to what extent does the idea stretch

beyond the product to encompass other elements of the business concept (*how extensive is it?*)" (Hamel ((2002), 63))

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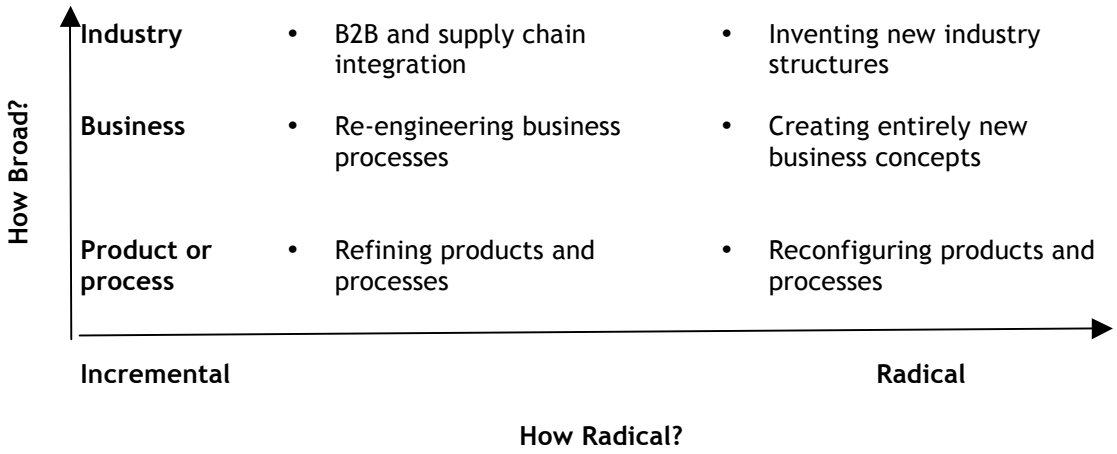


Figure 6 Expanding the innovation horizon (Hamel (2002), 64)

"In a nonlinear world, only *nonlinear ideas* will create new wealth. With regard to companies, for instance, most of them have reached the point of diminishing returns in their incremental improvement programs. Continuous improvement is an industrial age concept, and while it is better than no improvement at all, it is insufficient in the age of revolution. The foundation for radical innovation must be a company's core competencies and its strategic assets" (Hamel 2002), 13). The essence of this definition will further be emphasised in this study.

Notwithstanding, radical innovation often relies on dynamic methods like *management by vision*. When radical innovation is concentrated into the business concept, its impact becomes revolutionary (Hamel (2002)). Heavy reliance on experimentation, focus on ambition and low process formalisation are typical for management for radical innovations (Davila, et al. (2006)). A metaphor like "guerrillas reconnoitre" has been used to describe the unsure nature of the pioneers work in development of radical innovation (Linturi (2008)). The leader's capability to convince the group about the logic and usefulness of gyration nature of the uncertain reconnoitre phase is crucial.

Davila et al. (2006) remind that *continuous support is more important than working for a reward in radical innovation*.

Davila et al. (2006) has expressed the interplay between technology and business model innovation by a matrix (Figure 21, in chapter 2.3.1.2) in which three different types of innovations has been distinguished: *radical, semi-radical and incremental*.

Radical innovations are *comprehensive* and they are not limited to individual organisations. They can also change the paradigm of the entire field or they can be related to industrial revolutions. A change in one part of the innovation ecosystem may modify the interaction between all the subsystems and, in that way, may force all those involved to react, causing a series of incremental innovations. (Diz and Hirvikoski (2008))

Incremental innovations have been seen as those advances in the technology line that do not apply an amount of uncertainty. Incremental innovation is based on what has been learned earlier or on existing business concepts and processes (Tidd (1997)), and on utilization of even small-scale changes in technological know-how (Kautonen (2006)).

Incremental innovations are small improvements that compress value from existing products and services without making significant changes or major investments. Through providing improvements in both technology and business model, a company can ensure better cash flow and sustainability in the market competition (Davila et al. (2006) 38-43). In many cases, companies are said to get stuck in the incremental innovation.

Semi-radical innovation can provide crucial changes to the competitive environment that an incremental innovation cannot. This involves substantial change to either the business model or technology of an organisation - but not both (Davila, et al. (2006), 47-51). In chapter 2.3 the discussion of innovation

will be directed to the variation of management styles in dealing with different types of innovation and its level of radicalism.

By *sustaining innovation,* it has been referred to the similar incremental development of the companies. This innovation targets the demand to the high-end customers with improved performances (hence, existing companies beat entrant attackers). In contrast *disruptive innovation* is applied when the product trajectory is redefined and its results is not as good as the one on offer, as a result of the improvement process after when the product has been affected with the positive response in the market. (Christensen and Raynor ((2004), 34)). With regard to Davila et al. ((2006), 57) disruptive innovation has been referred as "a broader term that addresses both technology and business model changes". Disruptive innovation is a reason for the incumbent companies to lose to the attackers.

Disruptive innovation is very close to the notion of radical innovation. Nevertheless, they are not synonyms. Scholars speak about disruptive technologies and disruptive innovation. Christensen disruptive innovation theory is well known, it will be discussed later in this study. Disruptive innovation theory by Christensen, Anthony, and Roth ((2004), xv, 277-278), is based on the analysis of 100 innovations and it "points to situations in which new organisations can use relative simple, convenient, low-cost innovations to create growth and triumph over powerful incumbents."

Low-end disruptive innovations are disruptive innovations that take root at the low end of the original mainstream. In this response the creation of new market is unpronounced but the low cost business models and earning the attractive returns. (Christensen and Raynor (2003), 46-50). The scholars (ibid., 45) are as well referring to the *new-market disruptive innovation* as a competing with "nonconsuption" since they are so much affordable to own and can be simply used as well as improves the value networks of the customers when their performance improves. Both Low-end and new-market disruptive innovations

create the same “vexing dilemma to their incumbents (Christensen and Raynor (2003), 46).

With regard to d*isruptive technologies*; these are types of semi-radical technology innovation, brought about by changing the technology basis but not the business model (Davila et al. (2006), 57). Disruptive technologies are simpler, more convenient and less expensive, they are as well offering other benefits with a differently from the disruptive innovation (Christensen and Raynor (2003), 34).

Business model innovation and management innovation. Hamel ((2007), 32) presents a hierarchy of various forms of innovation (operational, product/service, strategic and management innovation), where “higher tiers denote higher levels of *value creation and competitive defensibility*”, and management innovation comes out on the top of the hierarchy (Figure 7).

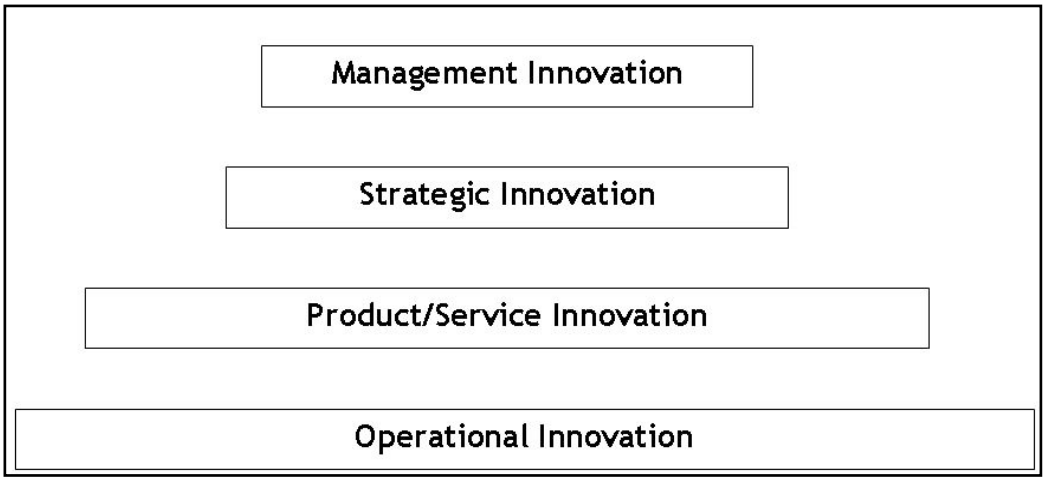


Figure 7 The innovation stack (Hamel (2007), 32)

Strategic innovation refers to the “new business models that put incumbents on the defensive” (Hamel (2007), 33) because their radical, non-linear nature dominates the business rules and structure within an industry or domain. Hamel

(2002) argues that it is not "more of the same" i.e. copying other's business concepts, but the new, *holistic and radical business concept innovations,* (Hamel (2002), 70) which are the best means to create new wealth. "The goal of business concept innovation is to introduce more strategic variety into an industry or competitive domain. When this happens, and when customers value that variety, the distribution of wealth-creating potential often sifts dramatically in favour of the innovator." (Hamel (2002), 69)

"[…] a capacity to first identify, then deconstruct and reconstruct business models lies at the heart of a high-performance innovation system", states Hamel (ibid.72-73). Hamel (2002), 100) introduces a framework of how to unpack the business model to four major components: core strategy, strategic resources, customer interface and value network (and to their subcomponents as mentioned in Figure 8). The components are linked together by three "bridge" components (Configuration activities linking core strategy with resource base, Customer benefits linking core strategy with customer interface, and Company boundaries linking resource base with value network). Furthermore, the following four factors determine the business models profit potential: efficiency, uniqueness, fit and profit boosters.

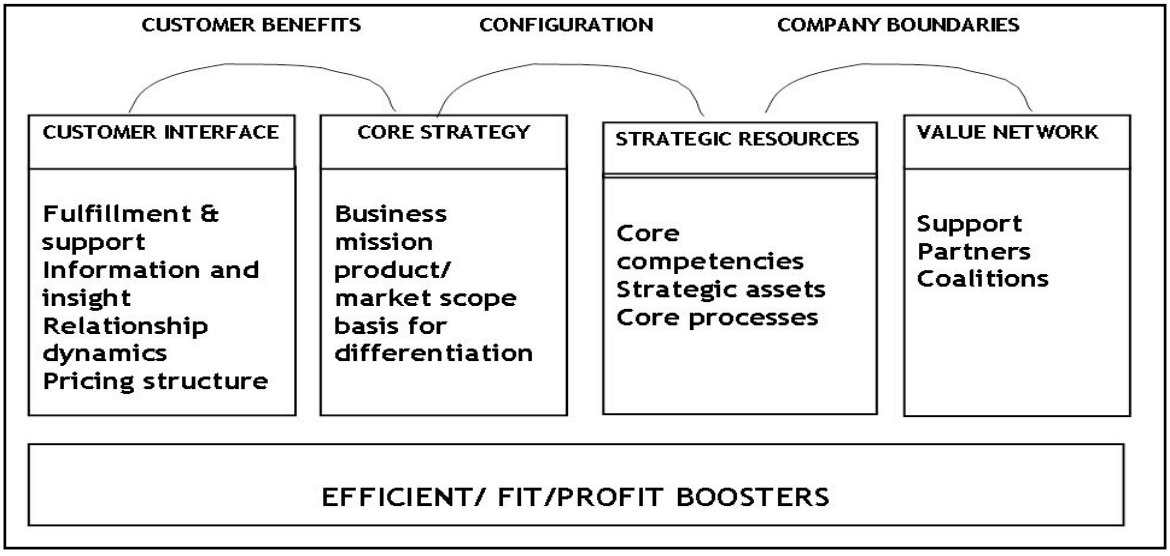


Figure 8 Elements, sub-elements and factors determining the profit potential of a business model (Hamel (2002), 100)

In addition to business model innovations Hamel ((2007), 35) encourages the "continuous management innovation." In order to do that he compares innovation articles (table 2) in the leading business magazines over the last 70 years and takes notice to the lack of discussion on the management innovation. *Management innovation*, according to Hamel, has been mostly incremental in recent years possibly "due to a lack of daring in the choice of problems to tackle". What is needed for a management innovation is "the passion for solving extraordinary problems that creates the potential for extraordinary accomplishment." (ibid., 37) (In results, this thesis uses the word *managerial innovation* as a synonym of the previous discussed management innovation. This is to avoid confusion between managerial innovation and *management of innovation*.)

Table 2 Comparison of innovation topics in leading business magazines based on Hamel and Breen ((2007), 35)

Search expressions used	Number of articles found
"Technology innovation" or "technical innovation"	More than 52 000
"Product innovation"	More than 3 000
"Strategic Innovation" ("Business Innovation", Business Model Innovation")	More than 600
"Management Innovation", "Managerial Innovation", Organisational Innovation" , and "Administrative Innovation"	Less than 300

According to Hamel and Breen (2007), management innovation renews the current control and efficiency centred management model. Consequently the new ways and innovation of mobilizing talent, allocating resources, and building strategies will help future oriented companies to cope with the revolutionary environment and to build long term advantages. Thus management itself, top-to-

bottom remodelling edifice of principles, processes and practices is seen as competitive advantage; "isolated initiatives and one-time projects are no substitute for a sustained, companywide campaign of breakthrough management innovation" (ibid., 241)

The goal of management is to multiply human accomplishment, first, to *amplify* (amplifying effort will be discussed more in detail in chapter 2.2.) and then, to *aggregate* human effort. Moreover, Hamel ((2007), 250, 254-255) encourages reinventing the technology of management by discussing an idea of post-organisational and post-managerial society. In order to do that, he compares the possible *future of management (namely Management 2.0) with the social revolution on Web 2.0*, and its pervasive, real time connectivity, which is amplifying and aggregating creativity and Web's capacity to facilitate coordination without hierarchy. *Thus, managerial activities in the future might look like the activities in the Web, distributed out to the periphery.* Scholars, like Florida ((2004), 22) and Hamel ((2007), 254) discuss the tension between the creativity and organisation and the conflict between "those who want to preserve the privileges and power of the bureaucratic class from those who hope to build less structured and less tightly managed organisations". Therefore, a worthy management innovation is the "*fully human organisation", "eliciting, honouring, and cherishing human initiative, creativity, and passion*" (Hamel ((2007), 255) as well as the *"learning region" which attracts "creative class"* (Florida (2004)). Both are essential for business success in the future.

Open innovation. Open innovation is a good starting point for examining the validity of these questions**.** In 1988, Von Hippel described how close relationships with the users are important sources of innovation in product development. In user centred product development, user explicit and tacit knowledge are merged with the knowledge of product development professionals. Open innovations quickly become commonplace alongside the in-house organisational innovations.

Since most of the ideas in the fuzzy front end of the innovation funnel turn out not to be suitable, or the timing is poor, the loss of ideas is high. Therefore, a large number of ideas are needed for the innovation funnel. One way to increase the number of ideas is to utilize the innovation capacity that exists outside one's own organisation. Chesborough introduced this idea of open innovation in the year 2003.

"Lundval (1988) argued that learning in producer-user interaction plays a key role in the economics of innovation. Erick von Hippel's classical study "Sources of Innovation" (1988) shows that the users have had a significant or even a leading role in the development of such high –tech products as scientific instruments and electronic assemblies. Furthermore, von Hippel (ibid.) has suggested that in many business areas it is possible to recognize "lead users", that is, advanced users who are able to anticipate the future use of the product and the challenges of the market. Together with his colleagues, he developed, the "lead-user method", in which the product developers organize seminars with the key users to improve the product (Herstatt & Von Hippel (1992)). Paradoxically, the strength of the key user's specialized expertise and interests can also turn into a weakness. Donald Norman, a well-known researcher of the usability of technical artefacts, notes that the needs of lead users often differ significantly from those of the majority of users (Norman (1996)). (Miettinen (2002), 122).

During the modern era of open innovation, individuals in different roles, for example as visionaries, innovators, leaders, employees, clients or the ordinary citizen have all been considered, as mentioned, as creative and having the potential to develop innovative ideas. The development of the knowledge society, the development of education standards, the increasingly open access to information have changed the environment in favour of more creative and, simultaneously, more demanding clients and consumers.

Social innovation: Social innovation is another type of innovation by which different authors have referred to it from the economical perspective and its social output (Phills Jr. et al. (2008); Pot and Vaas (2008); Australian innovation exchange (2008); Novy and Leubolt (2005)). It is an *efficient, effective and sustainable novel solution to a social problem, with the consideration of the social values towards the society as a whole* (Phills Jr.et al. (2008): Mulgan et al (2008)). Social innovation can as well be "*a principle, an idea, and a piece of legislation, a social movement, an intervention, or some combination of them*." (Phills Jr. et al. (2008)).

Social innovation is important for the innovation success (Pot and Vaas (2008)), it is a vital part of the process, product and technological innovation (Phills Jr. et al. (2008); Pot and Vaas (2008)). It is becoming more important in relation to the tackling of big dilemmas such as global warming, sustainable cities and poverty eradication, among others (Australian innovation exchange (2008)). Social innovation does not rely on any particular sector. It may relate to "the institutional conditions for social innovation", "the distinct processes of social innovation" and "systemic innovations that are needed to address the imperatives of our era". (Phills Jr. et al. (2008)). Tackling the challenges in the aging societies related to the elderly care and financial crises are subjects of social innovations (Diz and Hirvikoski (2009)).

Other authors have come up with the notion of the *social innovation capital*, which referred to "the structural manner in which whole social systems (i.e., firms) organize themselves around – and carry out – the production and integration of new knowledge" (McElroy (2001))

After developing the understanding of the creativity and innovation, as well as learning the richness of the meaning of those notions, getting to recognize how an idea develops into an innovation is important. The following chapter will discuss different phases of the innovation process in bringing the understanding of the unlike nature of innovation phases/processes.

2.1.3 Innovation process

The paradoxical nature of the notions of innovation and creativity has been outlined from different researchers' viewpoints. This chapter will stress on the *unique and paradoxical nature of the process of creativity and innovation*, in exemplifying the nature of the development of the processes as well as its different paths to the outcome.

In spite of the apparent uniqueness of the creative process in each individual and the idiosyncratic patterns followed by many creative individuals, studies of the innovation process are in fair agreement that it follows a recognizable overall pattern. *The creative process has been variously described; the most descriptions include series of steps, varying in number*. For example, Shapero (2004) outlined *preparation, incubation, illumination and verification*, whereas Basadur (2004) referred to *problem finding, problem solving, and solution implementation* activities.

The linear model of innovation has been challenged and more researches have indicated that the simple ideation-innovation-commercialization model does not fit to the multi-level nonlinear processes that firms, entrepreneurs and users participate in creating the sustainable innovation in the nonlinear environment.

Knowledge and motivation have been considered as some of other things that can affect the process of creativity. *Problem finding* is an important aspect in enhancing creativity; however, its essence has to be corresponded with the problem discovery, as it is an important skill for the creative work. *Problem finding is an important aspect that can apply in knowledge building sectors, since it will enable individuals to be able to generate their own open ended assignments, whereby through intrinsic application*, there will be an opportunity for defining the problems from themselves (Runco (2007), 194). "There are

three *main sources from which problems typically arise*: personal experiences, requirements of the domain, and social pressures" (Csikszentmihalyi (1997), 83). Burning curiosity, a lively interest, help in long endurance for making new contributions.

Creative ideas have been seen as affected from the work environment (specifically the role of teachers, mentors, co-workers) in relation to personal experiences and the domain knowledge something that provides effective influences that can divert one's career and channel through a thinking in new directions. (Csikszentmihalyi (1997), 87, 90-91). "One cannot be creative without learning what others know, but then one cannot be creative without becoming dissatisfied with that knowledge and rejecting it (or some of it) for a better way" (Csikszentmihalyi (1997), 90).

Through providing opportunity for creative thinking practices and emphasising the creative behaviours and values, the provision for the creative behaviours will be sustained (Runco (1991b); Runco ((2004), 194, 179)). Alongside problem finding, the process has to be associated with *problem solving* notions whereby the development of the new imaginative and useful solution is implemented, as well as the solution implementation, whereby the induction of the new solution in the life of the operating environment is taken in to an action as Basadur (2004) suggests in figure 9.

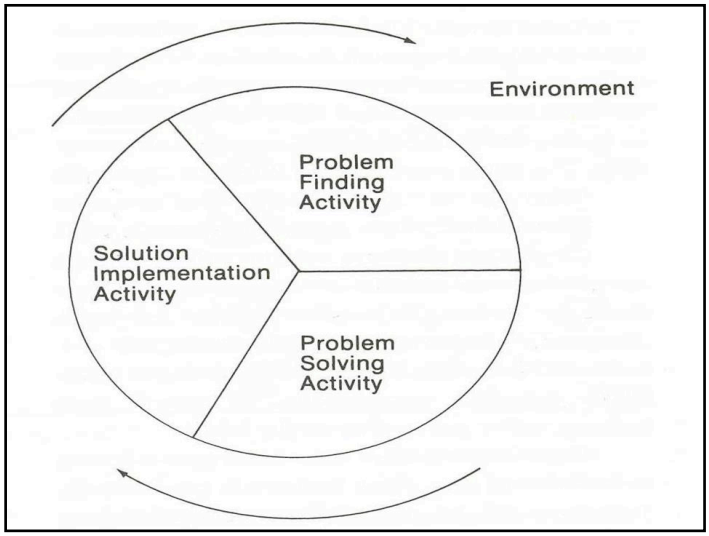


Figure 9 Creative activities in an organization (Basadur in Katz (2004), 63)

The aspect of problem finding is not different from the new version of the process of the creativity, such as preparation, illumination, incubation and verification (Shapero (2004), 49). Problem finding in this respect is falling in the category of preparation (Csikszentmihalyi and Getzels (1971)). There is a recycling back process whereby one could reverse to the earlier stage in the process after being ahead due to some rectifications that may be required for the process to end effectively. (Runco (2007) 193-194).

According to Shapero (2004) *Preparation* is a first phase in the creative process, whereby problems that lead to creative responses are experienced or arising from many sources: literature searches, talking to many people about aspects of the problem, experimentation, and doodling. Normally they appear unintentional. In this phase, conscious creative moment comes only after intensive preparation and a period of subconscious incubation. McKellar ((1957), in Shapero 2004) considers it as almost a form of "over learning" to the point where some of the materials become "automatic" in one's consciousness. The gathering of information is a critical part of the process in which the individual examines the material critically, but not negatively. Discriminating criticism that does not reject, but build upon the materials examined is important in this phase.

After the preparation, the *incubation* phase follows. This phase goes below the level of consciousness, which is recognized, however, not understood. The most widely held psychological conception is that, "creativity is the ability to call up and make new and useful combinations out of divergent bits of stored information" (Guilford 1964) in Shapero (2004)). In this case, an individual becomes inactive and passage of time varies with the problem and individual (McKellar, (1957) In Shapero (2004)). Mednick (in Shapero (2004)) claims "The more creative the individual, the greater the ability to synthesize remote bits of information. The likelihood of a solution being creative is a function of the number and uncommonness of associative elements an individual brings

together". A metaphor of creativity can be expressed as a "dumping together on the floor the contents of different drawers in one's mind" (Koestler (1964) in Shapero (2004)).

Illumination is the third phase, which is included in the creativity process. Gestalt psychologist refer to illumination as the "aha!" phenomenon ((Csikszentmihalyi (1997), 80 in Shapero (2004)). This is due to the sudden insight, in which the solution appears. It may be associated with the perception of a situation whereby one enters in unfamiliar room in the dark, and after stumbling around, the switch is found and activated, and as a result, everything is falling into place.

With regard to *verification*, which is the last phase, it is said to be a tedious and time-consuming stage. In this stage, the creative idea must to pass the tests of validity, reality, utility, reliability, costs, time and acceptance in the marketplace (Shapero (2004), 51). Furthermore, the creative ideas are to be clarified to become innovative ones.

March (1991) refers to the two phases of *exploration and exploitation* while defining the innovation. (Hautamäki (2007), 7) refers to March by writing: "Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation. On the other hand, exploitation includes refinement, choice, production, efficient, selection, implementation and execution. An organization like firms must find a balance between exploration and exploitation". One can assume that scholars such as Rogers (2003) who write about the adoption of innovation refer rather to the notion of exploitation, with the implicit aim of improving what already exists, than to creating breakthroughs.

The engine of innovation is ideas. These ideas are usually many in the starting phase. Throughout the process, ideas are refined and a few best ones remain that can be brought forward for the commercialization process (Davila et al.

(2006), 125). The process that refines and tape ideas to the result of the best one is referred as *innovation funnel (*figure 10*)*. In the innovation funnel, the beginning of the ideas, where many float around, is referred to be a *creative stage*, whereas the *execution stage* is when ideas have been selected, and later to the *value creation stage* whereby the ideas that have became the intellectual property are moved in (Davila et al. (2006), 125-126).

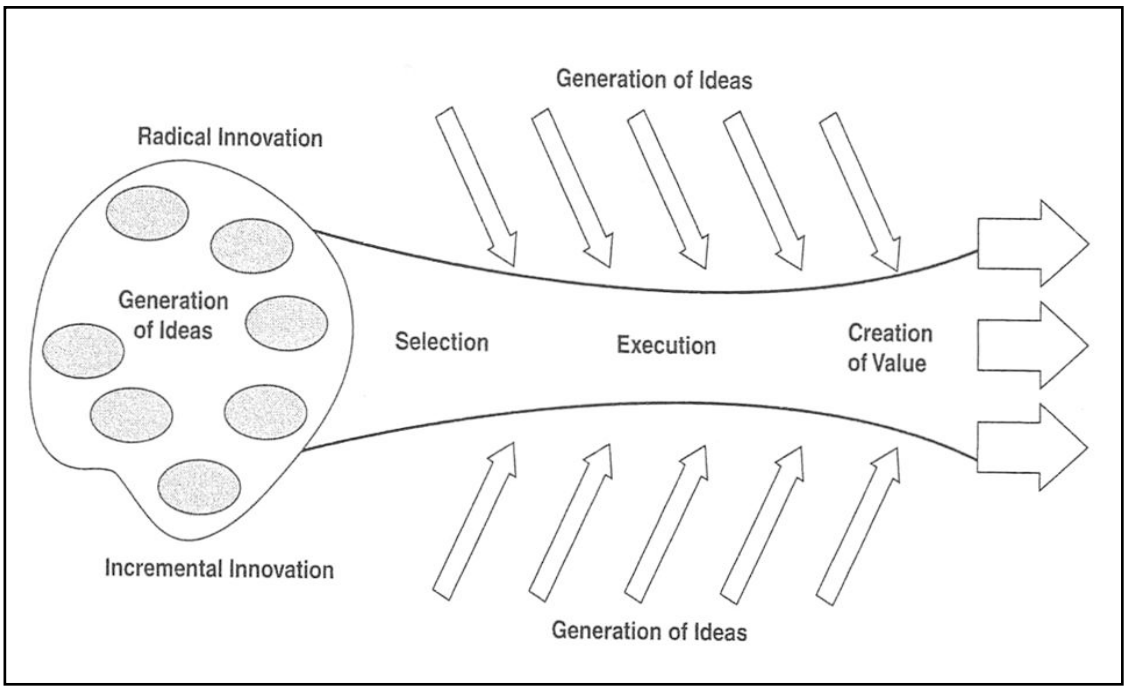


Figure 10 The innovation process (Davila et al. (2006), 125)

Previously in this chapter, the general descriptions of different phases relating to innovation have been discussed. In the following section, innovation processes will be considered in economic context.

Innovation *commercialisation process* (figure 11) is the final stage of the innovation process; four steps are to be considered: commercial introduction, commercial growth, commercial maturity and commercial decline. These stages are normally overlapping throughout the process of innovation and its creativity application does not end at the ideation phase (Davila et al. (2006), 127).

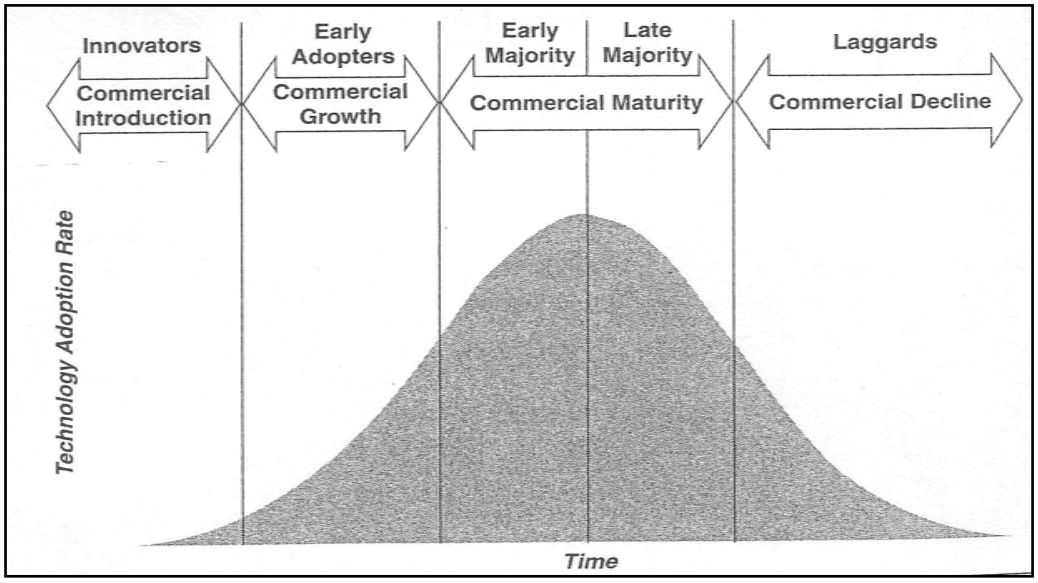


Figure 11 Innovation commercialization process (Davila et al 2006, 126)

Gary Hamel ((2002), 303) referred to the innovation process with the notion of *Innovation Portfolios*. He divided the portfolios in to three parts where as the first represent portfolio of ideas, the second as the Portfolio of experiments that validates the ideas with particular merits at a low cost market incursions; while the third one is the portfolio of new ventures, whereby the projects that could significantly change to the business concept. Hamel (2002) had integrated these three portfolios with the notions of imagining, designing experimenting assessing and scaling. The “imagine” and “design” phases fill the portfolio of ideas with ideas. These ideas are then advanced to the “experiment” and “assess” phases, which are filling the second portfolio, and the ideas that are ready to be taken to scale” will are filling the third portfolio (figure 12).

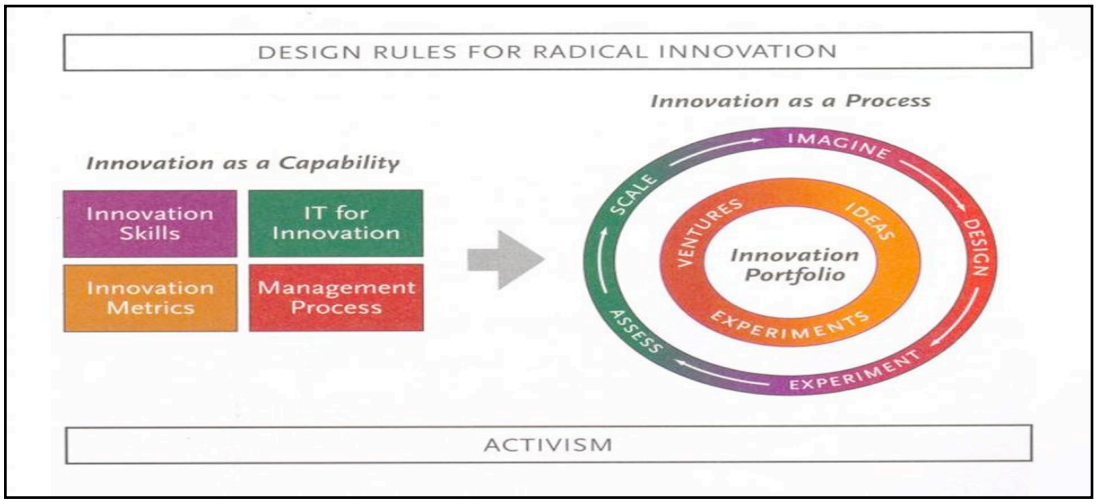


Figure 12 Innovation portfolio (Hamel (2002), 303)

"Innovation depends on the realization that something is missing somewhere in the network that produces value to the customers" (Davila et al. (2006), 127). Since, "ideas are the engine of innovation" recognizing the gaps is necessary for the processes aimed in producing great ideas. The need to recognize and understand ideas is a prerequisite; however, *nurturing the generation of the economically useful ideas in order to come up with the convenient number of ideas through the innovation process remains a challenge*. (Davila et al. (2006), 127-128)

The ideas that can come up may be incremental or radical, the decision on them tends to be made in the same way and using the same criteria, however, they would *require different approaches for development and selection*. The breakthrough ideas are the ones to be dealt first. Brainstorming has been seen as one of the companies' mistake which is done at the meetings to generate finished concepts. The thinking of the ideas that fits for the generation of the breakthrough could avoid the incremental developments. (Davila et al. (2006), 129).

In systemic level, there are furthermore requirements for different types of innovation. With regard to the breakthrough, authors such as Stefik and Stefik ((2004), 7-9) have referred to the "*breakthrough zone*" which is the zone that

focuses on the knowledge creation in different stages of professionalism. The universities are the creation of the scientific knowledge, which is based on innovation "internalization" phase, then corporate centres are the new technology constructors "institutionalization" phase. In "specialization" phase, the institution relies in their own efforts towards innovation whereas companies' emphasis comes to the product development in the "routinization" phase. The realization towards the need for new breakthroughs after the commercialization obligate the companies to re-enter a "renewal" phase and hence utilize the similar cyclic movement to achieve new breakthroughs (Figure 13).

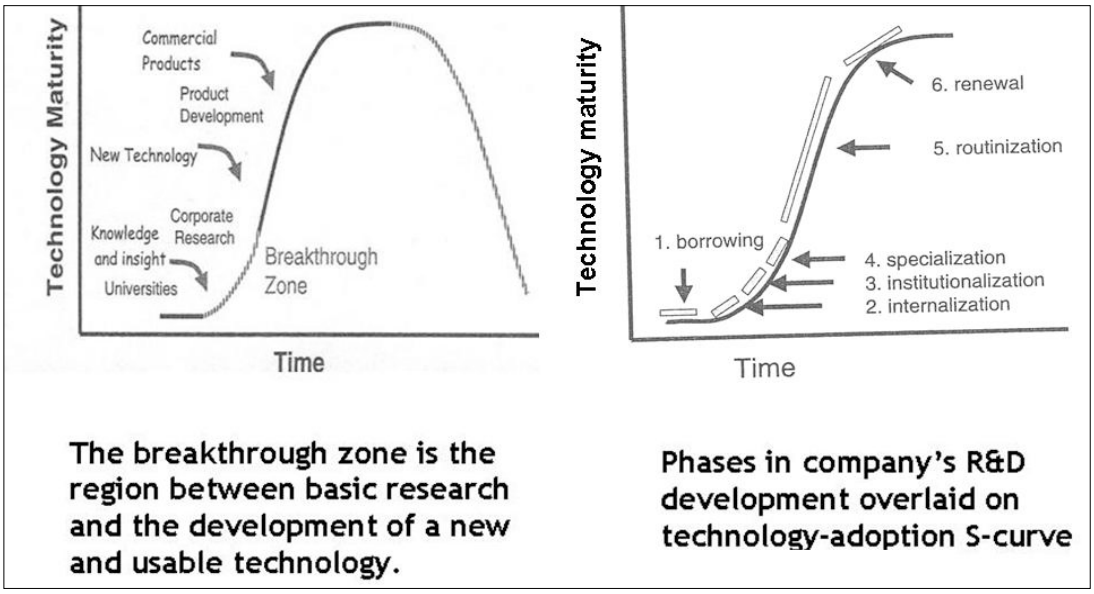


Figure 13 The breakthrough zone and company renewal phases (Stefik and Stefik (2004) 8-10)

Kanter's (1988) model elucidates structural and social factors and their impact upon innovation at different stages in the innovation process. Kanter (ibid.) notes that the *innovation process is uncertain and unpredictable*, that it is *knowledge intensive, which is controversial, and that crosses boundaries*. Innovations are most likely to flourish under conditions of flexibility, quick action and intensive care, coalition formation, and connectedness.

I*nnovation is most likely in organizations* that (a) have integrative structures, (b) emphasize diversity, (c) have multiple structural linkages inside and outside

the organization, (d) have intersecting territories, (e) have collective pride and faith in people's talent, and (f) emphasize collaboration and teamwork. Organizations producing more innovation have more complex structures that link people in multiple ways and encourage them to do what needs to be done within strategically guided limits, rather than confining themselves to the letter of their job. Kanter believes that although innovation stems from individual talent and creativity, the organizational context mediates the individual potential and channels it into creative production. (Kanter (1988))

2.1.4 Knowledge and learning in fast, complex, and radical changes

For the innovation to reach its results there must be pre-understanding of the *complex and paradoxical nature of creativity and innovation* and the various factors that could foster innovation. Innovation cannot be created in the vacuum; rather it takes place in a context. This study is about challenging environments and circumstances where the change is complex and rapid, and the more advanced learning and knowledge acquisition and creation is pivot. Therefore *knowledge,* "the state of knowing", "the capacity to act" and "the process of knowing" (Allee, (2003), 264) as well as the importance of the concept of the *deeper learning* (Senge, Scharmer, Jaworski and Flowers (2004); Scharmer (2006)) in individual and collective level will be discussed in this section. Comparisons of various *knowledge* and learning models would be important to fully understand innovation. However, they will not be included in this study, due to its resource requirement. The deep learning U-curve (Senge et al. (2004); Scharmer (2006)) has been chosen to this study, since the theory encompasses many of those intangible and future oriented aspects of creative ideation and thinking which are needed when real radical innovations are under construction.

Since the *Schumpeterian notion of innovation the inter-relationship* between *knowledge and innovation* has been stressed. According to Schumpeter (1934)

innovation is a new combination of existing resources and know-how and innovation involves building coherent systems of complementary knowledge. In the knowledge era and in revolutionary environment *competition on knowledge* is severe. The new global "competition for talent" (Florida (2004), 3) is reshaping the world. Therefore, societies and organisations are fighting for efficient channels to acquire both in-house and external knowledge. For the companies to reach the value added segments and knowledge-intensive products and services, there is a need to access new technologies and skills (OECD, (2007)).

In order to access those skills, realizing the importance of knowledge for societies, organizations and individuals for innovation is significant for this study. Castells ((1996) in Karvonen (2001), 39) states, "knowledge and information are critical elements on all modes of development, since the process of production is always based in some level of knowledge and processing of information". The action of knowledge as the source of productivity has, however, been outlined as explicit for the information mode of development.

Apart from scholars like Castells (1994), the importance of *knowledge related to innovations* has also been stressed in the recent Innovation strategy proposal by the Finnish government. The strategy involves the users to the innovation process while claiming that *innovation is knowledge based competitive advantage*, which has been utilized, *and it is created as a confluence of different types of knowledge stressing the creativity, knowledge, skills and needs of consumers, users and citizens*. With an exception of scientific communities, individuals, companies, public organisations and user communities and arts and nature have as well been stressed as the *sources of knowledge*. Through utilizing the global knowledge and value networks, the extensive knowledge in one's own end is a *basis for adoption of knowledge created elsewhere and for recognizing new opportunities*. ((Kansallinen innovattiostrategia (2008), 2, 5, 13)

Knowledge has been viewed as a *competitive factor* in a modern enterprise as well as an *added competence to the production* in addition to the traditional land, labour and capital (Karvonen (2001), 25). With reference to Allee (1997); Beckman (1999) and Stewart (1997)), Hakkarainen et al. (2004) state that, "In the modern knowledge organizations, practices of facilitating knowledge creation and sharing of knowledge are considered to represent the most important competitive factors". Knowledge is said to be a *critical resource for the social and economic development* (Bereiter (2002a) and Nonaka and Takeuchi (1995)). In this regard, Hakkarainen et al. (2004), point out the importance of the knowledge advancement as well as the support and sharing of the intellectual achievement through developing the competences that allow individuals to function as knowledge workers in the community.

The knowledge age has contributed to the change in the global operative environment, which, furthermore, has influenced all industrial, organizational and societal levels in assessing their association with knowledge. The fact that, *knowledge is deeply related and interwoven with the welfare society* and the society may compensate the knowledge creation and thus increase the opportunity for sustaining the welfare society, has been discussed by different scholars (Castells and Himanen (2001), 86-87; Karvonen (2001), 66-67). In this response, *knowledge has been explained as an ideal part in the human existence something that leads to the cultural and technical evolution, which is "a million faster", compared to natural evolution* (Rothschild (1992) in Karvonen (2001)).

Having seen the notion of knowledge and its effect to an individual level, *"bildung"* has been considered as another important aspect that stresses in the utility of knowledge and creation of the better society. Christensen et al (2006) prefer the German word "bildung". The word is difficult to translate since expressions like "cultural formation" or "liberal education" lack the deeper and a more profound meaning. "Bildung" introduces the concept of goodness; through embedding values a better society can be created. With the exception of its broadness "bildung" has been seen as an important aspect in different

professional fields (such as engineering), due to its emphasis on "*development of an individual into a virtuous and responsible citizen*" (Christensen et al. (2006), 10, 49). In Denmark, the introduction of the notion of "bildung" to the engineering education had been seen as a complicated one. However, its application had proven the essentiality and importance to the field (Christensen et al. (2006), 10).

The knowledge creation models are said to have the *pragmatic values* in easing expected knowledge advancement and innovation (Hakkarainen et al. (2004), 110). This may be as a result of its importance to the communities in the cultural and technological growth. In knowledge creation, "*individual efforts are embedded in fertile collaborative practices of innovation knowledge communities*" whereby learning can be understood as a process of "innovation inquiry" with an aim of expanding knowledge and skills through previous experiences and knowledge (Hakkarainen et al. (2004), 109-110).

In this view all knowledge is assumed to be embedded in practice. The distinction is based on the focus, whereby one is focusing on the *mental practices (cognitive)*, while the second one is based on *learning and growing up with community (expert*). Hakkarainen et al, (2004) compares Nonaka and Takeuchi's (1995), Bereiter's (2002), and Engeström's (1983) understanding about innovation and knowledge creating process with a table (3).

Table 3 Frameworks for understanding innovation and knowledge creating processes (Hakkarainen, et al. (2004))

	Nonaka & Takeuchi	Engeström	Bereiter
The role of individual expertise	Individual are taken as given, individuals crate knowledge	Social theory of mind, individuals embedded in socio-cultural contexts	Theory of expertise
Main focus	Tacit knowledge (insighting)	Knowledge embedded in practices (acting)	Knowledge objects (conceptualizing)

Type of processes focused	Emphasize bodily processes, personal experience	Emphasize material object-oriented activities	Emphasize solving of knowledge problems
Source of innovation	Transforming tacit knowledge to explicit knowledge	Overcoming tensions, disturbances, and ambiguities by expansive learning	Working deliberately for extending and creating new knowledge objects
Scope of framework	Different ontological levels from individuals, groups to communities, and organizations	Activity systems and networks of activity systems	Knowledge-building communities and organizations

The table by Hakkarainen et al. (ibid) outlines the differences of the notion of innovation with relation to knowledge; Nonaka and Takeuchi entrench on the matters relating to the *individual and originality* whereas *transforming tacit knowledge to explicit knowledge* is referred as important for innovation. Engeström refers to *individual and experiences* (socio-cultural context) especially in questioning, analysing, modelling, examining, implementing the new model, reflection of the process, and the consolidating of the new process. With regards to Bereiter, *expertise* have been considered in relation to innovation and knowledge creation. He focuses on the theoretical ideas that have not been fixed rather being transformed constantly. According to the Bereiter's theory, the main focus has been given to the guidance of research on and the development of knowledge building technologies (Hakkarainen et al., (2004), 112-119).

As mentioned above, knowledge has been considered in to two types according to Nonaka and Takeuchi (1995). These types are *explicit knowledge*, which can be processed, transmitted, and stored relatively easy and *tacit knowledge*, which dwells in a comprehensive cognizance of the human mind and body. According to Nonaka and Takeuchi (1995), "explicit" refers to knowledge which can be expressed in formal and systematic language and shared in the form of data, scientific formulae, specifications, manuals and such, whereas "tacit" refers to knowledge which is deeply rooted in action, procedures, routines,

commitment, ideal, values, or emotions. Both tacit knowledge and explicit knowledge are complementary to each other, and are essential to knowledge creation."

Individual knowledge and competences are an important part in knowledge creation (Hakkarainen et al. (2004), 148-150). With regard to Nonaka and Takeuchi (1995), an *individual is seen to be behind the knowledge creation* since new ideas emerge through cognitive efforts. However, the need for *adaptation to local environment* is important in order to transfer the knowledge. Another aspect of the two-way nature of knowledge should be emphasised; in addition to the fact that it is the individuals who create the knowledge (as also has been stressed e.g. in the resent national innovation strategy of Finland (Kansallinen innovaatiostrategia (2008)), the knowledge creation processes lead to both *individual and social transformation* (Hakkarainen et al. (2004), 155). Attention should also be paid to the fact that the aspect of "cognitive" can be different on different countries (Hakkarainen et al. (2004), 150).

In conceptualizing logic and epistemology for innovative knowledge communities, the model of *"applicative inference"* that tries to capture the process of knowledge creation and knowledge advancement from the logical point of view is said to be appropriate by Hakkarainen ((2004), 158). He outlined that; "Search for new knowledge has its risks, but it is better than nothing. Especially important from the point of view of innovativeness is to see the *interaction* between various modes of knowledge" (Hakkarainen et al. (2004), 157). Knowledge ability levels can be classified in various distinctions such as; *rational level*, *practical level* (the source of know-how) and *instinctual level* (feelings, emotions, hunches that we acquire from the experiences). Through understanding the levels of knowledge ability, the rationalistic idea of innovativeness will be avoided.

Mode1 and Mode 2 of knowledge production. Gibbons et al. (2005) have pointed out mode 1 and mode 2. They refer mode 1 as "the complex of ideas, methods,

values and norms that have grown up to control the diffusion of the Newtonian model of science to more and more fields of enquiry and ensure its compliance with what is considered sound scientific practice". Mode 2 has been referred to as "knowledge production carried out in the context of application and marked by its; *transdisciplinarity; heterogeneity;* organizational heterachy and transience; social accountability and *reflexivity;* and quality control which emphasizes context – and use – dependence. Results from the parallel expansion of knowledge producers and users in society" (Gibbons et al. (2005), 167)

The previous section has discussed the importance of knowledge from some scholar's perspectives. The U-learning theory will be described next, to illustrate the learning process, related to new knowledge creation. The wider societal context on the knowledge creation will furthermore, be carried out in chapter 2.3.2.4, whereby different knowledge creation models will be discussed. In this section the focus is in innovation-knowledge-learning inter-relation.

The U -learning curve (the U-theory) connects learning and knowledge and at the same time, form the point of view of this study, it examines the invisible side of the system. The essence of the leadership and innovations has been pointed out as important earlier in this chapter. In addition, Hamel (2002) stresses the importance that leaders should rather be the 'innovator and radical revolutionaries than agents of improving the status quo'. *The leaders challenge is to "develop a "precognition" for emerging business opportunities* that could be accomplished through the implementation of the *new learning capacity which is referred to as "presencing" or deep learning* as Senge et al. (2004) named it.

Based on interviews with 150 representatives of scientists and business and social entrepreneurs, Senge et al ((2004), 9) realized how *new ideas and intuitive knowing* are brought in to reality and how important the understanding of the emerging ideas is for the potential shift of the long established view of humanity and nature.

Improvements in the companies may be effected in different ways depending to how the change is approached. C*onventional learning* or reactive learning (learning from experiences of the past) may result in *incremental improvements*; whereas *deep learning could enhance radical changes*, which are based on "the learning from the emerging future". In their study, Senge et al. (ibid.) state that scientists as well as business and social entrepreneurs are living in the *paradoxical state of great confidence and profound humility*, something that knowing their choices and practices is important and "feeling guided by forces beyond their making" (Senge et al. (2004), 11).

Conventionally the Schumpeterian "creative destruction" of products, companies and industries has been viewed as parallel with the technological development. System theorists state that, *living systems continually "re-create" themselves whereby the social systems have to deepen their level of awareness both individually and collectively* (Senge et al. (2004), 7). Considering the level of understanding there is a need to utilise the *deeper ways of understanding*, whereby the question relies in looking for the problem. Another way of thinking as mentioned by Senge et al. (2004) is the "knee jerk" understanding as it relies to the realization of the problem at the standard cognitive level. The deeper learning is said to be more rewarding and fundamental since it comes from deeper levels of the mind and heart. There is a need to arise the capacity to sense, enact, and embody the future as it emerges (Senge et al. (2004), 84-86). For the management, slowing down whenever the new situation is faced is important since the fast solution ("knee jerk") has not been seen as the best solution when leaders are facing the new challenges (Jaworski and Scharmer (2000), 4).

With the relationship of the previous paragraphs, based on research on innovators and the eminent thinkers, Otto Scharmer had presented the U-learning curve, or theory-U, that portrays the phases of change while learning from the emerging future. In the U-curve, the capacity for sensing, embodying and enacting emerging futures, called "presencing" (a combination of two words

presence and sensing), throughout *letting the old practices go and bringing in the new practices* have been portrayed through different levels. (Scharmer (2000), 6, 17; Scharmer (2007), 8). Manu ((2007), 61-77) stresses the importance of recognizing and overcoming the barriers to unlearning in order to innovate and act creatively.

Scharmer's model is like an iceberg that emphasises on the need for the organizations to deepen their ways of knowledge creation and knowing. In order to *focus on the deeper level of cognitions* organisations have to take actions in the invisible part, or "under the waterline" since dealing only with the visible part of the system will not result in the radical changes in an organization (Arthur (1996), (2000) in Scharmer (2000), 7, 11). The Scharmer's (2000) notion of the visible part of the organization has been referred to as "reacting"; whereas through the deep problem solution other notions like restructuring, redesigning, reframing and re-generating appear. Organisations and their leaders have to develop new cognitive capabilities for sensing and seizing emerging business opportunities by engaging in a different kind of learning cycle (Arthur 1996, 2000) in Scharmer (2000), 2 ,7).

Scharmer (2000), (2007) and Senge et al. (2004) pointed out that, through "suspending, redirecting and letting go" (figure 14) one can move from one cognitive space to another. These have been viewed as the three distinctive gestures in the *process of becoming aware* (Depraz et al. (1999) in Scharmer (2000)). Firstly, "suspension of judgement is the sine qua non of observing and seeing". Secondly, "redirecting" emphasising of the inwards attention to the gestures in order to bring new outcome (ibid. (2000),17). Thirdly, "letting go" or a "surrender" process (Arthur (2000) in Scharmer 2000) or "emptiness" (Varela (2000) in Scharmer 2000), 18). This is a process which precedes presencing since by letting the old go, there will be the new outcomes that can take a lead to the change (Scharmer (2000), 18).

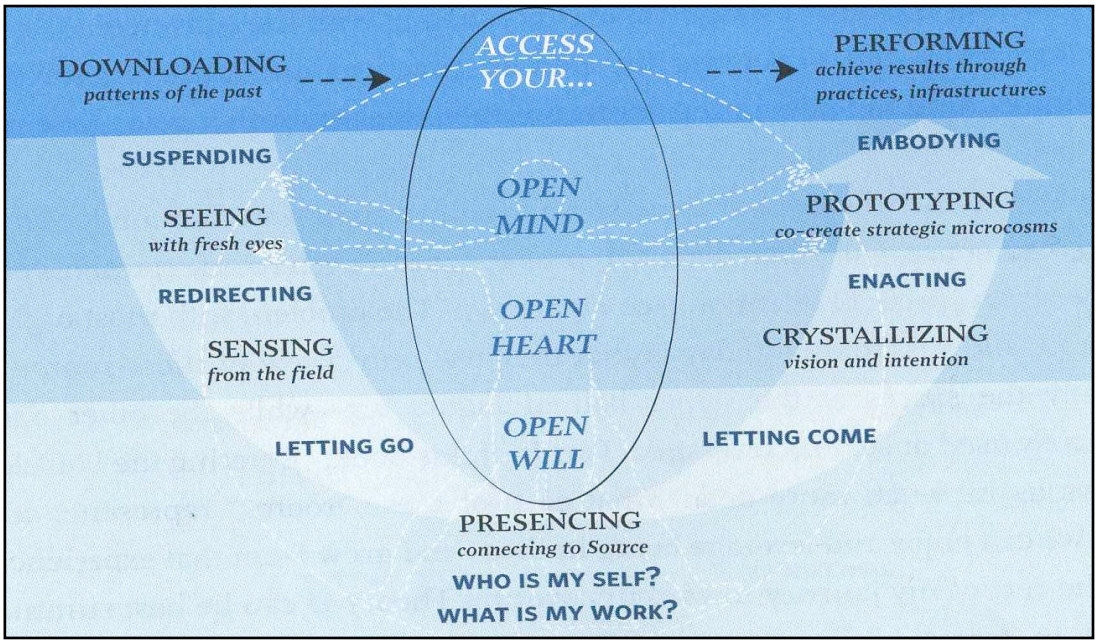


Figure 14 Three instruments of the U -curve: Open Mind, Open Heart, Open Will (Scharmer (2007), 40)

Based on his studies, becoming aware of the blind spots had been a key to leadership and everyday life, based on that Scharmer (2007) had wondered, "How creators and master practitioners operate from a deeper process". He calls it, the "U-process", which pulls us in to an emerging possibility and allows us to operate creatively, "rather than simply reflecting on and reacting to past experiences" (Scharmer (2007), 5). With reference to Varela, Scharmer has pointed out that "suspending habitual judgement; redirecting attention from perceived objects to the process of collectively co-creating them; and finally, changing the quality of our attention by letting go of the old identities and intentions and allowing something new to come in *some emerging future identity and purpose*"(Scharmer ((2007) 36).

Furthermore, the process of "*crystallising*" to the emerging new continues towards "*prototyping*". Scholars like Senge et al (2004), Kao (2007), and Hamel (2002) stress the importance of prototyping (experimenting, modelling, simulating, improvising), as a starting point for communication, open feedback and iterate cycle, in order to get some desired outcomes. According to the U-

learning curve, after "prototyping" the new organizational contexts are created through "*embedding*" something that allows the newly brought ideas to continue unfold. (Scharmer (2000); Senge et al. (2004))

Through all this process, the importance of open heart, mind and will (in the middle of the figure 14) is stressed in supporting seeing, sensing, presencing, envisioning and enacting since they are also important aspects for the transformation from one phase to another.

Considering the aspect of seeing in relations to suspending, one has to stop the habitual ways of thinking and perceiving. In this regard, suspending of habitual ways of thinking or perceiving does not require an individual to stop his mental ways of thinking. Rather it is a process that requires an individual to evoke his or her assumptions and hence becoming aware of one's thoughts and to "think freely about the future" (Senge et al (2004), 29, 32, 40); and Pearson (2003), 29).

Creativity which is within everyone and which is essential for health, happiness and success in all areas of life including business, can be successful through suspending the judgement that arises in our minds. Michael Ray (in Senge et al. (2004)) refers to "fear, judgement, and chattering of the mind" as the "*voice of judgement*" (VOJ) when he discusses the constraints for creativity and awareness. *Patience and willingness* have been pointed out as some of the things that may make the suspecting process successful for allowing creativity to take place (Senge et al. (2004), 30-31); Csikszentmihalyi (1994)).

Voice of judgement or groupthink (Janis (1971)) prevents us from seeing differently; however, awareness is needed to be able to examine and control our assumptions and to create breakthroughs. The atmosphere of trust and open feedback is important in enhancing creative mind (Senge et al (2004), 32). In order for one *to develop "trust" there is a need to create a "container" that will allow the transformability of the psychological energy rather than killing*

it. (Senge et al (2004), 34) The aspect of container is mostly applicable in the teamwork and social contexts whereby, through creating the container, one's courage to act will be enhanced. The Noble Laureate Ilya Prigogine stresses the importance of *positive feedback* in order to create conditions for self-organizing structures, in the complex and fast changing environments (Senge et al (2004), 36).

All those processes, as elaborated in the U-curve, affect the pace of the creativity and innovation in different ways. The need to act accordingly and in time will prevent different obstacles that creativity and innovation may face.

2.1.5 Summarising discussion on management of innovation challenges for the possible implication for the grounded theory building

This thesis is about creative and entrepreneurial individuals' experiences on and opinions about the circumstances and environments where innovations and creative work are taking place. In order to lay ground for the understanding of the core nature and possible parameters of *innovation-individual-environment relation* the first part of the thesis has examined the richness and the nature of the concepts of creativity and innovation. Nations and organisations operating in the rapidly changing and complex environment face at the same time many different realities and challenges when developing the circumstances and environment (system-of-innovation) for both mainstream production and variety of innovations in their corresponding development phases.

The literature review based on the innovation theories and realities in companies and societies revealed a rich and paradoxical insight on the notions of innovation and creativity and their core content. The discussion will next be summarised in the form of propositions for possible implications of this study in the pursuit of the question of *how to manage the challenges related to the*

richness and paradoxical nature of innovation and creativity. In the wider systemic review, different basic obstacles such as funding, lack of entrepreneurship or motivation has been referred to as factors that affect innovation in a greater extent. Chapters 2.2 to 2.4. will later outline the innovation obstacles and boosts relating to the individuals, organizations, context and environment (the system-of-innovation).

The literature in its enrichment provides the first proposition of this chapter:

1. *the idea of "all-inclusive" conception of innovation and creativity.*

Knowledge has been increasing the complexity in the global system-of-innovation where societies, organisations and individuals operate and thus, innovation became an imperative for all of them. Throughout the process of differentiation and complementary interaction, systems (organisations, regions, individuals etc.) face the increasing complexity in the fast changing circumstances. Paradoxically, actions related to innovations are furthermore increasing the complexity of the environment and thus, laying ground for even faster changes.

Thus, as in the modern knowledge era, in this study innovations are not considered as a matter of technology or product development alone, but they are integrated. *Innovation operates in all types of industries and organisations, and it can be found in functions like products, processes, management, and organisations. No matter if one is a manager or labourer, researcher or end-user, one is invited to the creative thinking and innovation endeavour. Innovation is created, dealt, and applied differently depending on the nature of the industry or organization and its aims and circumstances.*

From the point of view of the innovation strategies and decision-making in a society it is important to consider that the all-inclusive way to use the word

innovation may lead to communication problems, since, in precise inspection, the notion of innovation proves to refer to quite different phenomenon based on entirely different operation logics. While the innovation language has been developing, many new notions have been erupting. However, the lack of established practice to use those notions in both science and organisations has hindered innovation communication. For example, the notions of radical vs. breakthrough vs. disruptive vs. revolutionary innovation have all specific connotations, but they have also been used as synonym lay-terms. For the purpose of this study, innovation radicalism and revolution in environment function as a litmus test in order to increase understanding about the challenges related to the innovation-individual-environment relation.

The innovation radicalism refers to the level of extension between the status quo and the change: that is to say, for example the extension between the mainstream product, service or organisational aspects and the innovation. Additionally, the more demanding definition of radical innovation refers to the "power to change customer expectations, alter industry economies and redefine the basis for the competitive advantage." (Hamel (2002))

In the public discussion, due to the "all inclusive" nature of the innovation, there resides a challenge, which results from the different interpretations of innovation by different people from different areas of specialisation. In order to improve communication about different type of innovations, understanding the variation of the operation logics of innovation is important. One can argue that, especially in national innovation system level, the development of the complex issues like knowledge and value networks related to radical vs. incremental innovations could be facilitated by refining the concepts of creativity and innovation and specifying the types of innovation in relation to their applications.

One suggests that frameworks like Hamel's innovation horizon (figure 6) should be used in order to help to clarify the discussion about the innovation radicalism

(incremental vs. radical) and broadness of innovation (product and process; business, industry).

Moreover, Csikszentmihalyi's (1997), 27-30,147,371) way to distinguish creativity from Creativity with the capital C helps to distinguish the difference between individual creativity and the Creativity which is based on and will contribute for the knowledge of the domain.

2. The second proposition based on literature states that *innovation and creativity are paradoxical and controversial in nature*.

Scholars, like Anthony and Christensen (2006), Hamel (2002) and Hamel and Sayago (2006), discuss the paradoxes and myths of innovation: Like whether big ideas and more resources equal more innovation? Does growth result from innovation, which is random and unpredictable? Whether people can be taught how to be innovative or whether innovation is a matter of the research and development experts? Whether innovating is risky and expensive versus not to innovate is risky?

Due to the all-inclusive, intangible and controversial nature of innovation and creativity and their richness and multi-perspective dimensions, the distinction when a parameter is to be considered as an obstacle or a facilitator for innovation is complicated. *One parameter can arise as a constraint or facilitator, depending on the type, time, context and phase of innovation.* Hence, the paradoxical nature of innovation and creativity should be highlighted when dealing with the physical, social or technological constraints and facilitators from the point of view of different individuals, organizations, context (system-of-innovation).

The system-of-innovation is not static but dynamic, and it consists of subsystems which are inter-related. Any small change in the system will modify the innovation constraints and the facilitators. Furthermore, the innovation

constraints and challenges are case and time sensitive. All this creates new paradoxes for the systems, since; facilitation of one parameter will lead to the destruction of the other. For example, an ideal condition for incremental innovation can kill the radical innovation.

Lack of awareness of these paradoxes can create tension in system and instability in decision-making e.g., the tension arising from allocation of scarce resources in innovation, based on unclear criteria or lack of persistence and logic in the decision criteria, ruin the prerequisites for future success.

Moreover, the different innovation features and aspects (like novelty or usefulness) based on which innovation definitions can be classified can be considered as controversial or relative**.** I.e., in-depths analysis of the innovation criteria of novelties will point out the relative nature of the novelty. Novelty should be evaluated based on the environment where the innovation takes place and from whose point of view the innovation is perceived; an innovation can be considered as new from the point of view of one segment of the market (or organisation, individual etc), while it has been considered as old for another segment. The wide interpretation of innovation embraces also the end users; from their point of view, one can suggest that also a new way to *use* an old innovation is an innovation. Again, observing or analysing different ways of applying and using old methods in different contexts can serve as source of new idea and innovation.

3. Third proposition: *In complex and fast changing or revolutionary environment, both the radicalism and broadness of innovation increases and the distinction in the operation logics of radical and incremental innovations become more important.*

Management challenges related to simultaneous incremental and radical innovation suggests a *shift from the either-or -management logic into the both-and -principle*. Most of organisations competing on the edge have to manage

simultaneously both the contradictory conditions for linear and non-linear changes and related incremental and radical innovations. The, at first glance incompatible phenomena are however to be managed at the same time.

Distinctions in the operation logic of radical vs. incremental innovations are as following:

Long-term or short-term consideration of the management aims will affect the focus of the innovation strategy concerning radical (future) or incremental innovation (present and short-term). However, companies competing on the edge have to manage to cope both with the future and the present at the same time. It can mean that the development of the radical innovation will cannibalise the ground of the existing business concept. (After the discontinuation there will however be a new linear phase when incremental innovation are again needed (see more in detail, chapter 5.4.2.2).)

Furthermore, *the extent of change varies*, incremental innovation represent quality improvement and short-term profit goals whilst the radical innovation refers to systemic changes in business concepts, organizations and industries.

Affluence of *time, freedom and even chaos* in the early phase of radical innovation is pivotal, whereas incremental improvements are based on the logic of effectiveness, strict rules and time limits. Altogether, the innovation management operates with contradictory conditions, which can lead to failures. Or, as Amabile et al ((2003) warn, when creativity is under the gun, it usually ends up getting killed.

Scholars disagree about how to approach the question of risk in relation to innovation. Many agree that in the short term, incremental innovations are less risky than radical innovation. The disagreement concerns whether it is more risky if one *is not* involved with radical innovations or if one *is*.

In order to produce one successful innovation, thousands of ideas are needed in the beginning of the innovation funnel. *The fuzzy front end of the innovation funnel or the ideation phase corresponds to creativity and appropriate conditions*. However, also the *effective process of selecting the ideas* and *taking them to the implementation phase are needed*. In the innovation portfolio, there should be many innovations in different phases, which again, increase the need to manage with the incompatible conditions.

In order to cope with the incompatibilities, knowledge, learning and "bildung" are the cornerstones.

4. Fourth proposition: *The base of incremental innovation resides on existing explicit knowledge and traditional learning. Radical innovation corresponds to the new and tacit knowledge and deep learning related to the emerging future*.

Traditional learning and explicit knowledge refer to the visible and tangible aspects and conscious process in one's mind and are thus easier to communicate in the formal organisational context. Invisible sub-conscious level is highlighted in the deep learning (U-curve), which is related to radical innovation and the tacit knowledge concerning the emerging future. Trustful atmosphere is needed in order to feel secure to express the courage needed for open mind, heart and will. Which are the prerequisites for re-directing the awareness from the well known to unknown and for *letting go and letting come,* as Scharmer *(2006)* puts it.

How to integrate the inwards' and outwards´ awareness (that is to say, the inter-relation among subsystems and the whole), is an additional and new challenges for us, who have got acquainted to traditional learning and knowledge acquisition related to the mainstream and incremental development. Communicating something that is new is another challenge related to innovation. Firstly, failure in communication can be an obstacle for acquiring the knowledge from the domain, the failure can then prevent the Csikszentmihalyian

Creativity (with the capital C) to take place. Likewise, the lack of capability to communicate, visualise and explain the core of a new idea may lead to difficulties in system when selecting the final ideas. Lack of knowledge and awareness in the system can prevent the adoption or diffusion of innovation.

Simultaneous presence of these conditions and challenges may contribute to the tension, fear and risk of failure in organisation (or any system) if the awareness of these variations in different operations logic is poor. How to reconcile these incompatible logics to the organisational life will be discussed in chapter 2.3.

Whilst used method in this study is grounded on the data, the previously mentioned propositions cannot be considered as hypothesis to be tested. Rather they play the bridging role among the data and the literature and they may hence facilitate *GT building. The possible implications of the literature are as following:*

1. There resides an idea of an "all-inclusive" conception of innovation and creativity.
2. Innovation and creativity are paradoxical and controversial in nature.
3. In complex and fast changing or revolutionary environment, the radicalism and broadness of innovation increase and the differences in operation logics of radical and incremental innovation, become more important.
4. Incremental innovation is based on existing explicit knowledge and traditional learning. Radical innovation corresponds to new and tacit knowledge and deep learning related to the emerging future.

2.2. Creative and entrepreneurial professional

The focal point of this study is the *human side of innovation*. The aim is to learn what the key players of innovation regard as important when taking care of their creative work. The forerunners of the empirical data were considered as

creative, proactive and *entrepreneurial knowledge-workers* based on what they have achieved in their carriers or based on their professional colleagues' assessment. Their experiences and opinions on innovating and innovation circumstances formed the raw materials for the grounded theory. All the interviewed creative and entrepreneurial professionals had long experiences on innovative organizations or regional and National innovation systems. All of these individuals have faced challenges related to incremental innovations and some of them have managed radical changes in the operative environment, or they have been responsible for composing radical innovation themselves. This chapter will introduce relevant literature and previous research.

Chapter 2.2 discusses the people behind the big changes and innovations. What does earlier research tell about their characteristics, values, attitudes, skills and working strategies? What makes some people curious and persistent about the future of humankind? Moreover, kind of working strategies do they use in different phases of innovation and when coping with the circumstances? What is known about the inter-relation among creative person and circumstances in different life cycles?

This chapter discusses individuals' innovativeness and creativeness in different roles, when inventors, innovators, activists, experts, knowledge-workers, managers, creative thinkers and visionaries or end users. Some people are more creative than others are, but most human beings are creative in some sphere of their lives. If people are not creative at work, it may be due to lack of opportunity (Hamel (2007), 51- 53).

At the current phase of the research, the person behind the innovation has been called creative and entrepreneurial. The word "creative" represent the creative mind producing the remarkable and the rich ideas. The words "entrepreneurial" and stress the fact that *creativity is not limited to the individual* but has also a consequences for the community or for the field, and hence it calls for action. *"Creative and entrepreneurial"* has been approach in a multidisciplinary

approach. What does research then tell about the inter-relation between creativity and development of professions?

Levy and Murnane (2004), through their research on how work has changed, reveal five different work titles to which creativity and innovation apply differently. With that regard, the researchers associate complex communication, as well as expert thinking, as things that prosper the growth of jobs that require those skills. Levy and Murnane (ibid.) have pointed out that *expert thinking applies to all professions.* These jobs have been thought to be the ones that require *creative thinking and problem solving abilities.* Another type is the work that demands *interpersonal communication*, since its significance is based on designing innovation and motivation or management of others. Both of these types have been seen as the high paying and rapid growing jobs. (Florida (2005), 30-31)

On the other hand, the researchers found out the jobs that have declined and that continue to be vulnerable to outsourcing. They mentioned these jobs as the ones that require *"mental tasks"* which corresponds well with defined logical tasks, such as data coding and other routine tasks; and the "routine manual tasks" that require physical strength, such as blue-collar assembly works. In contrast to the two "non-routine manual tasks" which require optical recognition and fine muscle control such as personal service jobs and factory jobs have declined in the early years (i.e. 1969-1989), but levelled off since then. (Florida (2005), 31).

Since the work in the knowledge era is changing and the *role of creativity and innovativeness is increasing* in all types of work, it can be asked whether external and personal factors related to innovativeness and creativity can be learned by analyzing the truly creative people at their work. After all, they have got the experience on how it is to be creative and make something out of it.

Psychologists, sociologist, historians and business researchers' work on creative individuals, inventors, innovators, experts or genius and producers of scientific knowledge has been transformed towards the eminently collective and material process of knowledge creation and innovating and "in this sense, *the sources of innovations cannot be localized*" (Mialet (2006), 247). This trend is established because success is likely to result from the systemic and collective pursuit of opportunities rather than from a flash or genius. Sociologists and historians are interested in how an individual is constituted as an inventor, and the question on *how the idea comes to society* is under investigation, rather than the question of *how the idea comes to mind*. On the other hand, philosophers of science "characterize or localise invention, but do not give us the means to study it, since it is mysterious and bears no relation to official science." (ibid. 247)

It is obvious that an individual generates the creative process whereas creativity is a matter of importance for individuals and nowadays it is urgently *cultivated, in its various forms in different organizations and national strategies*. This can be seen for example in the hiring people process where the employers are considering the innovative potentials as well as the ability to creative thinking whenever they are offered the environment to expose their ability. In the working life this is referred to as the creative entrepreneurial knowledge worker; something that will be discussed in the following section of this chapter.

2.2.1 Creative and entrepreneurial person in history and in modern era

With the wide adaptation of the innovation concept and the recent tendency towards open innovation and end user innovation, all *individuals in different roles* (for example visionaries, innovators, leaders, employees, clients and even the ordinary citizen) have been considered as *creative* with potential to develop innovation. In knowledge society with high education standards and open access to information, citizens and consumers are more creative and demanding. New groups, like senior citizens constitute a demanding and growing market. At the

same time, underprivileged people form the next potential group in the emerging markets. Considering how to integrate their creativity and experience into the development of products and society, may be an asset when scaling up innovation into new market.

Human history and creative people. Firstly, the narrative around creative individuals has seen them as influential and heroes. Leonardo da Vinci, the Italian polymath; scientist, mathematician, engineer, inventor, anatomist, painter, sculptor, architect, botanist, musician and writer, effected the development of many fields. Furthermore, inventors like C`ai Lun (invented paper), James Hargreaves (spinning jenny), Wilhelm Conrad Röntgen (X-ray machine), Alfred Nobel (dynamite), Sumio Iijima (nano tubes), or Pablo Picasso (cubism) and Salvador Dali have all effected more the development of their domain and the human history than others.

Many simultaneous innovations *can generate an industrial revolution.* For example, the Second Industrial Revolution grounded on several developments within the chemical, electrical, and steel industries (Perez (2003)). Creative individuals, innovators and visionaries behind those and other innovation have affected human history, and thus they have often been considered as heroes. However, the heroes are not infallible, nor does they have a monopoly on creative thinking.

Csikszentmihalyi ((1994), 282) reviews the "Pharaonic of Egypt, Han China, Athens, Rome or nineteenth-century Paris", as unique individual human systems based on a relatively small minority of individuals with unusual skills and individual visions. In support to this notion, Csikszentmihalyi ((1994), 282) mentions that *sometimes creative minorities arise from the "least advantaged strata of the population,"* whereas the personal commitment and merit authenticate their achievement. Therefore, it may be thought that the infallibility or high economic positions are not necessarily conditions for

creativity of an individual, rather the *commitment, and the ability to frame out different situations*.

The role of creative professionals in the modern era. Creative individuals cover different areas or professional and non-professional expertise. In this regard, creativity is seen as an act of *"going beyond the current boundaries socially, technologically and knowledge wise",* whereby being a genius is not a prerequisite to it (Ettlie J, (2006), 55). Ettlie (ibid.) points out that standardized measures of creativity reveal that creative individuals do not necessarily have an extremely high IQ to accomplish the creativity process.

Csikszentmihalyi (1997) gave the definition of creativity as "any act, idea, or product that changes an existing domain into a new one," whereas the *creative person* has been defined as *"someone whose thoughts or actions change a domain, or establish a new domain"* Csikszentmihalyi ((1997), 28). Scholars suggest that only a tiny proportion of the population is involved in the creation of the vast majority of creative works and ideas (Simonton (1984), Runco (2007)), whereby Hamel (2002) added that it is because they were *not provided the opportunity*. Florida (2004) writes about creative and educated individuals as belonging to the *creative class* of the knowledge society; they are the drivers of the most successful and competitive regions; however, it is them who attract the investors and companies to those regions where they live and work.

According to Schumpeter innovation is a planning, generation and realization of new products, product quality, manufacturing processes, new methods of organization and management, as well as the development of new markets to buy and sell goods. In addition, Schumpeter stressed that *innovation is generated by people* and "economic change" is an evolutionary or irreversible change and perpetual *"process of creative deconstruction" initiated by creative people* (Schumpeter (1952), 121). In this process, the entrepreneur functions as a conveyor and promoter of the process of change. He replaces the old fashioned, obsolete manufacturing structures through "dynamics and new

combinations". In this manner, he pushes development forward. The so affected "creative deconstruction" is an essential part of innovation process.

The economic revolution performs a pioneering act and overcomes the period of stagnation (Schumpeter (1952), 130). According to Schumpeter, entrepreneurs are not only "pioneers" on a professionally independent basis, but they are also *leading managers of "vehicles for the reorganization of economic structures"* (Schumpeter (1952), 28; Schumpeter (1946), 136-137). These people will try to stand out from the existing and the established systems in order to develop markets for new ideas, structures and processes. (In Audretsch, Grimm, and Wessner (2005), 8-9).

Rice and O'Connor (2001) have used the term *opportunity recognizers* whereby they found that opportunity recognizers have an important role in the radical innovation life cycle (Rice and O'Connor (2001), 97). In their research, the term opportunity recognizer had been referred in support to breakthrough in an organization. They divided them in three different categories; which are hunters, gatherers and radical innovation hubs. *Hunters* are regarded as "active" in finding the opportunities among the activities in different sources of innovation. Their main concentration is in the marketing and business development with a broad technical specialist. *Gatherers,* who are referred to as "passive," have experience, skills, judgments as well as motivation, and are receptive of the ideas that arise out of the normal R&D environments. They have sufficient knowledge to understand technical concepts as well as envisioning the technology's potential impact on the market. (Rice and O'Connor (2001), 112). Hunter's and gatherer's ideas are then sent to the *radical innovation hub,* a "home of ideas". It includes staff having the skills and talents necessary for the opportunity recognizers, who can act as a catalyst when the initial evaluation turns out to be negative. Innovation hub furthermore stores the ideas for the future use. "Clearly managing the handoffs between individuals and organizational structures is critically important for the survival and progress of breakthrough innovation projects. Hence, the individuals responsible for these

sets of activities must be skilful at managing organizational interfaces." (Rice and O'Connor (2001), 113)

Discussing the *philosophical aspects* of the role of experts, philosophers such as Goldman (in Selinger and Grease (2006), 1) state that, in the modern world, experts and expertise permeate society in public and private spares and economic, scientific, social, and technological *decisions are delegated to experts*. Thus, an explicit philosophical *inquiry on the issue is needed*. Selinger and Grease (ibid.) argue that philosophers conventionally approached the issue indirectly through "authority", "power", "rational debate", and "colonization of the life-world".

The theoretical dimensions of *experts and expertise* lie at the intersection of knowledge, learning, skills and experience. "The word "expert" comes from the Latin "*expertus",* past participle of *experiri,* to try" (Selinger and Grease (2006), 1). Moreover, the Oxford English Dictionary has pointed out the meanings of expert as follows; "experienced in," "having "experience of," "trained by experience or practice," "tried by experience" "to know by experience," one who have gained skill from experience," "one whose special knowledge of skill causes him or her to be regarded as an authority," and "specialist." (Selinger and Grease (2006), 1).

Selinger and Grease (2006) continued discussing the characteristic of expertise by referring to the relative easiness of the previous definitions and comparing them to the modern society's disagreements over who the real experts are, and over the objectivity of expertise. They argue that, "the nature, scope, and application of expertise appears *deceptively simple both to understand and to cope with*" (Selinger and Grease (2006), 1).

In the literature review, it was found that, *the creative person* has been associated with concepts (figure 15) such as *innovator, inventor, creator, activist, opinion leader, and change agent or an innovative manager*. Creative

individuals can be found in various innovation phases in various roles. The creator, innovator, inventor and activist are mainly for the creation of ideas of innovation, whereas protectors, champions and sponsors are facilitating the innovation and opinion leaders and change agents are more associated with the diffusion process: The role or creative manager is important in generation of ideas in order to provide the flow in the circumstances. Creative person can furthermore be found in the role of innovation adopter.

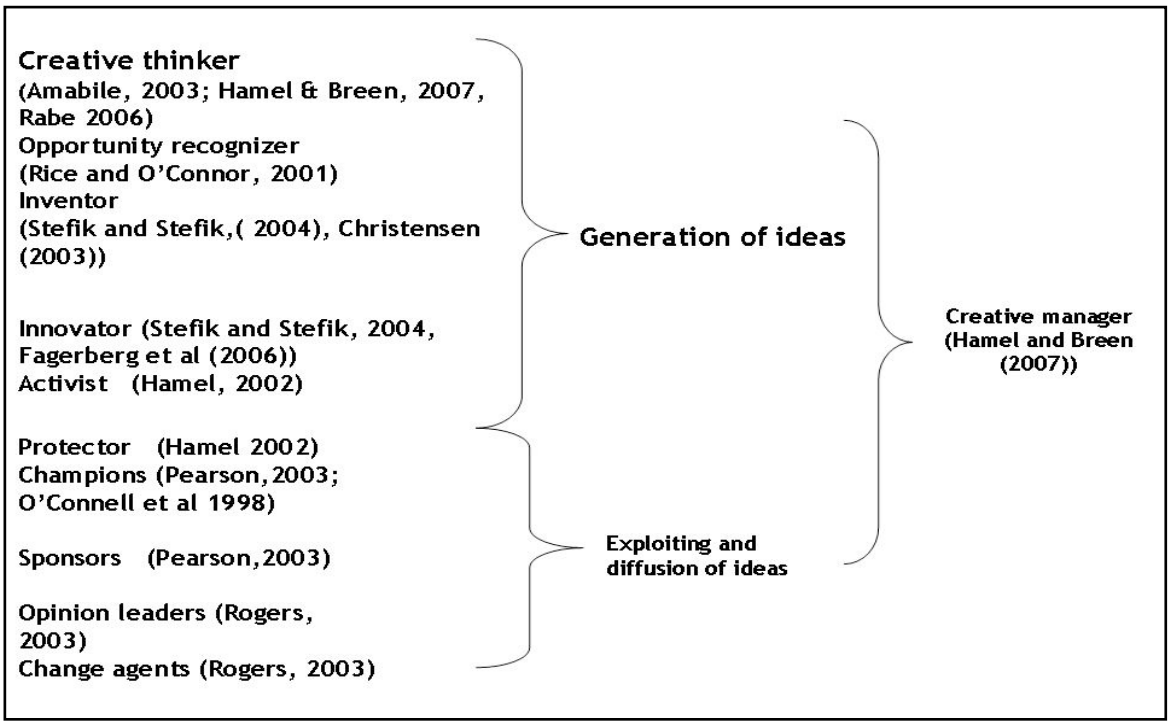


Figure 15 Different creative individual notions and their functions

An *innovator* has been referred as "the person or the organizational unit responsible for combining the factors necessary." (Fagerberg et al (2006), 5). *Inventors* are starting the process by soaking themselves in a problem, thoroughly exploring and spending time into the problem to be solved. Innovator may be differentiated from the notion of inventor due to the historical explanation of the inventor to fail in commercializing their breakthroughs. Moreover, the availability of materials, skills and other inputs that can support innovation is seen to be another different aspect between innovation and

invention, since the inventor in most cases fails to have the inputs (Fagerberg et al (2006) 5, Shapero (2004), 50).

Stefik and Stefik (2004), 47) portray *inventors' controversial nature*, by pointing out that "Inventors *see the world differently* from most people. This has to do with how they notice and understand, rather than what they are presented with. Sometimes inventors find *curiosities in ordinary things*. These curiosities become the seeds of the inventions." They (ibid (2004), 244) also add that: "Inventors can sometimes create technologies that nobody needs or solve problems that nobody needs solved". More than listening, imagination and facing the obstacles are needed in the invention process to reach the new directions and breakthroughs (Stefik and Stefik (2004), 244). F*urthermore, an innovator can appear in the innovation adopter's role*.

Rogers ((2003), 26), in his research on diffusion of innovation, defined the notion of *opinion leaders and change agents* in order to discuss how different types of people affect the diffusion of innovation. He mentions that the nature of the most innovative individuals is 'perceived as *deviant from the social system*' due to the *low credibility* by the average members of the system. He (ibid, 26) continues by explaining that, the innovative individual's role in diffusion is very restricted, whereas other organization members act as the opinion leaders, whose responsibility is to influence others about the innovation. In addition to the opinion leaders, there are as well people who influence clients' innovation decision in a direction deemed desirable: these are called, 'the *change agents'*; they are normally professionals with a University degree in technical fields related to the technical innovation. Rogers' research results are important when the difficulties related to the creation of radical innovation will be discussed.

Roger ((2003), 282) introduced *innovation adopter* categories as ideal types based on abstractions from empirical research on innovations diffusion. Rogers argues that *innovativeness* is a *continuous variable* and there are *no sharp breaks or discontinuities* between adjacent adopter categories, although there

are important differences between them. The categories, most relevant for this study, will be discussed next.

With regard to the adopter categorization based on the innovativeness (figure 16), *five adopter categories* have been named. Innovators correspond 2.5% of the individuals in the system of adoption. Early adopters occupy 13.5% of the system of adoption. Early majority and later majority have been seen occupying 34% each, while the laggards, who are referred to as being suspicious of innovations and change agents, represent 16% (Rogers (2003), 280-281).

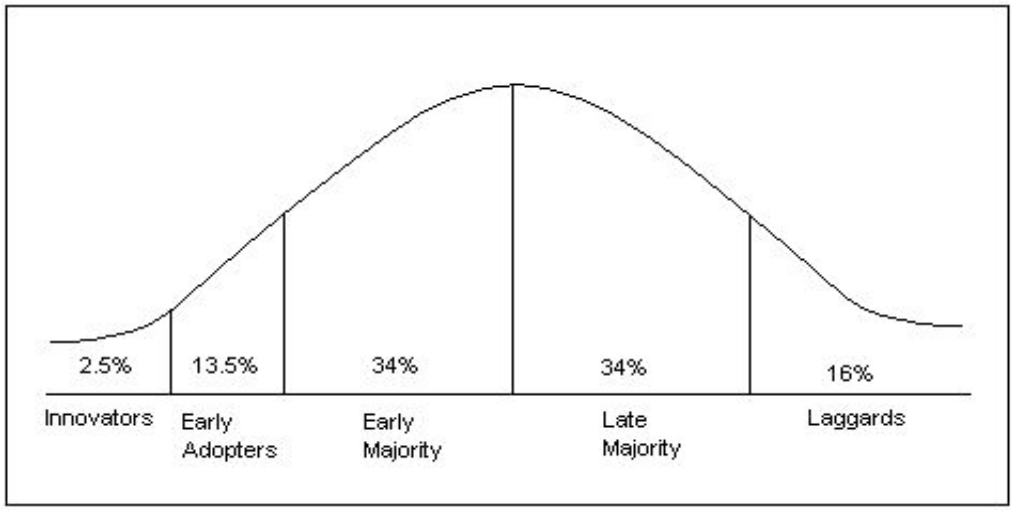


Figure 16 Adopter categorization based on innovativeness (Rogers (2003), 281)

Early adopters are more integrated, and have a highest degree opinion leadership in most systems than any other group. They are referred to be "individuals to check with before adopting new idea" (Rogers (2003), 283). They help to trigger the critical mass when adopting innovation. On the same juncture, O'Connell at al ((2002), 52) refer to early adopters as "often willing to accept a prototype and work with the innovating firm to define the form and function of the new product." According to Rogers, earlier adopters have no difference from later adopters in age; although their extent of *social status, empathy, ability to deal with abstractions and uncertainties, attitude towards change*, *upwards social mobility, unit size* (like farms companies etc), *literacy and formal education* is said to be higher than those of the later adopters

(Rogers (2003), 288-289). Moreover, the “change agents” consider early adopters as missionaries in speeding up diffusion process (Rogers (2003), 283; 298)

Lastly, the *creative and innovative managers* are needed. Creative managers have a passion to solve extraordinary problems as well as an ability to understand the *systemic roots of the problem* in order to solve it, *persistence, and informal implementation of their experiment commitment to the revolutionary goals, as well as an ability to iterate and clarifying the performance metrics (Hamel and Breen (2007), 239*. These characteristics are valuable to generate “management innovation” which “substantially alters the way in which the work of management is carried out, or significantly modifies customary organizational forms, and, by so doing, advances organizational goals” (Hamel and Breen (2007), 19).

Value creation depends on the human capabilities that contribute to a competitive success. Hamel and Breen (2007), 58-59), have classified these capabilities in an ascending order, whereby *obedience* is placed at the bottom, followed by *diligence*, after *intellect*, *initiative, creativity* and then *passion* at the top (figure 17) . Despite this hierarchy, Hamel and Breen (2007) mention that obedience has its importance to the company, although for the companies to capture the economic high ground, they have to look for employees who have “acquiescent”, “attentive” and “astute” nature. With regard to management, its goal is “to amplify and aggregate human efforts to get more out of the individual,” since “companies gain a performance advantage when they invent better ways of amplifying and aggregating efforts” (Hamel and Breen (2007), 250). Since an inspired management innovator can help to resolve intractable trade-offs, the Management innovation goal is reached when the companies push out the frontier of individual and collective achievements (Hamel and Breen (2007), 80 and 251). Further discussion on managerial innovation will continue in chapter 2.3.

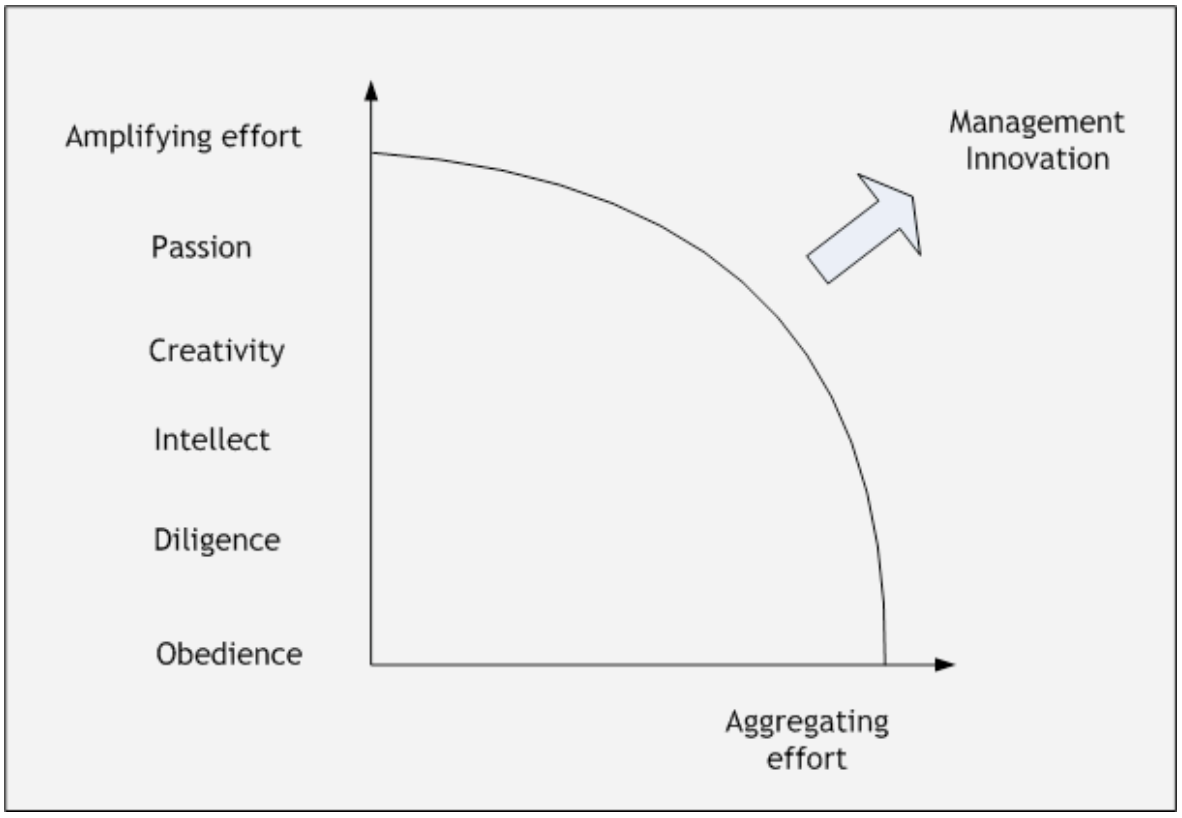


Figure 17 Dimensions of managerial effectiveness (Hamel and Breen (2007), 251)

2.2.2 Characteristics and motivation of creative individuals

The *level of creativity varies between individuals*, as well as within the same individual in interaction with different situations and environment at different times. Most researchers state that human behaviour is a function of both stable traits (personal factors) and environmental and situational variables (external factors). While it can be argued that not everyone is equally creative, Runco (2003) and Roger (1995) were without a doubt of the opinion that *everybody is creative*. Rogers (1995) refers to *self-actualization (SA)* in relations to creativity by pointing out that, "s[S]elf-actualization or health must ultimately be defined as the coming to pass of the fullest humanness, or as the 'Being' of the person, it is as if [SA] self-actualisation creativity were almost synonymous with, or a defining characteristic of, essential humanness." (Runco (2007), 407)

This section discusses first the characteristics and personality type in relation to creative individual. Secondly, creative individual is seen in relation to circumstances and finally the issue of motivation will considered.

2.2.2.1 Introduction to creative individual's characteristics and personality type

Research on creativity and creative individuals has connected many characteristics and traits to creativity. However, some scholars like Hargadon ((2003), 11) argue that any of these *traits have little significant impact on success*. With regards to novelty, Csikszentmihalyi ((1997), 51- 54) points out that there is no particular set of traits that a person must have to come up with the novelty. However, based on the system view of creativity, he (ibid.) points out that different suggestion could be associated with the creative individuals: "*generic predisposition for a given domain", "interest in the domain", "access to a domain" and "access to a field"*.

In Csikszentmihalyi's research, which was developend in five years (1990-1995), the indepth analysis was done out of the interviews which lasted for about two hours and conducted close to the natural conversation. The sample comprised ninenty one *exeptional people* who have made a difference in the major domain of culture, sciences, arts, business, government or human being in general. Some of the respondents had Nobel prizes . The pre-requisites for the sample selection had to rely on individuals who knew creativity "firsthand," as well as had active participation in the domain with at least sixty years of age. (Csikszentmihalyi (1997), 12-15)

The discussion about the traits is multidimensional, because of the systemic nature of the creativity as Csikszentmihalyi pointed out: "Someone who is not *known and appreciated by the relevant people* has a very difficult time

accomplishing something that will be seen as creative. Such a person may not have a chance to learn the latest information, may not be given opportunity to work, and if he or she does manage to accomplish something novel, that novelty is likely to be *ignored or ridiculed*." (Csikszentmihalyi (1997), 54)

Creativity is explained to be a part of the *complex system* whereby through its complexity none of its components alone can explain it (Csikszentmihalyi (1997), 55). Runco ((2007), 284) has referred to the "*paradoxical character*" associated with creativity. The paradoxical character can be found also in Csikszentmihalyi's (1997) illustration on the complex system, whereby the creative person is both *aggressive and cooperative* depending on the situation when individual integrate each other in a *dialectical tension*. There are ten pairs of apparent antithetical namely*; "physical energy" vs. "quiet and rest", "smart" and "naïve", "playful and discipline" vs. "responsibility and irresponsibility", "imagination and fantasy" vs. "rooted sense of reality."* They harbour opposite tendencies on the continuum between *"extroversion and introversion"*; and sometimes they seem to express both tendencies at the same time. Moreover, *humble and proud* at the same time, dominant and tough ("masculine") vs. more sensitive and less aggressiveness ("feminine"), "traditional and conservative" vs. "rebellious, iconoclastic and independent", "passionate vs. objective" and finally "suffering and pain vs. great deal of enjoyment" (Csikszentmihalyi (1997), 58-73)

A psychiatrist, former member of the Finnish parliament, and a writer, also a musician, Claes Andersson (2004), highlighted the *ambivalent nature* of the creative mind while writing. Ambivalence, the condition of contradictory, conflicting feelings, is difficult to withstand. However, it seems to be an imperative part of creative process. Ambivalence appears between the burning and compulsive need to write, and on the other hand, the "invisible hand" and fear preventing the individual from the actual writing. According to May (in Andersson (2004), 130) "one has to withstand the niggling insecurity and accept the inadequacy of capabilities, however to perceive one's courage and

determination in order to enter the creativity work and take it to the end with persistence and single-mindedness" [translated from Finnish]. According to Andersson the existence of obstacles should be permitted because, throughout the incubation of the ideas, they are a crucial part of the actual work. (Andersson (2004), 24-37, 130)

Furthermore, Andersson (ibid.) refers to *memory and imagination* as sources of creativity. *Omnipotence and idealisation* help in engaging with the early memories and they are referred as part of the sensation of *Flow*, which, according to him, is an exceptional state, whereby most of the creative work consists of the daily hard work. The creativity process includes many characteristics and events, which cannot be explained and analysed rationally. In order to reach the state of Flow, individuals use different antagonistic methods like solitude and isolation, or half-autistic behaviour and "inspiration of the *nick of time"*. (Andersson (2004), 37-44)

Andersson discusses the sensation and role of the "*outsider*" in the context of the paradoxical nature of the creativity.

> "And just as the *omnipotence* and experiences of transcendent beatific, also fear, anxiety and powerful resistance dictated by self-protection instinct are part of creativity." (ibid (2004), 114) [Translated from Finnish]

With the notions of *outsider* and *emancipation* Andersson ((2004), 113-116) refers to the capability to experience and see more faithfully and easily. Forerunners, innovators, clairvoyants and change initiators belong often to the outsiders. In addition to the capability to take distance, creativity involves also interaction and dialog. "We want that our message will been heard and understood" (Andersson (2004), 132).

Another approach to creativity is based on psychological research on temperament, which is an early, biological foundation of individual's

personality. *Temperament is an individual style of behaviour or a reaction*, appearing at a very early age and is remarkably constant throughout life and different situations. (Keltikangas (2007), 36) According to Thomas's and Chess's interactive temperament theory (in Keltikangas (2007), 47) *individuals react in an individual way to the environment, however also environment react to individuals in various different ways*.

Scholars have studied the relationship between creative behaviour and *personality types*. Personality type indicators, like the Myers - Briggs (1980) Type Indicator (MBTI), based on Carl Jung's (1923) theory provide an understanding of similarities and differences of preferences and behaviour among human beings due to differences in mental functioning. These differences can be seen as a source of diversity supporting the creativity of an individual or an organization. However, if the awareness of this diversity is missing there will be a negative tension that can prevent creativity.

Due to the difference among the individuals, there is a variation in the reasoning and principles among them. *Variation in the human behaviour is as a result of few basic observable differences in the mental functioning*. These differences concerns the way people *prefer* to use their minds, specifically the way they perceive (become aware of things, people, occurrences, and ideas) and the way they make judgments (coming to conclusion of what has been perceived) (Myers and Myers (1980), 1)

According to Myers and Myers ((1980), 7) "*extravert" and "introvert"* people have different preferences. When the circumstances permit, the Introverts' (I) concentration relies in the ideas whereas the Extravert (E) concentrates in the outer environment. In referring to Jung, Myers and Myers (1980) points out two sharply and contrasting ways of perceiving. These ways have been named as *Sensing (S)*, whereby the awareness is made directly out of the five senses; and *Intuition (I)*, due to incorporating the ideas that the unconscious tacks with the outside perceptions. The two kinds of perceptions are said to compete for a

person's attention. Most people from their infancy enjoy one perception more than another (Myers and Myers (1980), 2).

Thinking (T) and *feeling (F)* are the two ways of judgment, which arise from the existence of two distinct and sharply contrasting ways in reaching the conclusions. Thinking is a result of the "logical process aimed at impersonal finding" whereas feeling is a result of "appreciation - equally reasonable in its fashion - bestowed on things a personal, subjective value" (Myers and Myers (1980), 3).

Furthermore, *perceptions* (P) *and judgment* (J) attitudes are preferences that enter in the identification of types. We have use both perception and judgment, but they cannot be utilized at the same time and hence we are enforced to move back and forth between the two attitudes. People find the comfort of these attitudes when they are using them at the right time since both of the attitudes have merits in making life satisfactory whenever a switch of attitude is implemented when it is needed. (Myers and Myers (1980), 8).
Based on Myers-Briggs Type Indicator personality measurement instrument and the MBTI Creativity Index, *creative individuals* tend to be more intuitive ("N") rather than sensing ("S"), more perceiving ("P") rather than judging ("J"), more extravert ("E") rather than introvert ("I") and more thinking ("T") rather than feeling ("F") (Avril and Gough (1991).

When studying creative adults at their professional life, taking into consideration the growth root of the person as well as the environmental circumstances during the childhood may provide important understanding. Myers and Myers (1980) state that, if the environment is favourable, it enhances the child's native capacity, whereas if the environment is unfavourable, the child will result to inferiority and frustration of inhibiting other attitudes which are not from the origin. Successful development in the natural direction yields to the effectiveness, emotional satisfaction and stability (Myers and Myers (1980), 189). "Lack of faith", "lack of acceptance at home," "lack of opportunity," and "lack

of incentive" can affect the personality type due to mistrust and effective utilization of the person's preferences. (Myers and Myers (1980), 189-192)

In his research on creative people at their working life, Csikszentmihalyi (1997), 102-103) portrays the importance of the social environment whereby the incubation is reviewed as something that cannot be successful for the person who has not mastered the domain or being involved in the field. According to Csikszentmihalyi ((1997), 117) *there is a tension in trusting the domain and utilizing what is known and then rejecting the domain through dealing with the undefined truth, and "even most creative persons must overcome the barrier of entropy."* The existence of many personality traits that are conducive to discoveries and hard work with an ability to internalize the rules of the domain and the judgement of the field are necessary in the mind of creative person Csikszentmihalyi ((1997), 117-118).

2.2.2.2 A second look on the characteristics of creative individuals

Creative individuals are *complex* (Koski, Tuominen and Kärkkäinen (2004), 76); Csikszentmihalyi (1997)) since they can use their opposite operation models and traits flexibly. Creative individuals are often emphatic individual both in good and bad respect, they know and accept themselves and they can utilize their strengths.

MacKinnon ((1960) in Runco ((2007), 46) points out that "persons with most *extraordinary effectiveness* have life histories marked by severe *frustrations, deprivation and traumatic experiences*". In addition, the creative individuals have a *capacity to tolerance* of the created tension by strong opposing values.

According to Runco ((2007), 406), creative individuals, have *some universal indicative characteristics*, and some of these characteristics are typical for a certain domain and field. For example, Roe ((1983) in Runco (2007), 407) found that creative individuals working in physical sciences were *observant, open to experience, curious, capable of accepting opposites and ambiguities, independent, self-reliant, perseverant, and appreciative of complexity*. Observations taken from literature also imply, among other things, that a highly creative individual has characteristics like, the *capability for long term development of the skills and knowledge needed for the creative problem solving, or a preference for the challenge of disorder to the barrenness of simplicity* (MacKinnon (1965) in Runco (2007), 284).

Katz (2004), 15) has pointed out that, "technical entrepreneurs typically start their own companies and businesses because they really believe in a given product or service." However, their former organizations become less supportive to the continuation of the ideas. Moreover, Katz (2004) points out that "*entrepreneurial anchored people*" are often obsessed with the need to create whereas doing the routine running of business brings a sense of boredom to them. Roberts ((1991) in Katz 2004), 15) outlines the two different types of professionals, whereas some are good in *idea generation*, and others are the ones with the strong desire and capability to "grab or *exploit good ideas* and persevere with them" until the commercialization phase.

Differentiation of the requirements for running the organization and requirements to foster *creativity* will help in getting around the *organizational roadblocks*. Successful innovations are said to accommodate *champions* (who believe and whole-heartedly push new ideas), *sponsors* (resources marshal), *mix of bright and creative minds and a process that moves ideas through the system*. (Pearson (2003), 35). The *inter-mediation* of different parts that may enhance innovation such as lawyers, consultancies, the community and financial bodies are been viewed as important.

Optimism is a typical account to creative individuals (Csikszentmihalyi (1997), 18). "Family strains, professional jealousy, thwarted ambitions" may be the obstacles for the creative individual. It is explained that, to gain something new and important it now and then can happen that *one is poor*, *suffering* and *tired of the world* and for that reason the capability of optimism becomes important (Csikszentmihalyi (1997), 18). However Csikszentmihalyi (1997), 19) revels that, "the reigning stereotype of tortured genius is to a large extent a myth created by romantic ideology and supported by evidence from isolated and –one- hopes-a typical historical periods".

By referring to different acute changes on the creative individuals, Csikszentmihalyi (1997), 19) points out that *the rewards and the artistic scene that promised too much may be the case instead of their creativity*. He (ibid) points out that "It is perfectly possible to make the creative contribution without being brilliant or personally creative, just as it is possible-even-likely-that someone personally creative will never contribute a thing to the culture." (Csikszentmihalyi (1997), 27).

According to Csikszentmihalyi ((1997), 10) there are many paradoxes related to the creative people which can't be avoided. This is due to the systemic nature of creativity, concerning the relationship among the "domain", "field" and "individual" (figure 4, chapter 2.1.2). "It is practically impossible to learn the domain deeply enough to make a change in it without dedicating all of one's attention to it and thereby appearing to be arrogant, selfish and ruthless to those who believe that they have a right to the creative persons attention." (Csikszentmihalyi (2007), 10). "Creative people are neither single-minded, specialized, nor selfish" (Csikszentmihalyi (2007), 10). They prefer linking with adjacent areas of knowledge, being in principle caring and sensitive. The sense of selfishness and specialization is enhanced because of the demands of their role which is explained as one of the many paradoxes which is hard to avoid (Csikszentmihalyi ((1997), 10). Also Hamel and Breen (2007), 53) stress the nature of a contrarian of an innovator. He, however, refers to the problem of

the deeply held beliefs of the inherent superiority of a business model, and how, “yesterday’s heresies often become tomorrow’s dogmas”, and that is when the innovations and growth decline.

Regarding education, one can argue that the first challenge for the innovation ecosystem is to be very effective at teaching the students to find pleasure in the right things. It is effortless to *find pleasure in things* that are easier. It is also easy to enjoy making money. It is much more difficult to *learn to enjoy manipulating symbolic systems* by doing things such as mathematics and science or writing articles and reports, and learning from these things about the world and about ourselves. The real challenge is to find the solution how to teach, how exciting, how mesmerizingly beautiful all the mandatory knowledge behind the innovation and successful business can be (Csikszentmihalyi (1997), 125)

Csikszentmihalyi (1997) points out that performance in school matters more in some domains (such as mathematics and sciences) than in others: The high school exposure is necessary for further advancement in the future career development but *high school performance has been seen as a poor indicator of future creativity* in the arts and the humanities (Csikszentmihalyi (1997), 178). None of the creative people that Csikszentmihalyi interviewed remembered having been popular in adolescence (Csikszentmihalyi ((1997), 177). Most of them had a *feeling of marginality* as they *found themselves on the outside* and *different*. Despite this loneliness state, they were able to profit from it, instead of *lamenting their loneliness*. The aspects of *interests*, *experiences while growing* and the *strong feelings* are important in ones *creativity ability* (Csikszentmihalyi (1997), 178-179). There is no easy way - h*ard work and even painful loneliness* is needed. (Csikszentmihalyi (1997), 121;171)

School seems to have little effect on the lives of creative people; “but if the school itself rarely gets mentioned as a source of inspiration, individual teachers often awake, sustain, or direct students’ interests”. Teachers noticed the student, “believed in his or her abilities, and cared”, “teacher showed care by

giving the child extra work to do greater challenges that the rest of the class received". The child may arise the interest on the subject by enjoying working in it, whereby for the teacher, finding the right balance on the challenges given to students' skills may result in enjoyment and desire to learn more. (Csikszentmihalyi (1997), 173-175).

Form the point of view of this study and the exploration of society as system-of-innovation, creating learning environment that supports originality and capability to face the situation are crucial. That demands a lot more from the school than merely a well-established knowledge transfer system. If the intense curiosity and focused interest are mandatory for success in innovation, then the school should support them. However, if curiosity and focused interests may seem odd to the peers, since original ways of thinking and expression can make them somewhat suspect, isn't it then values like tolerance, which should be applied at the school? If the peer group itself is intellectual, then the conformity supports the development of talent. Nevertheless, in most cases it is not. In that case, the capability to face the situation and "bite the bullet", namely loneliness, however painful, helps to protect the interests.

According to Carl Jung, childhood curiosity, experimentation and imagination can develop into a play instinct that is an inner need. Manu (2007) stresses the difference of imagination and creativity, "*imagination* suggests ideas resulting from *freedom of thought*, while creativity suggests some actual aspect of creation, even if only in concept." (Manu (2007), 9). Curiosity in this way may result into many different phases that one may become creative. It may be assumed that *taking responsibility for one's own curiosity* is a core factor for a creative individual to reach his mission. For that reason, for the creative problem solving a person may acquire qualities such as *fluency*, *flexibility*, *originality* and *elaboration* as well as capability to *stay away from barriers of creativity* that may happen strategically, individual own value wise, self image wise and perceptual wise (Proctor (1999), 18; 28-29)

Csikszentmihalyi (1997) found that the being *lucky and at the right place and at the right time* were explained as a source of success by the great minds he interviewed. The need to *reproduce the creative system in one's mind* has been attested while *learning the rules and contesting the domain*. Furthermore, criteria for the selection of the preferences of the field are important for an individual. Csikszentmihalyi (1997), 46-47)

Hamel ((2002), 205) has referred to "*activists*", behind the business concept innovations, as the people who have the ability to *change big and complicated matters*. Different values namely *honesty*, *compassion*, *humility*, *pragmatism* and *fearlessness*, are required for one to take a role of an activist.

2.2.2.3 Introduction to the inter-relation of creative person and circumstances

This study on innovation and creative persons considers furthermore the circumstances and environment. Although the system-of-innovation will be discussed in details in chapter 2.3., this section gives and highlights the characteristics that are related to individual, that is, issues like communication, background, power distribution and tension. In addition, the following section (2.2.3.) will discuss the working strategies and methods related to creative individuals in interaction with others.

Different creative persons have revealed the fact that their values and truthfulness had given them a chance to gain credibility in maintaining relationship with other people. The role of the family in shaping the value of the creative individual has proved its clarity, while most respondents had shown how important their families were in bringing them up (Csikszentmihalyi (1997), 166-167). With regard to creative leader or manager, a German physicist had demonstrated that there is a need for the honesty built, not only to own self but also to the followers. (Csikszentmihalyi (1997), 166)

In addition, individuals may keep doing creative work throughout internalization of field's criteria judgement to the extent of being able to give feedback to themselves. The ability to separate bad ideas from good ones has as well an implication in bringing the competence in the creativity (Csikszentmihalyi (1997), 116). Motivation and hope for positive results in the beginning of the creative process is explained as important in accomplishing something new and worthwhile (Csikszentmihalyi (1997), 117).

In organizations, the manager is the one concerned with the creativity generation and the organizational environment with the high creativity (Katz (2004), 49).

In reference to Steiner (1965) Katz ((2004), 49) has pointed out the characteristics of *creative organisations*. They are as following: 1) "Open channels of communication are maintained," 2) "Contacts with outside sources are encouraged," 3) "Non-specialists are assigned to problems," 4) "Ideas are evaluated on their merits rather than on the status of their originator," 5) "Management encourages experiments with new ideas rather than making rational prejudgements," 6) "Decentralization is practiced," 7) "Much autonomy is allowed to professional employees," 8) "Management is tolerant of risk-taking," 9) "The organization is not run tightly or rigidly," 10) "Participative decision making is encouraged," 11) "Employees have fun". These factors may be also associated with the successfulness of the *external support* that the organization might be utilizing.

Newcomers create most of the new wealth as they may assist the organization to the diverse performance of things, in the fast changing world. Top management have to give up monopoly on strategy creation and consider innovation in both business models and political models for the power distribution in the organization (Hamel (2002), 151-153). *Creating space for the innovators* is needed in order to originate the business concept innovation. According to Hamel (2002), 154) this space can be created by being aware of the power

relating to mental and political models and by distributing power, from the management to the innovators.

Cooper ((2005), 528-529) compared hierarchical and organic organisational settings and found that *tension, anger and frustration* was frequently reported by new product innovators in the hierarchical organisation. However, *self-organising energy* was expressed by all the innovators regardless the organisational setting.

Kutaragi, the previous innovator in Sony, who invented Nintendo and afterwards became Sony's leader, is a literature example of the importance of protector. Kutaragi was a radical innovator with the classical difficulties (as an outcast) with the mainstream and the working community. Without the help of his *protector* Ogha, who was one of the Sony's managers at that time, the innovation had been killed. (Hamel (2002), 170 – 178). Runco ((2007), 194) argues that support to new ideas and opportunities to initiative is important for the innovation to take place. This may be implemented out of trust that employees may be given as well as and the support to the risk taking towards the implementation of the new ideas.

With regard to *empowerment in technical innovation environments*, Katz (2004) points out that more strategic focus and clarity need to be established, as well as business managers to give autonomous opportunities for the technical personnel within the clearly defined goals and boundary conditions. In addition he (ibid) uses the proverb "lines in the sand" in referring to the relationship that "the clearer the organization conditions is about in expectations and constrains the easier it is to empower the teams and project groups effectively" Katz ((2004), 11).

From the point of view of a leader, however, the *creativity - environmental interaction is a two-way process*, it is not only leadership and environment affecting creative people but as Simonton's (1990) notion of *persuasion* shows,

creative people change the way other people think. Runco (2007), in his definition of creativity, discusses *person, product, process, place and persuasion*. With regard to persuasion creativity had been "associated with the ideas that are so good that they change the way others think" Runco (2007), 248).

2.2.2.4 Motivation and creative individuals

According to Katz ((2004), 4) innovative individuals and especially the ones from the technical profession are said to be "*boldly to go where no man has not gone before*". Katz has pointed out that, there would not be any demands that cannot be met when the individual has a sense of excitement as well as believe that what they are doing is challenging, significant and innovative *(Katz (2004), 4)*. In addition, Katz (2004) refers to the *degree of motivational potential as* dramatically influenced by the perception of the person towards the assigned *responsibility*. *A sense of having fun* on what one does, is evident in making the work to seem motivational by the professionals. *Katz (2004), 4;* Csikszentmihalyi (1997), 75*)*

Scholars refer to *intrinsic motivation* as a way to relish the creativity of innovators. According to Cooper ((2005), 525) "excitement" and "creative buzz" are intrinsic motivators for innovators, while the sensation of "tangible benefit for organisation or customers" reinforce the motivational effect. Work is viewed in the same way as *having fun*. Then, jobs tasks should have some of the characteristics that create such high levels of *intrinsic work motivation*. Hackman's and Oldham's ((1980) in Katz (2004)) *motivation framework and Katz's (2004) multidimensional framework of work motivation* show that people are more motivated when they feel their jobs require them to use a wide variety of skills and abilities. Table 4 illustrate the motivation framework as presented by Hackman and Oldham ((1980) in Katz (2004). Table 5 is about the relationship

between task dimensions and the two alternatives ways (organisation and professional) of looking at it.

Table 4 A framework for work motivation (Hackman and Oldham (1980) in Katz (2004), 6)

Dimensions of Task Characteristics	Definitions
skill variety	The degree to which the job requires the use of different skills, abilities, and talents
task identity	The degree to which the person feels that he or she is part of the whole job or project activity form beginning to end.
task significance	The degree to which the job is considered important by and has impact on the lives of others.
autonomy	The degree to which the job provides freedom, independence, and discretion in how the work is carried out
Feedback	The degree to which the person is provided with clear and direct information about the effectiveness of his or her performance

Table 5 Multidimensional framework for work motivation (Katz (2004), 10)

Task dimensions	Organisational orientation	Professional orientation
Skill variety	To utilize one's skills and abilities	To learn and develop new skills and abilities
Task Identity	To become a contributing member of the organisation	To become a contributing member of the profession
Task Significance	To work on projects that are important to the organisation	To work on projects that are exciting within the profession
Autonomy	Strategic clarity	Operational autonomy
Feedback	Subjective data and information processes	Objective data and information processes

Tables 4 and 5 highlight the different needs of the organisation and the individual. Innovation management may be developed throughout the awareness of these realities. The organisation hires professional employees because they want to use their skills, knowledge and abilities. The professionals however aim towards their growth, learning, as well as extending their skills, knowledge and abilities. Professionals and executives differ in rank order of their relative priorities regarding skills utilization and extension. That results to the de-motivation and counter-productivity whenever the differences remain unsolved (Katz (2004), 10-11). Similar confusion can happen between the organizations when viewing the dimensions of "task identity" and "task significance". Katz (2004), 11) discusses the dilemma whether the professional employee is a part of the organization or personnel. Katz (ibid.) refers to Allen and Katz (1992) who outlined that, "in essence professional employees have one head but two hats." That is to say, "many professional prioritize their orientations, scientists and Ph.D.'s in particular."

In addition, Katz (ibid.) claims that individuals are motivated when they accomplish projects that are considered important with the positive effects into their "organizations, professions and society". It is due to the belief that they will be taken seriously with regards to honour. Katz (2004) points out that, R&D professionals appreciate more when they receive "*kudos*" from their respected colleagues rather than from management (Katz (2004), 7). However *common good* as a value has been mentioned as the ultimate dream for an individual (Katz (2004), 8). The driver for the technical innovator's motivation is their *work excitement and pride of accomplishment* of the process.

With congruence to motivation, the *degree of autonomy* as well as the *sincere (wholehearted) management, trust and support of the worker* is necessary for the individual to become more self-reliant in his work. Autonomy can be classified as the strategic autonomy in questions relating to goal, expectations, directions, and constraints; and operational autonomy, which relies on the one's choice to accomplish the goals (Katz (2004), 10). The need of an individual to

evaluate his work performance is important for enhancing future improvements; nevertheless, management clarification on the task and conditions that need to be accomplished will give people freedom to function within their required boundaries (Katz (2004), 8).

Above all, Katz ((2004), 11) points out that, "freedom is crucial for creativity and generation of innovations". Professionals are contributors who are often having *strong beliefs and personalities, as well as more motivated when pulled rather than pushed*. These professionals respond best to leaders who have an empathetic understating of their technical problem-solving worlds and who make their lives easier by respecting their expertise, *supporting them* in their technical efforts; *providing the best available tools, equipment and information*; and *protecting* them from non-productive hierarchical demands and inflexible bureaucratic constraints.

In spite of the above generally positive attributes, an *uneasy equilibrium* can be perceived in creativity and creative individuals, for creativity is associated with both favourable and unfavourable traits. Some of *the traits, like autonomy, are a sine qua non condition* (Runco (2007)). Nevertheless, innovation related trait could be socially undesirable and create problems for the creative individual. MacKinnon (1965) found that the most creative architects were well acquainted with the social challenges which were embedded in their creativity, and that they would have liked to *improve their interpersonal reactions* and *social relationships*. Other researchers (Crutchfield (1962), Griffin & McDermott (1988)) connected characteristics like *autonomy, nonconformity and rebelliousness* to creativity. All these characteristics may constitute sources of *inconvenience and discomfort* in organizations and communities and can even lead, sometimes, to *hostility towards creative individuals or creative ideas*.

2.2.3 Creative individuals' working strategies

Saatcioglu ((2002), C1) views innovation as a part of *idea management* process. He (ibid.) has conceptualized idea management as an "organisational process

that structures members' acting and thinking toward stability and change." He postulates that it is not the actors' capacity for ideas but the types of idea management they employ that verify their degree of innovativeness. In his study, based on Grounded Theory generating method, he found two distinct ways of managing ideas among 24 high-level executives: "adaptive and imaginative" (Saatcioglu (2002), C4). "Imaginative managers take the extra step beyond the default ways of operating and proceed in dynamic ways." (Saatcioglu (2002), C5). Differences in the idea management of adaptive and imaginative managers are shown in Table 6.

Table 6 Adaptive and imaginative managers idea management orientations (Ideas adapted from Saatcioglu ((2002), C4).

	Adaptive manager	Imaginative manager
Orientation towards the origin and reason of ideation	Reacting: Adjusting to changing situation	Proacting: Considering change to create advantages of the perceived opportunities
Problem solving strategy	Searching: Hone in a given problem, collecting information and solicit knowledge in reference to problem	Scanning: Search for alternatives and possibilities, collect information and solicit knowledge in reference to multiple issues
Orientation towards others	Directing-collaborating: Expect others to support their efforts	Mediating-facilitating: Create new agenda and invite others to take charge in ideation
Ideation strategy	Reflecting, streamlining: Reliance on similar sources of information and expertise during different episodes	Diversifying, diverging: Rely on the variety of information sources and expertise during the ideation
Implementation strategy	Retaining: Employ few different routines for generating and implementing ideas	Complexifying ,exhausting: Experiment with new techniques for generating and implementing ideas whenever they can

Quinn, Dixit and Faerman (1987) found *paradoxical thinking* at effective managerial behaviour. Subordinates described most effective leaders as exhibiting seemingly contradictory behaviours or styles (in Quinn and Cameron (1988), 12). (Scholar's idea about how competitive companies have learned to manage paradox especially on what concerns new ventures and innovations will be discussed in detail in 2.3.)

Csikszentmihalyi ((1997), 77) found that the creative individuals usually have different theories on what are the mental processes that can chance the domain. "Yet some common threads do seem to run across boundaries of domain and individual idiosyncrasies, and these might well constitute the core characteristics of what it takes to approach a problem in a way likely to lead to an outcome the field will perceive as creative" Csikszentmihalyi (1997), 78). Creativity consists of *anticipation and commitment*. Anticipation refers to a *vision* of something that will become important in the future before anybody else have that vision. Commitment involves having a belief that keeps one working to realize the vision in spite of any discouragement. (Csikszentmihalyi (1997), 77).

According to Csikszentmihalyi ((1997), 97) the creative process is accompanied with *tension, which acts as a stimulus* for the creative process to start. The creative individual is the one who *identifies the problem and solution*. *Personal experience, requirements of the domain and social pressures* are the three main sources where problems typically arise. "The discovered problems have a chance to make a large difference in the way we see the world." (Csikszentmihalyi (1997), 95).

Hamel (2000), 121) refers to the *revolutionary innovators* as having penetrated an unclouded eye in order to stress the *capability to see what is coming next*: to imagine the "inevitable, real, and three dimensional future", in order to find the possibilities as to what could happen. There is a difference between *knowing* what is coming and *imagining* what is coming. The capability of *letting go* and

seeing differently as well as being different has been seen as a valuable trait (Hamel (2002), 123-125). The need to "search for new experiences, go to new places, learn new things, reach out to new people", "novelty addict" as well as *finding the discontinuities and underappreciated trends* are been mentioned as aspects for new discoveries. Individual awareness on the change as well as embracing and feeling the opportunity are important for one to apprehend the idea of the discontinuities. (Hamel (2002), 126-136).

Hamel (2002) refers to revolutionary innovators as "heretics" because they are *continuously asking why*, *asking stupid questions*, *going to the extremes* and *distinguishing form from function*. Antithetical phrases such as *disciplined imagination*, *routine creativity* and *informed intuition* as well as being disciplined, well informed and following routines, are all describing the working strategies of radical innovators (Hamel (2002), 148). Hamel points out that "the challenge is not long-term thinking but unconventional thinking" (Hamel (2002), 139). Thinking of the changes and their opportunities, building ideology, create a coalition, selection of the moment and co-opting are some of the things that are considered in starting an insurrection (Hamel (2002), 190-210).

The creative individuals are *sensitive in finding the missing parts of their process*. Their conscious sequence is analysed in the incubation process which is the most creative part in the whole process (Csikszentmihalyi (1997), 98). *Mastering the domain* is explained as important for the person to utilize incubation stage of creativity successfully (Csikszentmihalyi (1997), 102). This is in congruence with the earlier (2.1.) discussion about the importance of knowledge and skills in innovation process.

Due to different ways that domains are structured, there are several ways that domains may help or hinder the creativity. There are *three major dimensions* of domain that are particularly relevant; "clarity of structure", "the centrality within culture" and "accessibility" (Csikszentmihalyi (1997), 38). In addition to that, creativity can be affected by field in three different ways, namely; "by

being reactive or proactive", "by choosing either narrow or a broad filter" and by "fields' connectivity to the rest of the social systems" as well as their ability to "channel support" in to their own domain. (Csikszentmihalyi (1997), 43-44) It may be considered that reactive and narrow filter may be associated by the incremental changes while proactive and broad filter may be associated with radical ideas.

Goal definition, problem identification and understanding the root of the causes of the problem are required from the *senior management* team in order to be able to develop a plan for the company and manage the change of different details that includes execution. Failure to neutralize the organization antibodies is viewed as something that companies face in the execution of innovation (Davila et al, (2006), 284). Moreover, not understanding the causal linkages between the parts of innovation through the departmental collaboration (e.g. R&D and marketing) as well as not addressing the key elements for change are seen as possible causes for failure that companies face. (Davila et al, (2006), 284-285).

Outsiders keep creativity on track because they bring the diversity to the group. Florida (2005) and Johansson (2004) have considered the notion of intersection and diversity respectively, as a way to portray the effectiveness of innovative or creative actions. Johansson (2004) has referred to different ways of interaction as a key success to innovation. The effect of the *culture mix* and *freedom* may enhance the success of creativity. According to Florida (2005), 4), diversity will let the regions and cities enjoy "the higher rates of innovation and high wage economic growth". Furthermore, *tolerance to diversity* functions in the economic growth by giving places the creative capacity to grow, as well as cultural and *multi-diversity* opportunities (Florida (2005), 53; 171). He (ibid) points out that both *diversity and creativity encourage each other* and are good for profit and loss (Florida (2005), 60). In relations to sharing of knowledge and creativity Rae-Dupree (2007) points out the essence of the Renaissance with

creativity. The Renaissance man was a polymath, who excelled in multiple fields.

The external environment has been studied in its relations to paradox and knowledge. Rae-Dupree (2007) pointed out that “as our knowledge and expertise increase, our creativity and ability to innovate tend to taper off.” This can be related to the Scharmer’s U-Theory, since the knowledge to sense the field and see, as well as to let go, will allow one to enhance the inner work, which is a pre-requisite for creativity. Referring to Grove’s 2005 interview statement, Rae-Dupree (2007) outlined that “w[W]hen everybody knows that something is so, it means that nobody knows anything.” In some cases, it is difficult to look outside one’s boundaries of knowledge as a result of experts’ imagination that they do not know what they are doing. Rae-Dupree has referred to Rabe (2006) on the importance of the outsiders in serving the so called “Zero-Gravity Thinker’s role”. She wrote, “Look for people with renaissance-thinker tendencies, who’ve done work in a related area but not in your specific field,” she says. “Make it possible for someone who doesn’t report directly to that area to come in and say the emperor has no clothes.” (Rae-Dupree (2007))

Rabe (2006), 38) refers to the “people who have psychological distance from the company or team, people who have Renaissance tendencies and the knowledge relevant to the particular challenge” as Zero-Gravity Thinker. In order to be effective, Zero-Gravity thinkers need to be temporary members of the team to teach, facilitate inform, collaborate and do the work enhancing problem solving as well as innovative thinking. (Rabe (2006), 38-40).

In addition to working with diversity, Day (2007) had referred to the IT professionals with the notion of the “strangers on the train”. Day draws on efficiency whereby “a train” referred to the relationship that is needed to be established in the field of work, among the IT professionals and other professionals. Day (2007), 14) found that knowledge sharing is important despite the differences on the individuals in seeing things differently. In addition she

(ibid) had found that strength in individuals' social processes and relationships (intensity and stability congruence) can affect the degree of the congruence in the individuals working field (Day (2007), 20). It can be assumed that, through this congruence, the flow of performance in the individual's working strategy will be enhanced.

Flow and personal working strategies. According to psychological research, the optimal experience or *Flow* refers to the everyday life of people in all cultures. From the innovation's point of view, it is important to pay attention to the fact that people have reported that *discovering or inventing a new matter is most similar to the experience of Flow*. Furthermore, the most creative genius and intellectuals report the sensation of flow as a part of their working experiences. (Csikszentmihalyi (1975), 29) - What is the Flow and how does it operate; will be discussed in forthcoming paragraphs.

Csikszentmihalyi (1991, 25) refers to "a *phenomenological model of consciousness based on information theory*" which deals with the phenomena in our minds as we experience them. He defines consciousness as intentionally ordered information (Csikszentmihalyi (1991), 26). According to Csikszentmihalyi (1991) individual's personal condition, so called "*control of inner experience*" is equivalent to individual's happiness. "People who learn to *control inner experience* will be able to determine the quality of their lives, which is as close as any of us can come to being happy" Csikszentmihalyi (1991), 2). Thus happiness refers to inner rather than external conditions, to our capability to be totally accompanied with all the details; good alike bad moments of our lives. *How we perceive and interpret positive and negative experiences* is essential from happiness point of view, and the *sensation of Flow* (ibid. (1991), 9). Victor Frankl (in Csikszentmihalyi (1991), 2) considers "*happiness* [...] as an unintentional side-effect of one's personal dedication to a course greater than oneself."

Human mind fights against chaos and entropy by increasing complexity of the self, which takes place throughout *differentiation* (development towards uniqueness) and *integration* (with the external phenomena like other people, thoughts and entities). *Complex self* can successfully combine these two reverse phenomena of differentiation and integration. (Csikszentmihalyi (1991), 41)

Avoidance of chaos constructs conditions for *optimal experience,* which refers to the order in ones consciousness. In addition, optimal experience refers to those moments when, based on our own free will, we engage all our psychological energy (attentiveness) to perform something valuable and difficult. (Csikszentmihalyi (1991), 3-5)

Psychological processes has been explained with Ilja Prigogine's notion of "*dissipative structures*" referring to the system which have a *capability to harness energy which otherwise would dissolve and disappear*. Dissipative structures can thus create a more complex order from chaos. In human mind, they refer to *courage, viciousness, persistence, and developed defence*, which can help individuals to neutralise negative experiences or even more to use them as an origin for a more complex and stronger structure. (Csikszentmihalyi (1991), 201-202)

In addition to external obstacles, which will be discussed later in 2.3., a person emanates inner obstacles for Flow to exist. According to Csikszentmihalyi (1991), 8) these obstacles are due to the fact that *universe does not fit our needs; and we experience disappointments because of this incompatibility*. Cultures created different protection systems like religions, philosophies, arts, or conveniences toward these disappointments. They are however, unrealistic (Csikszentmihalyi (1991), 10) and can create groundless sense of security since often they lose their influence during time. Moreover, people are aspired to cope with disappointments with variety of sources of pleasure; quality of life does however not increase with these means. Only throughout the control of one's own experience one can overcome the obstacles related to the fulfilment

of one's happiness. People with the *capability to enjoy the flow*, do not search for ways to escape the increasing pressure of expectations. Nevertheless, in spite of the material conditions they can enjoy the present and *live powerfully*. They are open to different types of experiences and learn throughout their entire life. Moreover, they are *strongly engaged with the people who belong to their lives* (ibid. (1991), 10). Furthermore, "individuals who depart from the norms-heroes, saints, sages, artists, and poets, as well as madmen and criminals-look for different things in life than most others do" (Csikszentmihalyi (1991), 28). It is also possible that *some people have better genetic requirements to control their awareness than others do* however; neurological research does not prove *if the difference is because of learning or heredity* (Csikszentmihalyi (1991), 86-88). According to Logan (in Csikszentmihalyi (1991), 90), some people can *change bleak objective circumstances to subjectively controllable experiences*.

Psychological entropy and artistic creativity can be inter-related because of reasons related to the individual or the external environment. Often artists who differ from the average norms have withstood insecurity, *neglect, mockery*, and *lack of common symbols for means of expression* and in those conditions individual's behaviour can *reflect symptoms of psychological entropy*. (Csikszentmihalyi (1991), 266)

Cultures are protection system against chaos, they create norms, goals, and believe; that help us to cope with the challenges of life. Paradoxically, these goals and norms also exclude some of our possibilities for innovations. In human history, there have most probably been cultural phases when both the goals and rules have been demanding and fitted well with people's skills. Csikszentmihalyi states that it is possible that the sensation of Flow has been experienced unusually often and intensively by the people of previous civilizations, like citizens of the Athens, the Romans who lived in accordance with their principle of *virtus*, or the Brahmins of India. (Csikszentmihalyi (1991), 81).

Based on research (utilizing methods like interviews, questionnaires and experience sampling) on thousands of individuals, optimal experience and psychological circumstances making that experience possible seem to be similar all over the world. Flow phenomena consist of eight factors, which are as following

1) “the experience occurs when we confront tasks we have a chance of accomplishing”,
2) “we must be able to concentrate on what we are doing”,
3) “the concentration is usually possible because the task undertaken has clear goal”,
4) “the task undertaken provides immediate feedback”,
5) “one acts with a deep but effortless involvement that removes from awareness the worries and frustrations of everyday life”,
6) “enjoyable experiences allow people to exercise the sense of control over their actions”,
7) “concern of the self disappears, yet paradoxically the sense of self emerges stronger after the flow experience is over” and
8) “the sense of the duration of time is altered” (Csikszentmihalyi (1991), 49).

If there is no clear goals in creative activities, *people have to develop themselves clear conceptions about what they are aiming at*. Moreover, one has to have inner guidelines and clear criteria for what is good or bad in order to know what works and what does not work. As discussed earlier, if generating radical ideas, the problem or explicit goal does not exist and has to develop the criteria and provide the needed feedback himself. (Csikszentmihalyi (1991), 55-56)

Self-organising systems and innovation regarding persons and communities will be discussed in the following paragraphs. How does then the earlier discussed differentiation and complementary interaction, communication and chaos relate to the capacity of self-organisation?

Being an innovator has its role in enhancing communication with other innovators regardless the distance. There is a *common clique and communication* pattern among innovators. Rogers (2003) states that, an ability for understanding and applying *complex technical knowledge*, copping with high degree of uncertainty about innovation as well as accepting setbacks when a new idea proves unsuccessful is needed (Rogers (2003), 282-283).

Hamel uses a metaphor of a "Flock of Geese". He refers to how the geese *operate without strict* rules and with no distinctive leader. Their course is true as *order without careful crafting or order for free* which has a lesson as to *how revolutionary strategies should emerge in a chaotic and ever changing world* (Hamel, ((2002), 253).

By the complexity theorists, right set of preconditions can provoke the emergence of highly ordered things, such as rule breaking. With regard to top management, Hamel (2002) reminds that, their work is to build the capable organization for new business concepts and to reinvigorate the old ones. Furthermore, manager's task is to operational rules that can create a deeply innovative organization (Hamel (2002), 253-254).

Form the point of view of creative person self-organising can be considered in situations of complex circumstances. According to Csikszentmihalyi ((1994), 175), we can have a sense of *exhilaration* when dealing with the tasks that require complex skills when facing the circumstances over which we have no control (entropy). Moreover, Csikszentmihalyi ((1994), 178-179) found that the working strategies of top creative people, had the characteristics of flow such as; *knowledge of one's process (clear goals); high opportunity, ability and awareness for decisive action; positive stimuli on the concentration on the task; a sense of potential control; a sense of self growth and fast moving time; and an autotelic experience.*

With regard to complexity, Csikszentmihalyi (1994) has pointed out "when attention is not focused on a goal, the mind typically begins to be filled by disjointed and depressing thoughts. The normal condition of mind is chaos. Only when involved in a goal-directed activity does it acquire order and positive moods. […] in order to avoid [such] negative feelings, a person is forced to *grow in complexity*. […] when the conditions of flow are present, people tend to report an optimal state of inner harmony that they desire to experience again" (Csikszentmihalyi (1994), 190-191). Thus, it seems, creative working is not only a pre-condition for individual but also preventing chaos in mind.

Notwithstanding, harmony and entropy are the two opposite tendencies of evolution. Evolutionary change, which increases *both differentiation and integration, enhances harmony*. When a system is differentiated and integrated it is viewed as complex, and its parts are regardless the extent of diverse are organically related to one another. (Csikszentmihalyi (1994) 155-157). Systems need energy, which is important for providing competence in ones activities through the struggle against difficulties as well as keeping them existing and living longer and successfully (Csikszentmihalyi (1994) 152-154).

Flow experience is beneficial due to its relationship to the quality of life in bringing happiness in relations to health, wealth and success. Creativity, peak performance, talent development, productivity, self-esteem, stress reduction and clinical applications enhance flow in various circumstances. Those criterions assist in raising the self-esteem because of happiness and removal of stress related sickness (Csikszentmihalyi (1994), 204). Notwithstanding, people "who master enough skills to *find flow in more complex activities tend to develop selves that can transform everyday events, even when these threaten to bring chaos and entropy in their wake, into meaningful experiences*. That will bring personal life enjoyment and a contribution on the "evolution of complexity for humanity as a whole" (Csikszentmihalyi (1994), 204)

Considering the previous connection among complexity, creativity, and the tolerance of inconvenience, the question is whether the current educational systems are capable to empower the citizens with the needed skills. Csikszentmihalyi warns about our tendency to be attracted by simple rather than complex issues. In the same line, Hamel ((2002), 146) refers to educational crisis in America where media override the school practices. He points that "unless teachers can find a way to make learning educational and fun, "media moguls" will be the real teacher in America."

Furthermore, Hamel protrudes the need to the academics in presenting more interesting things than the righteousness expectations. When one has to be right, he becomes a prisoner (Hamel, (2002), 145). This statement may be associated to the nature pre-condition for the creative individuals as Scharmer (2006) pointed out namely to the ability to letting new and old to come and go respectively.

Creative person's thinking. Scharmer's Theory-U (which was discussed in chapter 2.1.) referred to the learning from the emerging future and deeper understanding ("inner knowing") in order to develop the "centuries-old collective patterns of thinking, and institutionalizing to fit the realities of today" (Scharmer (2006), 3; Senge et al. (2004), 85-86).

In order to understand creative individuals the connection between creativity and thinking has been a subject of research. Example Runco ((2007), 35) refers to Eyseneck (1997) by pointing out that, in terms of cognitive bases of creative thinking our thinking is often *structured and organised in hierarchical* fashion and creative thinking sometimes results, *when ignoring "conceptual boundaries" that define categories*. With regard to Csikszentmihalyi ((1997), 60-61) both *convergent and divergent* thinking are typical for people with novel ideas. Divergent thinking includes fluency in generating great quantity of ideas, flexibility in switching from one perspective to another, and originality "in picking unusual associations of ideas." Convergent thinking is used in order to

select the right idea among the thousands of ideas. Runco ((2007), 4) refers to divergent thinking as requiring open ended questions, for which there are multiple number of solutions. Scholars like Gruber and Wallace, in Sternberg, (1999)) argue that more research on divergent thinking and creativity is needed.

Radical, *visionary thinking and intelligent creativity can be taught and learned*: different methodologies have been developed to facilitate learning (like Creative Problem Solving (CPS), or the Theory of Inventive Problem Solving (Triz)). Radical Innovations Triangle method (RIT) by Linturi (2008) focuses the search for radical innovations to areas where the searching organization has higher than normal potential for profitable innovations. RIT method refers to questioning structures and categories of knowledge and finding new connections, thus one can see a connection with Eyseneck's ignorance of conceptual boundaries.

According Cameron and Quinn ((1988), 4) *paradox* is fundamentally a mental construct and the capacity to perceive and think about paradox can be very important to the scientific process. "*Paradoxical thinking* is associated with creative insights and scientific breakthroughs (i.e., the transformations of old ways of thinking about a problem to new ways.)" (ibid., 4) When introducing the way how two contradictory thoughts can be held to be true simultaneously, these scholars refer to Rotherburg's (1979) notion of "*Janusian thinking*" and his research on creative achievements of highly creative artists and scientists such as Einstein, Mozart, Picasso and O'Neill.

Concerning paradoxes relating to creative problem solving, Naisbitt (2002) points out that, "You just have to hang out with the paradoxes, hang out with the contradictions until you understand them. When there is a perceived contradiction, I like to look for something that helps to resolve the contradiction. A lot of people have an either/or mentality. We get the internet and everyone says, "Well newspapers are going to go away." It's not either /or. There will be a change in the mix, that's all" (Hamel (2002), 146).

Quinn and Cameron (1988) have referred to “reframing”, the essence by which an individual or organization is in a rejuvenation process. Reframing refers to the “qualitative, discontinuous, “second-order”, or “double-loop” shift in the understanding of some domain”, not an incremental modification of previous understanding (Quinn and Cameroon (1988), 138-139). The overlapping stages of reframing include the elements of feelings, constraints, and cognitive processes (figure 18). The process of reframing includes a considerable amount of thoughts, which may result to tension, and feelings such as the sense of loss, confusion, and hopelessness. In this process, of gathering information and generating alternative possible “frames”, its’ beginning is occupied with crisis and challenges in order to develop adequate understanding of some phenomenon (Quinn and Cameroon (1988), 157).

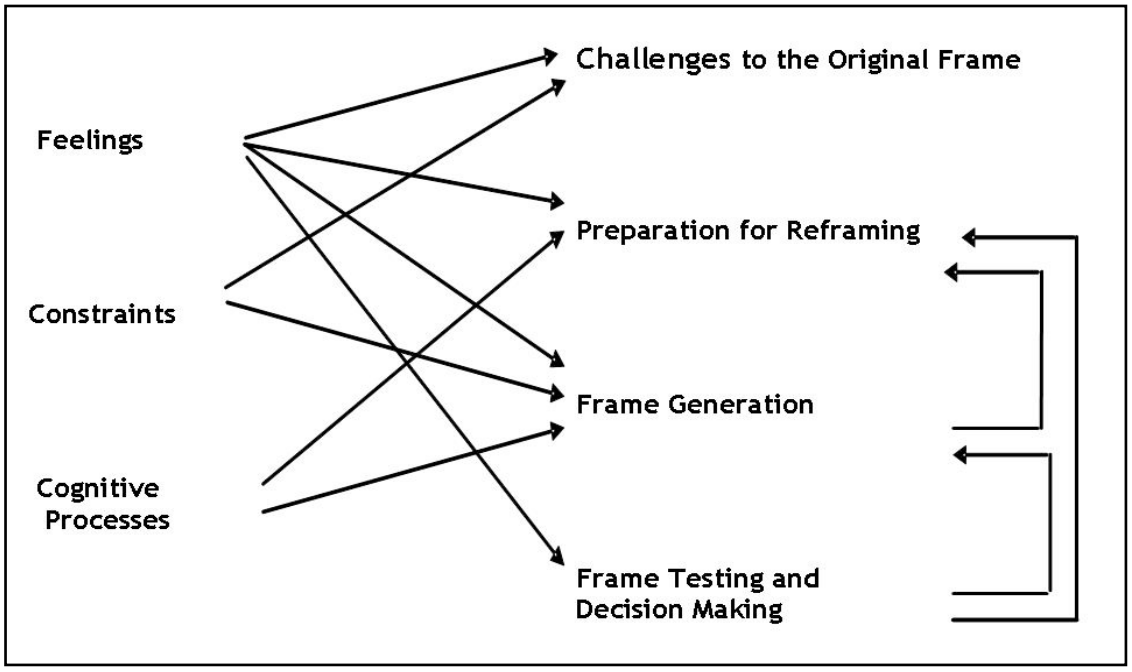


Figure 18 Stages of Individual and Organizational Reframing (Bartunek (1988), 145)

The capacity for holding two or more differing pieces of information is a pre-requisite for developing novel and appropriate understanding. Notwithstanding, Quinn and Cameroon (1988), 157) summarised that, the managerial action is

paradoxical since it includes a “considerable control” while initiation of reframing or presenting of an alternative perspective: however autonomy with respect to the outcome of the reframing is as well mentioned. These processes have been referred as “a janusian” which are hard to implement and the outcome does not always correspond with the manager’s original perspective (Quinn and Cameroon (1988), 157) .

Fischer ((2006), 111-113) refers to Losada (1999) and Losada and Heaphy (2004) and their findings about the connection between working teams’ positive behaviour and productivity and Fredrickson’s (2002) “broaden and build” theory about how positive affects increase individual’s and community’s intellectual resources. Fischer stresses that these findings are about how positive thinking provides inner resources, which will help to cope with the future challenges. She (ibid.) points out that positive behaviour can be encouraged in organisations by encouraging positive affects like compassion, optimism, joy, and happiness. Consequently, the “systems intelligence” will increase and thus enable the positive spiral. Fischer ((2006), 113) Systems intelligence will be discussed more in detail together with various systems theoretical approaches in chapter 2.4.

In the figure 19, the extent of innovation has been correlated through different steps that are critical to the innovation process (Runco (2007), 194). These steps (i.e., knowledge, motivation and skills) are applied in different environments to reach a conclusion. From problem finding towards the evaluation, there are different phases by which a creative individual has to go though, in reaching the intended goal. Things like *critical view of issues, motivation, sharing of ideas have to go side by side with problem finding and ideation to reach the evaluation of the problem*.

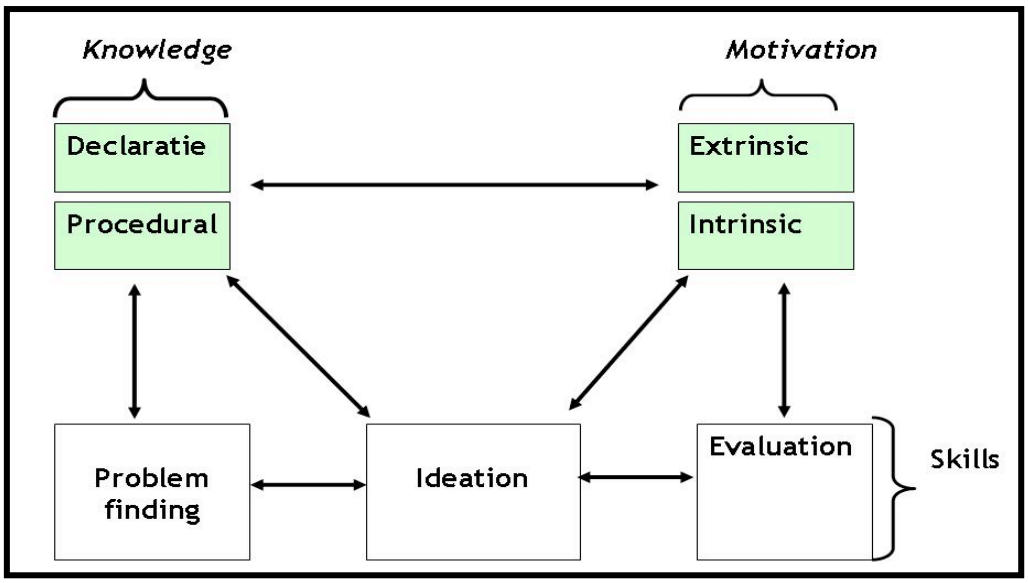


Figure 19 Two tier models for creative thinking according to Runco ((2007), 194)

Regarding to the activists, Hamel (2000), 38) refers to both rational visions and the probability of coincidence as well as pure lack. To lead a revolution, one has to "dream, create, explore, invent, pioneer, imagine". Moreover, curiosity and ambition as well as a sense of challenging the process of the institutional entropy in order to avoid the existing institutional estrangement and bring the meaning of accomplishment are necessary (Hamel (2002), 28). In conjunction with activism he (ibid) outlined that, "Activists are not anarchists". They, instead, are the "loyal opposition". "Their loyalty is not to any particular person or office, but to the continued success of their organization and to all those who labour on its behalf." (Hamel (2002), 156)

On the same juncture Myerson and Scully (in Hamel (2002), 157) point out that, activist are "tempered radicals", they are committed to their company, but they are also committed to a cause that is at odds with the pervading values or practices in their organization. They behave as responsible members of their organization, but they are also a source of alternative ideas and transformation." They challenge the status quo by their refusal to "fit in" and through their intentional acts to unbalance the status quo. These activists who

have been referred as "*cold blooded hot heads*" are said to be idealists and non conformists who know how to go about the political system (Hamel (2002), 157).

With regard to technical working strategies, innovators and creative people construct *conceptual maps* for discussing and communicating innovation challenges. *Visual diagrams* have an ability to describe complex systems, their processes and relationships. They can portray order and structure to help simplify the complex and ambiguous content and meaning of the idea, which yet does not exist.

Collective working on innovation. Scholars stress the importance of the environment, which is conducive in the innovation process. Ettlie (2006), 57) points out the importance of people *working together, blending innovative ideas* with other people out of their specialized jobs, and different kinds of personalities that "converts good ideas for the success of the new products and services". Furthermore, Ettlie ((2006), 60) underscores the necessity for the "*intra firm mobility*" in the adopting new technology. The intra-firm mobility has proved importance for example in Silicon Valley (Saxenian (2006)).

In viewing a wider perspective of innovation environment, Steinberg and Arndt ((2001), In Kautonen (2006), 65), discuss the firms with regional innovation environment. They stressed the *unified influence from both regional and firm levels as key in the innovation*. This is due to the reason that region environment is not independent from the firm's environment, since, as they write "firms innovation can easily occur in the suitable regional environment". (Kautonen 2006, 65-66)

Moreover, Johansson ((2004), 78), mentions that successful innovators tend to work on *interrelated projects and hence bring out solutions out of different ideas* that have appeared through their re-evaluation of the projects that they have been interacting with. He (ibid., 91-92) continues, "the strongest

correlation of quality of ideas is, in fact, quantity of ideas". Therefore, *intersection* of ideas helps more in finding one better idea.

Cooper ((2005), 532) found in his research about new product innovators that their *self-organising customer and diversity networks* are the key area of organisations when working with innovators in generating the productive innovation climate. Cooper found that some of the innovators had experienced good relationship with Sales and Marketing and R&D, while the others did not experience good relationships.

In referring to Heath (2007), Rae-Dupree (2007) firstly says that to innovate one has to bring together people with a variety of skills. However, innovation will get blogged, if the communication is improper due to the abstract language of specialization and expertise.

In the collaborative performance, according to Myers and Myers (1980), misunderstandings about what should be done are obvious and natural. This is as results of opposite kinds of perceptions and judgements and the fact that people see different aspects of a situation and hence attempt direct actions towards the results. Due to the differences, the group contribution may result to the informed decision (Myers and Myers (1980), 173)).

Individuals contribute on the innovation through the *team building, generating common objectives and incentive for collaboration and support each other's work* to reach the goals that are set up in the beginning of the project. In relation to this, Hamel ((2002), 265) stresses the importance of the *market for capital, ideas and talent*. Invention can be successful if people speak out, share ideas, which help in thinking outside the box, and facing the "*creative misunderstanding*". Creative misunderstanding refers to a situation when the second person thinks she has understood what the inventor is explaining. With the misunderstanding of the concept or idea, there can be a solution or then the problem can be reframed. (Stefik and Stefik (2004), 136 - 137).

Firms' collaboration result to economic strength, knowledge development, and the product quality among the firms. Notwithstanding, the degree of *trust* among partners in the network is explained to be necessary since it can avoid problems like direct competition as well as failure of partnership interests. Mutual adaptation and considerable investments from both parts are key matters that lead to innovative knowledge. The nature of networking may differ depending to how strongly the collaboration or network applies. *Strong ties* are normally counted as "diverse, complex and require a lot of resources since their context of knowledge applies to them as a part of one large entity". While the *weak ties* are normally "imperfect, simple and requires little resources since they are often not bounded and can be understood independently". In some cases the weak ties are the potential future strong ties. (Kautonen (2006), 33-38)

Generally, the above points are all stressing on the importance of flexible time schedules, collaboration and mixing of different ideas to reach a concrete innovative expectation. Johansson (2004) when emphasizing *intersection* in reaching a breakthrough targets has as well discussed the previous issues. Apart from professional collaboration (intersection as used by Johansson), Johansson has as well spoken about the cultural mix as a tool to favour innovation and "*occupational diversification*", (2004), 24, 73-87). Collective innovation strategies open up the context perspective to innovation. The external factors will hence be discussed more in detailed form the viewpoint of organisation, region and nation in chapter 2.3; and in a more abstract system-of-innovation level in 2.4.

Time pressure in relation to innovation is a two-folded issue**.** Since complex cognitive thinking requires time, the implication of *time pressure* is mentioned to be reasonable in enhancing the creative capabilities (i.e, creative thinkers need a freedom of time to enhance effective results) (Amabile et al (2006), 16-17). Although, their research pointed that low time pressure does not necessarily

foster creative thinking if people are not encouraged to learn to play with ideas, and to develop something new. Amabile et al (2006), 18-19) emphasize that, organization which cannot avoid time pressure, should focus on protecting the pressured individuals from interruption, distractions and unrelated work demand. It is also important to give people the understanding as to why tight time frames are necessary in order to give the individual worker an understanding of the urgent needed mission of their work. Amabile et al (2006), 19) found the following as useful for innovation: Minimizing the abrupt changes in scheduled activities and plans, encouraging one to one collaboration and avoiding the obligatory excess group meetings that may contribute to the feeling of fragmentation and time wasting . Table 7 illustrates the essence of high and low time pressure in relations to creativity.

Table 7 Time pressure/creativity matrix (Amabile (2003), 14)

		Time pressure	
		Low	High
Likelihood of crative thinking	High	Creative thinking under low time pressure is more likely when people feel as if they are on an expedition. They: - Show creative thinking that is more oriented toward generating or exploring ideas than indentifying problems - Tend to collaborate with one person rather than with a group	Creative thinking under extreme time pressure is more likely when people feel as if they are on a mission. They: - Can focus on one activity for a significant part of the day because they are undisturbed or protected. - Believe that they are doing important work and report feeling positively challenged by and involved in the work. - Show creative thinking that is equally oriented towards indentifying problems and generating or exploring ideas.
	Low	Creative thinking under low time pressure is unlikely when people feel as if they are on autopilot. They: -Receive little encouragement from senior management to be creative -Tend to have more meetings and discussions with groups rather than with individuals -Engage in less collaborative work overall	Creative thinking under extreme time pressure is unlikely when people feel as if they are on a treadmill. They: - Feel distracted - Experience a highly fragmented workday, with many different activities. - Don't get the sense that the work that they are doing is important. - Feel more pressured for time than when they are "on a mission" even though they work the same number of hours.

			- Tend to have more meetings and discussions with groups rather than with individuals. - Experience lots of last-minute changes in their plans and schedules.

2.2.4 Summarizing discussion on the challenges related to the creative and entrepreneurial professionals

Scholars have referred to the person who has a role in innovations or creative work with different notions like,

- *inventor* (Stefik and Stefik (2004), Fagerberg et al. (2006), Drucker (2003)),
- *innovator* (Christensen (2003), Perez (2003), Runco (2007), Florida (2005), Ettlie (2006)),
- *radical innovator* (Katz (2004)),
- *creative people or geniuses, exceptional people* (Csikszentmihalyi (1991,1994,1997)),
- *creative or innovative knowledge worker* (Hamel (2002)130),
- *management innovator, heretic, contrarian, visionary, revolutionary innovator and activist* (Hamel (2002), (2007)),
- *change agent and opinion leader* (Rogers (2003)),
- *clairvoyant, forerunner, reformer, settler, outsider* (Andersson (2004), Amabile (2003), Linturi (2007, 2008)),
- *opportunity recognizer* (Rice and O'Connor (2001)), and
- *Zero-gravity-thinker* (Rabe (2006)).

From the richness of the notions, one can deduce that the scholars wanted to emphasise the wealth of creative individual's roles and the different shades of meaning these roles have.

In order to lay ground for observations concerning how the complex issue of innovation are perceived and managed by creative individual, this chapter has discussed the concept of creative individual from different perspectives: Who are they and what kind of people are they? How do they manage with the richness and paradoxical nature of innovation in various contexts? What are the factors in their background which helped them to develop the needed sine qua non to manage the innovation and utilize their own creativity? And finally, what are the external hurdles and prerequisites from the point of view of the creative individual when working with an innovation?

Possible identifiable person related values and attitudes, motivation, and general characteristics have been illustrated. The *cognitive dimension*, or point of inquiry, illustrated the mental dynamics and expertise that are critical for innovation. Apart from person related aspects, innovation is also about context, hence, an introduction to the individual – environment relation has been presented.

Possible conclusions for the grounded theory on the innovation-person-context and the analysis of the main hurdles and boosts related to the creative individuals have been summarised in a form of the following *concluding propositions:*

1. *Creative individuals are pivotal for innovations*. If successful, history can treat them as heroes, however failures are part of the innovators' life. Creative individuals do not have the monopoly for innovation, but personal creativity can be fostered and techniques can be used to foster creativity in organisations.

2. Creative knowledge workers should *not* be dealt as *a homogenous group* of people, since they can be found in different roles in different phases and situations. Creative individuals and type of innovation can be cross-tabled as in table 8

Table 8 The interaction between the different type of innovators and creativity in various working roles

TYPE of INNOVATION								
	Ecosystem							
	Social							
	Industrial							
	Business							
	Managerial							
	Product and Process							
	Operational							
	Meta-Innovation							
		Creative Thinker (Hamel,2002, 2007; Amabile, 2003) Opportunity recognizer (Rice and O'Connor, 2001).	**Inventor** (Stefik and Stefik, 2004; Fagerberg et al. 2006).	**Innovator** (Stefik and Stefik, 2004):Drucker, 2003); Christensen, 2003)	**Activist** (Hamel, 2002, 2007)	**Protector** (Hamel, 2007). Champion and Sponsor (Pearson, 2003)	**Change agent** (Rogers. 2003)	**Opinion Leader** Rogers, 2003)
		Generation of ideas			**Exploitation and diffusion of ideas**			
		Creative people in various working roles						

3. Innovators do not act in a vacuum. Due to the systemic nature of creativity, the relationship between creative individual, mastering the domain and having the access to the field is a sine qua non for the creativity with the capital C. Individual acquires the needed knowledge and skills related to the domain with hard work. Due to the multidisciplinary nature of the modern innovations, intersections of domains are source of innovations and throughout networking individual can acquire the needed knowledge from various domains. Networking can moreover open the access to the field.

Thus, when comparing the results of the experiences of the participants of this study with the theory of domain-field-individual integration, issues, like learning the rules and then contesting the domain, or internalization of field's criteria, and *reproduction of the creative system in once mind in order to overcome entropy,* should be taken into consideration.

4. True creative people can be characterized as complex. Their characteristics consist from antithetical pairs and they utilize working strategies of opposite tendencies. They can be compared to hybrids, which utilize these extreme pairs in a flexible way. This complexity is pivotal for the innovation however; its heretical dimensions can create tension with the environment and thus prevent the idea from developing into an innovation if awareness of this prerequisite is missing.

The tension between the creative people and the system is a built-in aspect of the relationship. Professionals might prefer to work on breakthrough solutions for problems defined as important by their fields. Organisations, on the other hand would prefer that they concentrate on coming up with technical advances that are "god enough" – advances that solve customers' problems and can be quickly turned into products, services, or intellectual properties that eventually make money. (Steel 1988)

5. Creative individuals know themselves and their own complex nature; they furthermore approve themselves as they are since they have learned to control their complex self. Values and intrinsic motivation are the drivers for creative individuals and provide the needed stamina to do all the hard work and withstand the failures related to innovation.

6. It can be postulated that the growth root and circumstances during earlier life phases might have facilitated to learn to control the complex self and to fight the entropy. *Differentiation and integration are the means of creative minds to cope with the complex environment*. Support in developing towards ones natural direction has been found important during childhood on one hand, however successful creative people have additionally reported the feeling of marginality during their adolescence. Individual teachers, who believed in these people's capabilities and cared, have been reported as important. Learning to enjoy what doing, that is, to internalize the symbolic system of the domain, and

to “bite the bullet” of loneliness, is what the creative people have to manage. Apart from personal qualifications, good luck and being at the right place at the right time have moreover been reported as reasons for success in creative work.

7. *The individual-environment relationship is a two way process*, individual react independently to the environment, and the environment react to individual in diverse ways. One can assume that a fruitful integration of the creative individuals in various roles, that is, an efficient innovation micro ecosystem, can help to refine the ideas all the way to commercial success or other type of fulfilment and diffusion. The role of senior management has been found important, but if it fails, the role of a protector can be crucial for radical innovators. However, due to the complex nature of the creative individual, they are also self-organising and can act independently form the environment and management. According to some scholars the collective of creative people can moreover act like a flock of geese or fish, and thus, especially in the early phase of innovation, strong management can be a hurdle for innovators.

2.3. Innovation context

Previous chapters have discussed various meanings incorporated with creativity, and innovation as well as individuals who play the key role when innovation and creative work are considered. Before introducing the data of this study, one more aspect will be discussed based on the literature, namely the meaning and role of circumstances and environment in an attempt for innovation. The idea of system-of-innovation will be explored in organisational, regional and national levels.

Most of the data of this study has been collected in Finland where the notion of National Innovation System (NIS) is embedded in policy papers and in the common discussion on innovation. In the following chapters, the fuzzy and multidimensional expressions like national innovation system and innovation

ecosystem will be discussed and their development will be analysed. We shall learn how the scholars' opinions differ, not only in what concerns the content of the concepts, but also in relation to the methods to be used to study the relations between innovation and circumstances. Only, a few empirical research results have been found concerning creative professionals experiences on innovation-context relationship, hence, the review has mainly been based on academic discussion about what and why the difficulties occur in organisations and regions faced with rapidly changing circumstances. Based on the earlier chapters it could be assumed that the productivity of an innovation environment is related to the type and radicalism of innovation in concern. However, we shall learn that not much attention has been paid to this aspect in previous research.

2.3.1. Creativity and innovation in organizational context

This study is based on an assumption that individual creativity and capability to learn affect the innovativeness of an organisation, and vice versa, an organisation's capability to renew itself influences its member's capability to explore and exploit innovations. Hence, this section will discuss the interdependences among individual creativity and organisational innovativeness based on literature. Most of the researches explored in this section discuss organisations creativeness and innovativeness. However, this chapter focuses on organisation's capability to facilitate creativity and innovation creation rather than innovation diffusion and adoption of innovation. Based on Roger's finding this distinction seems vital.

Based on an analysis of several hundred studies of organisational innovativeness, Everett M. Rogers ((2003) 412-413) argues in the Diffusion of innovations: "Each of the organisational structure variables may be related to innovation in one direction during the initiation phase, and in the opposite direction during the implementation phases." Rogers' discovery refers to the complex and

paradoxical nature of innovation in organisational context, something that brings confusion in analysis of innovation-context relations.

System's external and internal circumstances, such as strategic approaches, values and actions of top management, have been associated into organizational creativeness. Martins and Terblanche (2003) have portrayed different scholars' ideas about organizational culture that supports creativity as follows.

Kanter (1988) reveals the importance of the "*external environment"* in boosting organizational creativity. He (ibid) refers to matters such as economy and competition as factors that may encourage product development, technology and enhance customer preferences. Additionally, Robbins (1997) and Schein (1990) emphasized organization's *strategic reactions to critical incidents,* outside and within the organization as an important key for the creativity enhancement.

"Managers' values and beliefs" in relation to different aspects of diversity, information exchange and support for change are also considered as key important factors, for the organizations creativity (Amabile, (1998); Kanter, (1988); King and Anderson, (1990); and Woodman et al, (1993) Tesluk et al (1997)).

Moreover, *technology* "which includes knowledge of individuals and the availability of facilities (e.g. computers, internet) to support creative and innovative process (Shattow, (1996))" and "the *structure* of the organization, which in turn allows management to reach organizational goals" (Hellriegel et al., (1998)) are important.

The *attitudes* of the personnel in the organization, on how to act and behave within the sub-systems, will have an impact on the organization's degree of creativity and innovation. (Martins and Terblanche (2003), 68-69). The latter, that is to say, the inter-relation between micro level behaviour and

organisational life, is at the focus of this study. However, not all organisations are alike and different type organisations match together with different types of innovation.

Maula (1999) explored the challenges related to the *simultaneous phenomena of creativity and efficiency* in order to deepen the understanding of learning and change in organisational context. She (ibid.) referred to the fact that *organisational innovations have developed in accordance with the type of the problem the organisation is dealing with and the collective vs. individual nature of the endeavour*.

According to Blackler (1995), (in Maula (1999), 33), an *organization as a whole may be classified* in different ways. In the knowledge era, organisations driven by knowledge depend on conceptual skills and cognitive abilities. Thus, the development is from Knowledge-Routinized and Communication-intensive organisations towards Expert-Dependent and Symbolic-Analyst-Dependent organizations (Maula (1999), 33-34, table 9).

From the innovation's point of view it is important to realise that organisations are coping with *different types of problems (familiar vs. novel)* in relation to the emphasis on *collective vs. key individual contribution (Blackler (1995)) and the nature (simple vs. complex) and speed (fast vs. slow) of change (Doz and Kosonen (2008))*. Thus, different types of organisation situations and settings fit with different types of innovation. This study aims at observing factors relating to complex and radical changes in knowledge economy and in organisations. Compared to the Blackler's (table 9) typology it refers to those types of organisations that focus on novel problems.

Table 9 Four organization and knowledge types (Blackler (1995), in Maula (1999), 34)

	FOCUS ON FAMILIAR PROBLEMS	FOCUS ON NOVEL PROBLEMS
EMPHASIS ON COLECTIVE ENDEAVOUR	*Knowledge-Routinized Organization* • Emphasis on Knowledge embedded in technologies, rules and procedures. • Capital technology or labour intensive. • Hierarchical division of labour and control • Low skill requirements Example: 'Machine Bureaucracy' such as a traditional factory.	*Communication-Intensive Organization* • Emphasis on uncultured knowledge and collective understanding Communication and collaboration • Empowerment through integration • Expertise is pervasive Example: 'Ad hocracy', 'innovation mediated production'.
EMPHASIS ON CONTRIBUTIONS OF KEY INDIVIDUALS	*Expert-Dependent Organization* • Emphasis on the embodied competencies of the key members. • Performance of the specialist experts • Status from professional reputations • Training and qualifications. Example: 'Professional Bureaucracy' such as a hospital	*Symbolic-Analyst-Dependent Organizations* • Emphasis on the embrained skills of key members. • Entrepreneurial problem solving • Status and power from creative achievements • Symbolic manipulation is a key skill Example: 'Knowledge- intensive firms' such as software consultancy

Culture and innovativeness goes hand in hand in organisations**.** As Christensen (2003) explains, the location of the most powerful factors that define the capabilities and disabilities of organisations migrate over time – from resources towards visible, conscious processes and values, and then towards culture. These factors also define what an organisation cannot do; they constitute disabilities when the problem facing the company changes. *When capabilities have come to reside in processes and values and especially when they have become embedded*

in culture, change can become extraordinarily difficult (Christensen, (2003), 195)

Organizational culture may be seen as an umbrella of the whole organization, from the departmental culture to the individual's own culture. Culture at work may as well be an aspect that can portray differences in understanding between functional units, individuals or different types of innovation processes and, hence, favour or harm the innovativeness in organization. Martins and Terblanche (2003), 67) claim, "Successful organisations have the capacity to absorb innovation into the organisational culture and management processes". According to Tushman and O'Reilly ((1997) in Martins and Terblanche (2003)), organisational culture lies at the heart of organisation innovation.

According to Martins and Terblanche (2003), 70-73) organizational culture is a result of five determinants of the organization: strategy, structure, support mechanisms, behaviour that encourages innovation and communication. Along with the determinants, strategy portrays that *vision and missions* are important aspects for the organization innovativeness whereas the *structure emphasises some values like flexibility, freedom and cooperative teamwork* in enhancing innovativeness and organization. With regard to the support mechanisms, they assist in the innovation process due to their implications in the involvement of human resources. Innovativeness in organisation can be promoted through *rewarding, tolerance of essential elements, and encouraging risks taking*. Lastly, the organizational culture, which supports *open, trustworthy and transparent communications*, in enhancing open communications and emotionally safe feeling between individual teams in gaining new perspectives will have a "positive influence" in resulting to the creative and innovative culture.

Davila et al (2006) has pointed out that, in some companies innovation is more than a strategy, whereby harnessing creativity and renewal of the company are covering the mystical aspects of the innovation (Davila, Epstein, and Shelton

(2006), 236- 237). In the creation of culture that innovation needs, Davila et al (2006) claim that managers have different levers which may locate a company in a position between conflicting goals whereby the particular positions depends on the culture that is resulted from the need of the manager (Davila, Epstein, and Shelton (2006), 243).

Every organization is said to have the "*legends*" and "heroes" in receiving the new ideas and offering the stories respectively into the culture. Since legends and heroes emerge as stories circulate, the management affects on the highlighted aspects from the emphasized stories. (Davila et al (2006), 249-250).

Concerning people in relation to innovation, the need to apply techniques that may assist to *identify innovative people* and to hire them is conventionally seen as important. On the other hand, *hiring wrong people* will help to challenge the status quo, increase diversity and creativity as well as higher level of innovation in the organization (Davila et al. (2006), 254). Davila et al. (2006), 253) point out that, "It is the people in an organisation who adopt, adhere to, change, or reject a culture. They are the vehicles through which a culture has impact and through which innovation [...] happens." (Davila et al. (2006), 253)

2.3.1.1 Organisation level determinants related to creativity and innovativeness

After viewing how the culture may affect creativity, this part of the study will enlighten different attributes that are associated with the creative organizations.

Research on organisational innovativeness. According to Rogers ((2003), 434) "today, research on organisational innovativeness is less likely to be conducted than is the study of the innovation process in organisations". The earlier studies of the organizational innovativeness have been considered as rich but at the

same time over-simplified. Research has been helpful in illuminating the characteristics of innovative organisation. However, many were equivalent to the characteristics of innovative individuals, due to the consideration of a single person, normally a top executive, representing the whole organization. According to Rogers ((2003), 407-208), "each organization in these studies was reduced to the equivalent of an individual" something that made the whole organization be treated as a single unit of analysis.

In explaining the reasons as to why the organizational innovativeness become outdated *(passé),* Rogers ((2003), 408-409) points out that, "organizational innovativeness found rather low relationship between the 'independent variable' that assesses qualities of the organization, and the 'dependent variable' of innovativeness." Moreover, due to the method of data collection (based on the single individual), the data representation of the organization was inadequate. The models and methods of investigating innovativeness that developed earlier have been "oversimplified". Hundreds of studies of organizational innovativeness were said to be completed in the 1970s (Rogers (2003), 407). The consideration of the organizational process of innovation was then traced over time with increasing focus of innovation as a process with an emphasis on stage models (from ideation to innovation and commercialization).

Organisational determinants related to creativity and innovativeness. Kautonen ((2006), 65-66) claims based on Steinberg and Arndt ((2001) and Tödtling (1995) tat the *firm-level determinants* have a greater influence on innovation activity than most region-level determinants, but the *region's capacity for research* is the most important individual determinant of firms' innovation behaviour. Therefore, industries in the regions have been viewed as the potential bodies in such a way that their innovativeness *may affect the regional environment*. The two factors have, therefore, been described as depending on each other, although not with the same level of intensity.

Innovative processes in organizations and the different ways that people in the organization work to foster innovation are crucial in maintaining continuous innovation development. Ettlie (2006) has pointed out different important factors that organizations have to take into an account in their process of innovation. He has portrayed that the process of innovation needs to continuously *define the needs and opportunities, priorities, know-how as well as improved and sustained stakeholders satisfaction to reach its goal* (Ettlie (2006), 26).

Furthermore, Williams and Yang ((1999), 383) added that "considerable freedom (in deciding what to do and how to do it)", "good project management", "sufficient resources", "an atmosphere of collaboration and co-operation", "ample recognition", "sufficient time for creative thinking", "sense of challenge and internally generated pressure to accomplish important goals", were key points for the creative organizations. William and Yang's (ibid.) as well as Ettlie's (ibid.) factors are closely related due to their overall focus related to management, external factors, opportunities as well as the individual motivation.

As discusses earlier, organizations producing more innovation *have more complex structures that link people in multiple ways and encourage them* to do what needs to be done within strategically guided limits, rather than confining themselves to the letter of their job (Kanter (2000), 170). She believes that, although innovations stem from individual talent and creativity, the organizational context mediates individual potential and channels it into creative production.

Kelley and Kaplan ((2004), 21-34) found that, *taking initiative, cognitive abilities and technical competences* are important in the process of developing strategic skills for creativity. These were the results from the interviews conducted in the Bell Labs in order to specify the strategy of the star engineer in his work. In their research on how Bell Labs created "star performers", they

pointed out that taking initiative is the main factor that may prolong the creative work. They moreover outlined the essence of responsibility to the creation of the personal development and interest to learning more, something that will increase efficiency and creativeness.

With regard to “middle performers”, Kelley and Kaplan ((2004), 25-26) had similar results with an exception of the difference in two critical ways, namely, how they ranked the strategies in importance and how they described them. They thought that ’show and tell and the organisational savvy’ had been seen as core strategies. Crucial issues such as networking as a result of effective results had not been taken into account with the middle performers.

With reference to the organization as an innovative body, Ettlie ((2006), 122) points out the characteristics of the *manufacturing experienced CEOs* as the people who have a possibility in adopting new changes. He (ibid.) points out that those companies have a reputation of being first to try new methods and equipments, active campaign in recruiting best qualified technical talent, commitment to technological forecasting as well as the kin awareness of new technological capabilities (Ettlie (2006), 122). In this regard, it seems that the innovators behaviour is based upon the need to flexibility and risk taking readiness. Moreover, genuine interest in the work is the launch pad for creativity. This is supported by Davila et al ((2006), 205), who wrote “risk taking behaviour is necessary for successful innovation, but it can be killed if the failure is punished either economically or socially”.

By giving an example of a CEO who had publicly abused the team of innovators because their initiative was apparently failing, Davila, Epstein, and Shelton (ibid.) warned that, “no amount of financial compensation could offset the message sent to the entire organisation about innovation: Do not fail or you will be humiliated and punished” ((2006), 205). Radical innovation is said to be a result of risk sharing and management with the aim of creating innovative technologies and the business models (Davila et al. (2006), 191).

2.3.1.2 Innovation management and managerial innovations

This section will discuss different aspects found relevant from innovation management point of view. In addition the importance of the "management innovation" (Hamel and Breen (2007), 35) which had introduced in chapter 2.1.2 will be highlighted. (In order to avoid conceptual confusion this study uses the expression managerial innovation)

According to Hamel ((2002), 69) the fundamental challenge at "the age of revolution" is that the *companies have to reinvent* themselves continually and create new business models, which are more than disruptive technologies, but business concept innovations. Hamel stresses the importance of adding strategic variety into industry and he suggests that companies unpack their business models in order to create new business model innovations regarding to core strategy, strategic resources, customer interface, and value network.

According to Doz and Kosonen ((2008), 6) *strategic agility* is about "the capability to think and act differently, leading to new business model innovation." Related to the top management, strategic agility calls for three fundamental shifts, which are as following. First, there is a "shift from foresight-driven strategic planning to insight-based strategic sensitivity". Secondly, "a very deep change in the way the top teams work and how its members relate to CEO, from usual one to one relationship to collective commitments" takes place. Thirdly the "mindset and behaviour shift from resource allocation and ownership to resource sharing and leverage, and from the budgetary sports and tournaments to a commitment to sharing and exchange around intangible resources like brands and competencies" (Doz and Kosonen (2008), 33-34).

Furthermore, strategic agility considers how well and how fast companies can imagine new business models. They (ibid.) pointed out however, "companies naturally become the victims of their own success: As they grow and become successful they lose some of their adaptive capacity" (Doz and Kosonen (2008),

6). Top management need to balance the continuity and stability essential for operational efficiency with the need for evolution and change, flexibility and agility in strategic decisions (Doz and Kosonen ((2008), 219)

Moreover, Doz and Kosonen (2008) emphasise on the strategic sensitivity in identifying and framing new opportunities in an insightful way, fast and efficient resource fluidity and leadership unity, which refers collective decision-making and commitment. They point out that (figure 20); strategic agile companies know how to make first turns and transform themselves without losing the momentum.

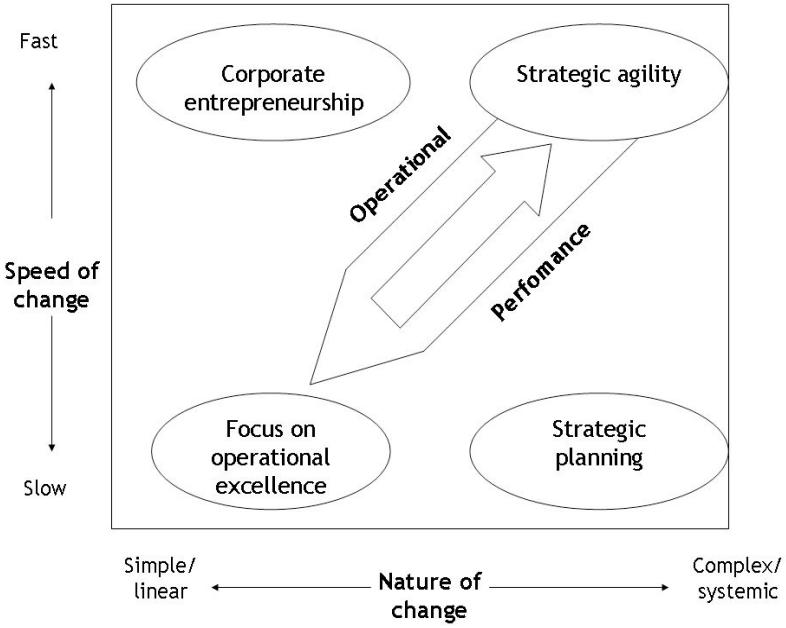


Figure 20 The healthy tension between strategic agility and operational excellence. (Doz and Kosonen (2008), 218)

Individuals are different, their experiences and preferences vary, something that represents a source of innovation capacity for organisations. *Organisations need different types of individuals, creative individuals, as well as good organisers,* to make the systems work and develop. Murakami and Nishiwaki (1991) found that, in large organisations, 5% of the personnel were those who created ideas. From psychological research and studies about creativity, we learn that people

are undoubtedly often more active and creative if they can develop and use their skills in accordance with their preferences and capabilities. The managerial challenge is, then, how to build the teams in which everybody can play the role that best suits him and the organisation, and how everybody can complement each other's skills and preferences (Myers and Myers, (1980).

Every innovation requires the *support of management* to survive; and especially the deep and personal involvement of top management is essential (Pearson (2003), 31)). In a survey among senior technology officers, top management support was ranked as the most important factor (Davila et al. (2006), 13). The leadership role includes, among others, providing an aspiration that challenges the complacency with a long-term view of innovation and nurturing key creation projects and a leadership commitment in terms of resources, as well as a culture, to foster new ideas and change.

Moreover, management needs to keep a special attention in order to fulfil the important aspects of Innovation. Among the factors that came up in Davila et al ((2006), 11-26) research, were the following:

- the senior management's 'strong leadership in innovation strategy and portfolio decisions,
- integration of business with the company's basic business mentality,
- alignment of the types and amounts of innovation needed to support business,
- management of the tension between creativity and value capture,
- neutralizing organizational antibodies as well creating a right matrix and rewards for innovation'.

In this case, the innovation may be through the technological research and development or through defining the business model.

The *innovation matrix* (figure 21) presented by Davila et al (2006) illustrates the interplay between technology and business model. Davila et al ((2006), 14) pointed out that, "knowing how to change business models and technology

together and individually is the mark of a successful innovator". In addition, the matrix portrays that incremental, semi radical and radical innovations are not created equally. (Davila et al. (2006), 14-15).

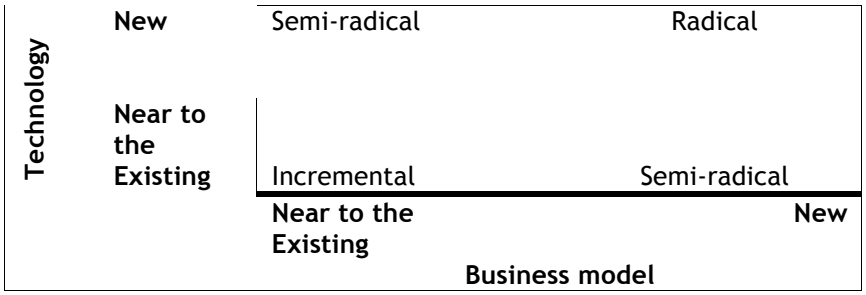


Figure 21 The Innovation Matrix (Davila et al (2006), 14)

Management systems play a role when ideas are moved across the organisation to where funding decisions are made (ibid., 126). As in any other operating environment, the organization may comprise different types of people of which their ability to be innovative may vary. The role of management is to assist or offer an environment for the creation or diffusion of innovation: "a process in which innovation is communicated through the members of social system" (Rogers, (2003), 35) and hence business development.

In order for the business development to happen, innovative ideas need to be communicated and accepted. This can be understood well while following Rogers ((2003) 388-415), who approached innovativeness and innovators from the viewpoint of innovation diffusion and wrote about the *heroes'*, *opinion leaders'* and *champions'* role in an organisation innovation adoption. An innovation champion is a charismatic individual who can play an important role in boosting a new idea in an organization. Schön ((1963), 84) emphasises that "*The new idea either finds a champion or dies*". Pearson ((2003), 27-28), argues that, "new ideas need champions, sponsors, a mix of creative types (for ideas) and operators (to keep things practical), and separate systems to get ideas to top management early and quickly". In addition, Day (1984) found that for costly, highly visible, or radical innovations the support from top management was fundamental. These managers are the ones that require some qualities to enhance the radical innovation in the organization.

According to Rogers (2003), 415), the *"champions'* occupy a key linking position in their organization, possess analytical and intuitive skills in understanding different individuals and demonstrate well-honed interpersonal and negotiation skills in working with other people in their organization". In the organization, champions were considered as brokers and arrangers who helped the innovation to fit in the organizational context. People's skills may be more important than power in which according to Rogers, "champions, tend to be innovation-minded and are not necessarily distinctive from others in being more powerful." These are people who are the higher risk takers and more innovative and influential with others (Rogers (2003), 415).

In order to develop radical innovations, an organisation or innovation ecosystem may need *managerial innovations*. As said, apart from top management's vital role for innovation management, the managers themselves can take responsibility and generate managerial innovation.

Steering groups in effective organisations may sometimes suffer from *groupthink* (Janis (1971)). Groupthink leads to careful, conscious, personal avoidance of deviation from what appears to be group consensus, leading to insufficient discussion on creative options and renewal in organisation.

The high degree of uncertainty created by a radical innovation is a specific managerial challenge; it emphasizes the sensitivity for change and need for agility. According to Rogers ((2003), 426) "The more radical an innovation, indexed by the amount of knowledge that organisation members must acquire in order to adopt it, the more uncertainty it creates and the more difficult its implementation". Radical innovation represents a type of *unstructured decision* a*nd a subroutine innovation process* and radical innovations adoption entails "a much more difficult process" than the relatively routine innovation-decisions, for which customary procedures exist (Rogers (2003), 426). However, over time,

organisations learn and become more accustomed and the radical innovations become less radical and more routine.

Comparing management systems concerning incremental versus radical innovation. In managing an organization, *different types of management attitudes are considered in different development and innovative practices* of an organization. Scholars such as Davila et al ((2006), 157) have portrayed a list of management situations with regard to incremental and radical approaches (table 10).

Table 10 Comparing Innovation System for Incremental Versus Radical Innovation Davila, Epstein, and Shelton (2006), 137)

System	Incremental innovation	Radical innovation
Rewards/ recognition	Heavy use of rewards. Rewards are linked to achieving milestones and output targets. Usually cash rewards but also public recognition. Also rewards clearly defined before the start of a project	Rewards are decided once the project is complete. Continuous support more important than working for a reward. When the project is successful, recognition but also reward that is perceived as fair.
Project planning	Lot of upfront planning, definition of milestones, clear objectives. Plan suffers small modification.	Define broad goals; little detailed planning, but heavy reliance on experimentation. Plan constantly revisited.
Resource allocation	Based on financial metrics. Clear definition of resources committed and how they will be released.	Based on promise of technology and market. May be informal. Not clear how much will be needed.
Metrics	Clear metrics; includes input, process, outputs.	Metrics are limited to input metrics at most and experimentation-related metrics.
Monitoring	Based on weather milestones are met, by exception.	Based on subjective evaluation of weather the experiments provide learning.
Process formali-zation	High; based on stage gates.	Low; based on small team dynamics.
Market research	Traditional tools; focused groups, conjoint analysis, surveys, prototyping.	Anthropological; observation, experiential, experimentation.
Strategic boundaries	Not needed; managed through objectives/milestones.	A strategic framework may be relevant to bind the search process.
Strategic	Extrapolate current business model.	Explore new technical approaches and

planning	Identify gaps.	business models.
Portfolio planning/ manage-ment	Straightforward, simple, tradeoffs.	More complicated; risks and rewards are larger.
Culture	Focus on detail, cross functional collaboration, experience-based.	Focus on ambition, exploration.
Learning tools	Continuous improvement tools – quality tools, cycle time, reengineering, customer feedback, optimization tools.	Experimentation tools, prototypes, learning tools.
Knowledge management	Develop system to make knowledge accessible across the organization.	Knowledge is created and managed within the team.
Partnership	Collaboration over various projects – long-term	Partners provide access to capabilities that the organization lacks.
External monitoring	Monitor current competitors and current eco-system.	Monitoring idea generation places – universities, labs, start-ups.

In summary, Davila et al ((2006) distinction reveals that in implementing *incremental innovations*, the purposes are normally clear and the main focus is towards the continuous improvement, enhancement of collaboration, quality maintenance of the organizational tools and systems, monitoring competitors as well as feedback and finance portrays the success.

In contrast, for *radical innovation* in organizations, Davila et al ((2006), 137), point out the unclear purposes and focus for the outcome. They continue by explaining experiment as the key element and the importance of partners in attaining capabilities that their organization lacks. Furthermore, they found ambitious exploration of new technical or technological approaches and business models is concentrated, and technology as well as the strategic framework to bind the search process relevant.

These distinctions between incremental and radical innovations have referred as well to the incentive rewarding process that will be discussed later in this chapter. With that regard however, both radical and incremental innovation apply the business model of innovation (figure 22). This is because each process has the beginning as input of the process throughout the end as an outcome of the process (Davila et al. (2006), 150, 208)

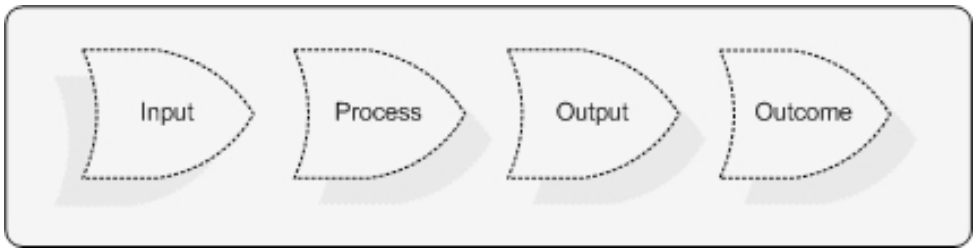


Figure 22 A business model of innovation (Davila et al (2006), 150)

At the strategic organizational level, several measures assist the company in managing the flow of ideas, evaluating the balance of innovation efforts in different dimensions, measuring the aggregate performance of the innovations that are going on in the company, financial performance and fulfilment of the organizational mission. Davila et al. ((2006), 158-170) classified these measures as *measures for ideation, measures for portfolio, measures for execution and outcomes of innovation as well as measures for sustainable value creation*

With regard to those measures, this chapter focuses on the measures *of ideation*. According to Davila et al ((2006), 158-162), measures of ideation focus in different aspects that influence human capital. These are culture, interaction, understanding of strategy as well as process and system. Human interaction results in a change in core competencies and revenue per employee, through the mix of backgrounds and alliances, to further development of ideas that increase the percentage of sales from ideas which are originated from outside. Moreover, the company gains the understanding of its own strategy that may have an effect on sales from both radical and incremental innovations against their competitors. Process and systems assist in enhancing empowerment that prolongs an effective planning systems and knowledge stock improvement as a result of the actual budgeted costs for planning and knowledge management (Davila et al. (2006), 162)

In addition to the ideation measure in paving a way to innovativeness in the organization, the concept of designing incentives in supporting organizational

innovation is viewed as one possibility to favour the employees' motivation. These incentives can be in the form of rewards. However, careful consideration of the behaviour rewarded is important. Designing an adequate reward system has to consider four elements of motivations: passion, vision, recognition and the economic incentives (Davila et al (2006), 179-181). However some people have a passion in their work therefore, a reward is not a push towards their motivation. Using incentives for radical and semi radical innovation is not simple, since their targets, are not as well defined as in incremental innovations (table 11). Therefore, radical innovation relies on recognition as its reward (Davila et al (2006), 182).

Table 11 Summary of differences in incentives and reward systems for incremental and radical innovation (Davila, Epstein, and Shelton (2006), 208).

Incremental innovation projects	Radical innovation projects
Incentive systems more relevant	Reward systems more relevant
Cash-based compensation more relevant	Stock-based compensation more relevant
Formula-based incentive systems emphasized	Subjective evaluation emphasised
Performance measures play a significant role in compensation	Performance measures play a minor role in compensation

Figure 23 emphasises the power of incentives and clarifies the reference in innovation metrics. These goals, which can be specific or broad, qualitative or quantitative, sketch or realistic, and success driven or loss avoidance, are applicable depending to the nature of innovation in question (Davila et al 2006, 186-190).

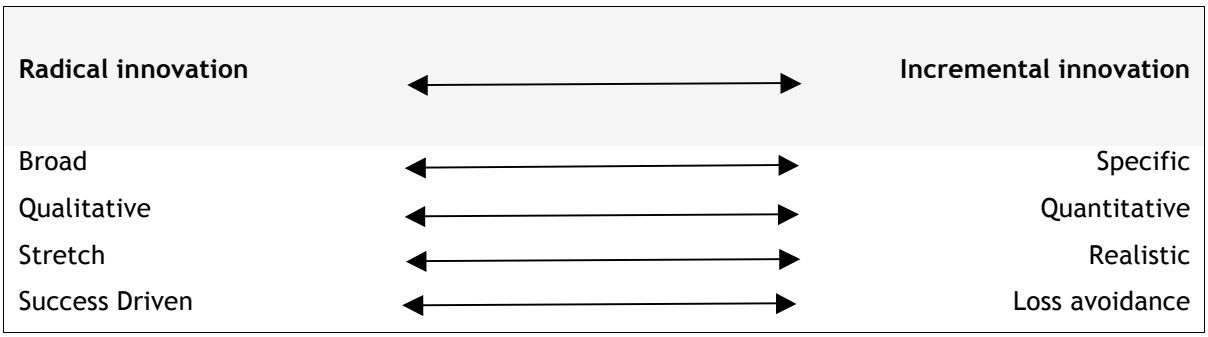


Figure 23 Characterizing goals (Davila, Epstein, and Shelton (2006), 190)

Scholars from the Helsinki Technical University have developed *Systems Intelligence* approach (Saarinen and Hämäläinen (2004), (2005), (2006), (2007)), Luoma, Hämäläinen, and Saarinen, (2007 a & b) Saarinen, Hämäläinen, and Handolin,((2004), Handolin (2005), Handolin and Saarinen (2006)) that may be useful for companies in maintaining their innovativeness. The approach stresses different aspects of management strategies and rewarding systems in enhancing organizational innovativeness. They will be discussed in chapter 2.3.1.2.

Notwithstanding**,** Davila et al ((2006), 88) argue that, to ensure successful organisational innovation, an *internal marketplace,* where the ideas and functions of innovations can flourish in a supply-and-demand environment, is needed. In the innovation market, people can submit their ideas to the management attention, in order to fund and advance them to commercial realities. The authors (ibid., 121) also stress that an innovation system must fulfil five important roles: efficiency, communication, coordination, learning and alignment. Innovation platforms can also be organized internally by using alternative organizational models in order to limit redundancy between the business units. They also provide portfolios for the innovations that business units can consider meeting their business objectives (Davila et al. (2006) 108-109)

The isolation of the innovation development, as a venture unit, joint venture or ambidextrous organisation (Davila et al (2006),111-112), may be necessary when creating the environment, culture, values, resources, rules and methods supporting radical innovation as well as for the maintenance of productivity of the mainstream of the organisation. Davila, et al ((2006), 112) argue, “Isolated units must have access to the brains and resources of the larger organisation, while still being insulated from the negatives such as organisational antibodies and distractions.” However, separating the units can limit the amount of information in innovation that is available to the organisation.

In addition, Välikangas and Hamel (2003) pointed out the role of investors as potential sources of funds from different departments in the organization that could assist companies to generate their operations to get positive returns. In this regard, investors consider the internal workers who support the innovative idea presented by the fellow in the same company. Välikangas and Hamel (ibid.) stress the essence of the potentiality of funding of the internal innovators that companies can appeal whenever seeking rise for funds. They use the notion of 'angel investors' as the providers for the ideas that aim at the business transformations. Davila et al ((2006), 109) introduce a similar idea called *Corporate Venture Capital (CVC) Model* to promote the development of commercially viable radical innovations. With regard to Välikangas and Hamel ((2003), 61-62) the need for the employees to nominate themselves for project has been stressed, since it will let the people utilize their freedom of negotiating as well as securing risks for the success of their projects. They (ibid.) explained that through having the freedom of nomination insure that successful projects generate meaningful returns both financially and professionally.

Christensen ((2003), 185-193) studied different successful companies from various sectors and compared them in addressing sustaining vs. disruptive technologies. In his striving for organisational innovations, he suggests that managers should carefully think about whether their organisations are capable of succeeding and weather their organisations' processes and values fit the problem to be solved. Moreover, knowing what sort of innovations their organizations are not likely to be able to implement successfully is important. The failure of implementing their innovation successfully is said to be affected by three types of factors: resources, processes, and values. The *resources-processes-values (RPV) framework* has been a useful tool to understand the findings related to the differences in companies' track records in sustaining and disruptive technologies (Christensen (2003), 191).

Considering organization's values, these are the standards by which employees at every level make prioritization of decisions: *Clear, consistent, and broadly*

understood values are the key metrics of good management (Peters and Waterman 1982). However, *they also define what an organisation cannot do.* Nevertheless, *the dilemma of management* from the point of view of innovation or change is that, in order to run the organisation effectively the processes are established so that employees perform recurrent tasks in a consistent way. They are not meant to change or to change through tightly controlled procedures. The very mechanisms through which organisations create value are intrinsically inimical to change.

Because of the above describe dilemma in addressing sustaining and disruptive technologies, Christensen ((2003), 197-203) stresses the importance of obtaining the organizations whose processes match closely with the newly introduced task, changing the processes and values of the current organization, as well as selecting a separate organization “spin out” that can be functioning in the newly introduced problem. Figure 24 describes the needs of different organizational capabilities in maintaining innovation or technologies in the companies. These organizational capabilities cover all levels of the organization in the company (i.e., from the administrative to the individual employee).

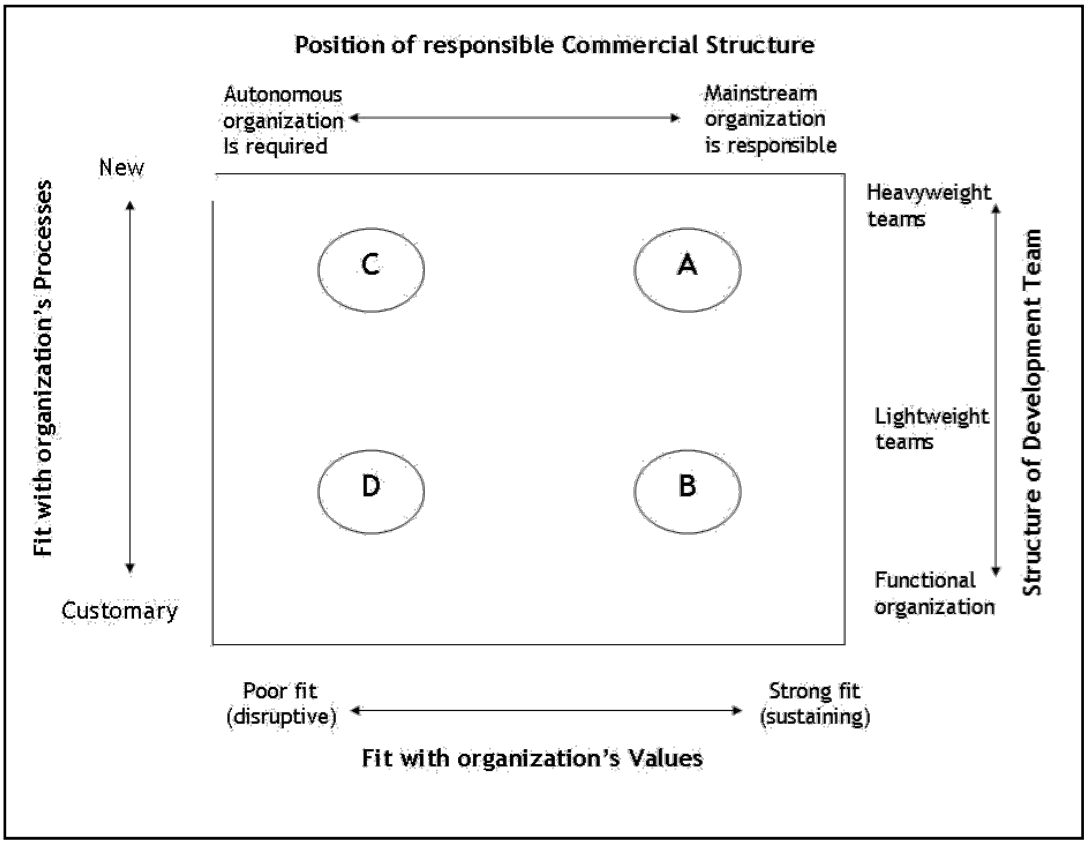


Figure 24 Fitting an Innovation's Requirements with the Organization's Capabilities (Christensen (2003), 203)

In previous figure, sector *A* refers to the new process with strong fit to the sustaining organisation's values that the mainstream organization and the heavy weight teams utilises for the development of sustaining technology. In this sector, the team is capable of tackling difficult assignments and making decisions pertaining to the process and hence increase the capabilities of the organization. Most of the processes (projects) in this section are new and hence require a hard work for implementation. In *B*, the company's project is easily integrated to its resources (values and capabilities), and hence a successful accomplishment of the task is to be expected, since the mainstream organization is accountable.

The challenge of this study is related to the *region C*. With regard to C, the need for an autonomous management has been verified to be important; and the existing heavy weight teams will foster possible decisions for the innovation to

occur. This is due to the new assignments poor fit with organisations values. *In D*, the high requirements for the capabilities expansion through the enhancement of the lightweight and functional teams will be essential. The presence of the autonomous organization could be also required for the capability building of the process.

Above all, the essence of the *autonomous organization* has been seen as an important tool for the company's success in its innovativeness. For sustaining technology to occur, a multi dimensional team has to work together in evaluating difficult assignments for the success of a business or an organization (Christensen (2003), 205). Whenever the mainstream coordinates itself, the sustaining technologies can be successful under the application of the lightweight teams. Therefore, *autonomous and mainstream organizations are both necessary for innovativeness in an organization. The development teams will vary* as to whether the company is in the process of expanding capabilities (autonomous organization and light weight teams), or solving a challenging task in the process of achieving new results (mainstream organizations and heavy weight team)

2.3.1.3 Organizational learning and change

Organisational *learning and change are interconnected* phenomena, because innovation is all about change. Organisational learning is an inherent part of innovation. By referring to the chapter 2.1.4., learning-knowledge-innovation framework can be summed up as following. Incremental innovation relies to a larger extent on the Learning to Act cycle, and radical innovation uses the Learning to learn cycle more often. Both types of innovation use different forms of knowledge. Incremental innovation is grounded on explicit knowledge, knowledge that is widely shared in the organisation. Radical innovation relies on tacit knowledge, hence radical innovation "dives to the unexplored territory". The unarticulated, intuitive and fuzzy nature of knowledge is implanted in

radical innovation and the interaction between people is crystallizing the ideas. “Radical innovation is not only hard because of the novelty of the idea, but also because communicating it so that other people understand it is difficult”. (Davila et al (2006), 215)

Maula ((2006), 178) points out the notion of individual creativity and learning processes as influenced by organisational solutions such as; career structure, recruitment policy, task definitions, measurement, rewards and incentives.

As discussed earlier there are many *dilemmas related to innovation*. Other conflicts and dilemmas have also been discovered as *related to organisations*; conflict between productivity and innovation (Clark (1985)), dilemma between exploration and exploitation (March (1991)) and dilemmas related to organisational learning and evolution (Dodgson (1993)). Many scholars assume that renewal is a strategic paradox arising from the *conflicting forces of change and stability* (Baden-Fuller and Volberda (1995)). The further discussion concerning the conflicting forces will be carried out in chapter 2.4 when discussion different innovation systemic approaches for integrating different perspective of innovativeness.

In order to explain the organisation’s evolutionary capability Maula (2006) has referred to organisations as *living compositions and living organisations,* which utilize internal self-organisation in communities in facilitating creativity and creating new knowledge and capabilities. According to Maula ((2006), 209), “in a living composition, memory (the capacity for self referential) facilitates efficiency whereas sensing (condition for interactive openness) facilitates creativity”. Similarly, Maula (figure 25) illustrates how creativity and efficiency can simultaneously be enabled in a living composition.

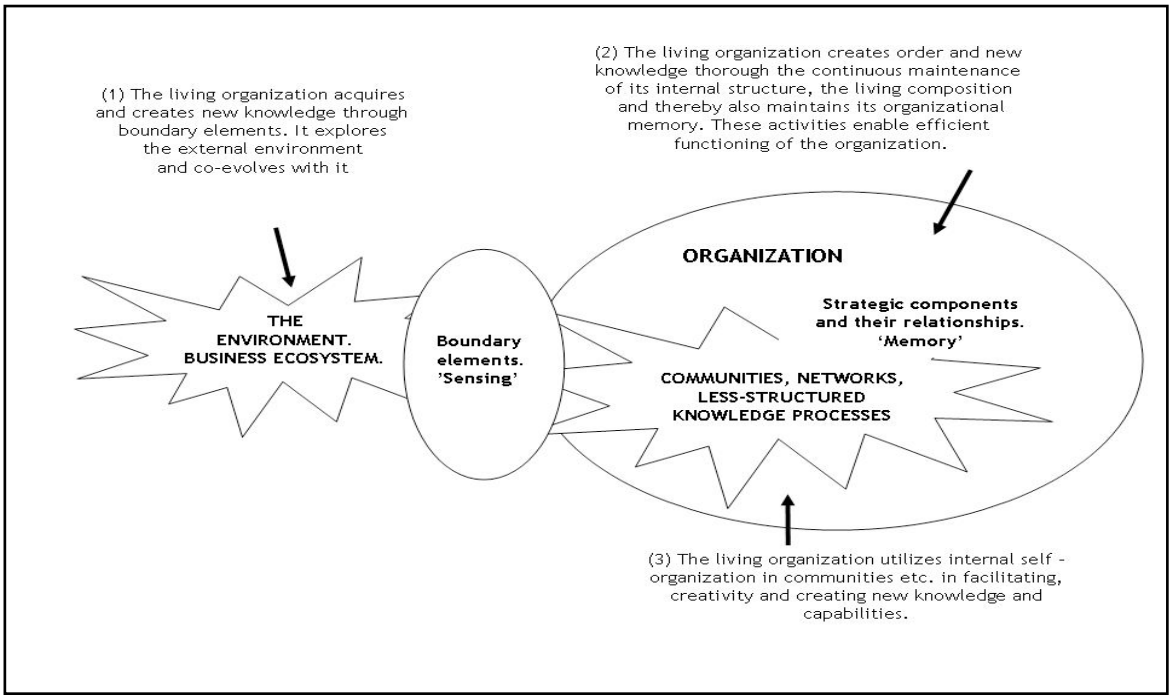


Figure 25 The living composition enables creativity and efficiency (Maula (2006), 206)

Maula ((2006), 203) has pointed out that, "The living composition model specifies the essential characteristics of living organizations." The Living organizations is said to be of a "self-producing (autopoietic) system" that is made out of ten different non-physical components as presented in figure 26. She (Maula (2006), 77 and Maula (1999), 246-289) pointed out those components as follows:

- identity of the organisation
- perception of the multinational environment
- strategy
- knowledge (highly distinctions structured, less structured and tacit)
- boundary elements (interactive openness: coordinates the company with the multinational environment (improves congruence), improves knowledge, helps validate the learning and evolution system)
- interactive processes and communication with the environment (structural and social)
- triggers/perturbation (exposure to triggers)

- experimentation
- internal standards, processes, and communication
- information and communication systems (provide the platform for accumulating and sharing knowledge)

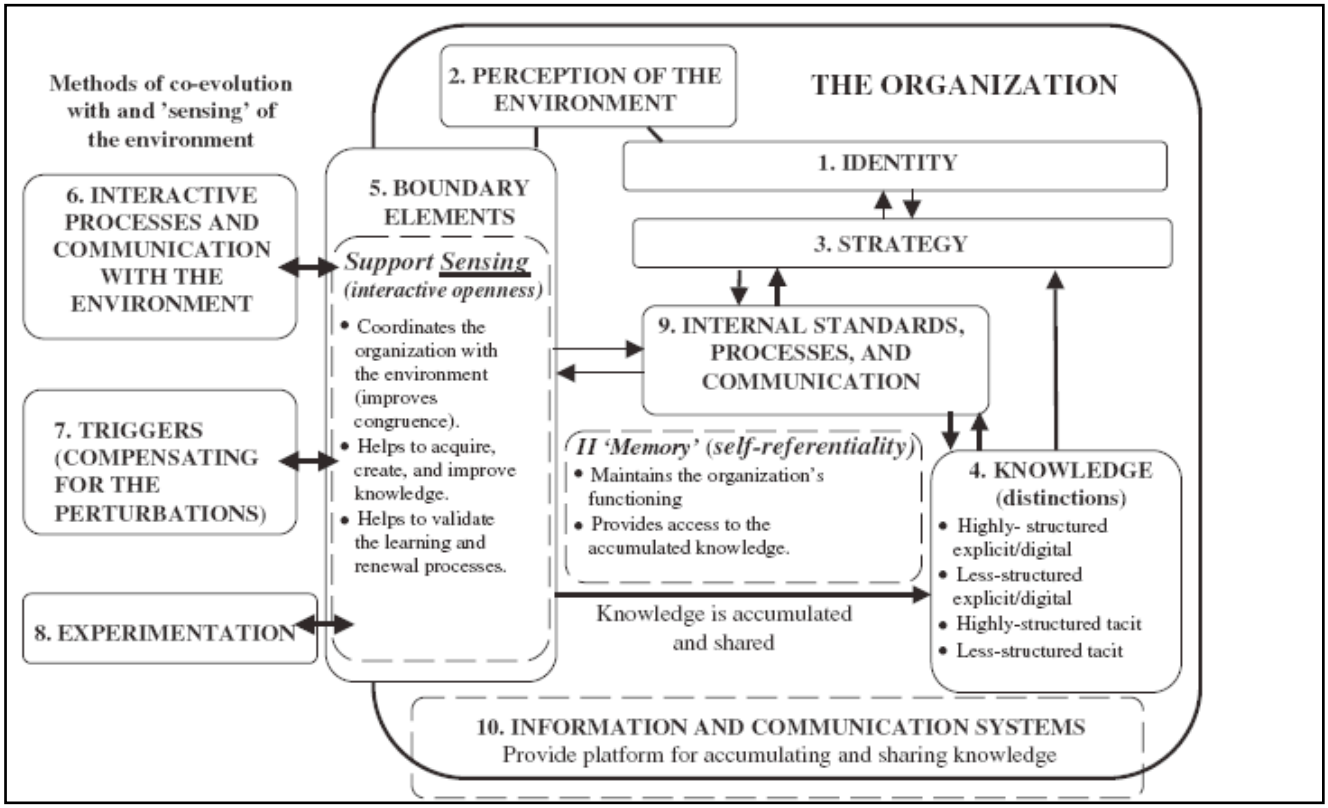


Figure 26 Living Composition: Ten Strategic Components and Two Knowledge Flows of a living organization. (Maula (2006), 80)

These components lay a ground for the renewal and learning of the organisation as well as for effective utilisation of results for learning. The interpretation of an organisation as a living system means that an organisation is self-renewing throughout a continuous self-renewal of the organisation's components. With regards to long-term planning or chaos and revolution, Maula (2006), 7-8, 208) suggests that, through the utilization of the living composition, organizations may be able to reframe controversies such as, "control and autonomy", "efficiency and creativity" as well as "exploitation and exploration." Because of interactive openness, the company can coordinate its operations with the constantly changing environment and operate creatively. Effectiveness is

sustained by the earlier knowledge and experience, which can effectively be utilised. (Maula (2006), 186-187)

Nevertheless, Maula ((2006), 202) outlined the six steps for improving living composition as following: creation of awareness and communicating the need to change, analysing strategic components, analysing the knowledge flow and the knowledge processes, analysing the current living composition of an organisation, utilising, measuring and also improving the living composition as well as implementing the improved living composition.

The following section will entail the detailed explanation about the ideas relating to systems intelligence and Superproductivity, which have as well had an aim of emphasizing the organizational strategies towards innovativeness.

2.3.1.2 Systems Intelligence and paradox in organisational context

This section introduces the concepts of System Intelligence (SI) and Superproductivity, which have been developing during the recent years. System Intelligence provides a systemic and holistic tool to analyse innovativeness in organizations. Moreover, it increases the awareness pertaining visible and invisible factors in the organization and in enhancing the so called Superproductivity.

Systems Intelligence (Saarinen and Hämäläinen, (2004), Hämäläinen and Saarinen, (2006), Luoma, Hämäläinen and Saarinen, (2007a), (2007b)) is an approach, which is looking for the ways to observe and address the entire organization as a system, paying a special attention to the invisible subsystems. Systems intelligence connects the visible and invisible side of the system (figure 27). This section discusses the invisible subsystems and the interaction of emotions, believes and micro-behaviour based on the systems intelligence approach. The purpose is to lay ground for the understanding of the

organizational rewarding systems as a contingent of innovative behaviour and the thus to understand the powerfulness of the invisible subsystem. The concept of Superproductivity will be discussed to interlink the invisible side of organization to the visible side.

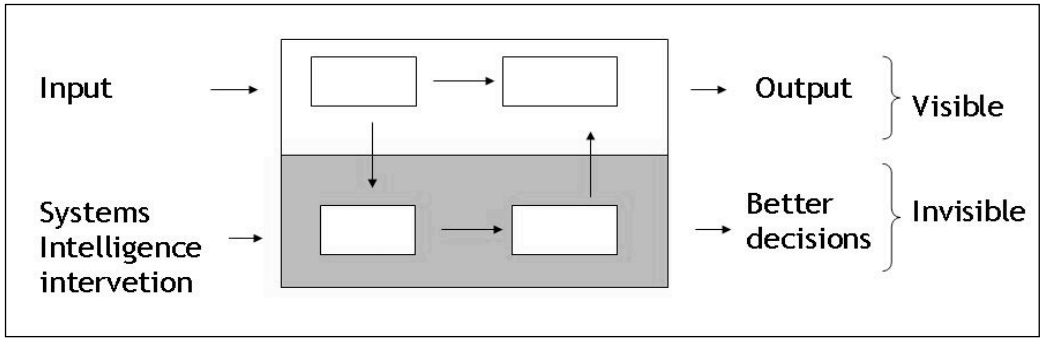


Figure 27 Systems Intelligence, visible and invisible subsystems (modified based on Hämäläinen and Saarinen)

From the viewpoint of the motivation of real radical innovators, a diverting, conceptual, and philosophically deductive approach to the perceived reward systems and organisational culture, presented by Handolin and Saarinen (2006) may be more productive than the conventional rewarding systems. In their article Handolin and Saarinen ((2006), 134) first pointed out problems related to conventional material incentives and rewards and then, in order to distinguish them from the *perception of immaterial rewards system*, they identify them as compensation systems.

Systems intelligence thinking is a wider frame inside which Handolin and Saarinen inspect the idea of perceived immaterial rewards systems. Systems intelligence has been developed since 2002 in the Helsinki University of Technology (Saarinen and Hämäläinen, (2004), (2006), (2007a), (2007b)) and *aims to take into account, the actual human competences, experiences, and interaction, at the same time building upon systems thinking*.

The Systems Intelligence approach has positive overtones and it strives towards flourishing as opposed to avoiding pitfalls or neutralizing negatives (Hämäläinen

and Saarinen, (2007), 4). Hämäläinen and Saarinen, ((2007),52) point out that "Systems Intelligence makes positive use of some key ideas of a number of other forms of holistic thinking, such as '*Systems Thinking*' (Churchman (1968), von Bertalanffy (2001); Senge (1990); Checkland (1999); Flood (1999)), theories of '*Decision Making and Problem Solving*' (Simon (1956), (1982), (1997); Newell and Simon (1972); Rubinstein (1986); Ackoff (1987); Keeney (1992); Kahneman and Tversky (2000)), '*Philosophical Practice and Dialogue*' (Bohm (1980); Isaacs (1999); Schuster (1999), as well as of the human sciences and certain forms of therapeutic thinking". (Hämäläinen and Saarinen (2007), 52) According to these authors, systems intelligence is not challenging the systems thinking and methodologies but it is a multidisciplinary perspective and research direction that complements systems thinking. It is applicative and philosophical in its orientation.

Systems intelligence refers to "*intelligent behaviour* in the context of complex systems involving interaction and feedback… She [a subject acting] perceives herself as a part of a whole, the influence of the whole; upon herself as well as her own influence upon the whole. By observing her own interdependence in the feedback intensive environment; she is able to act intelligently" (Saarinen and Hämäläinen, (2004), 9), see also Hämäläinen and Saarinen, (2006))

The systems intelligence perspective is about how human competences *combine propositional and practical knowledge* in order to operate in complex and uncertain systemic environments and, vice versa, how the agent's participation influence the systems. Systems intelligence emphasizes the systemic nature of human action in general. That is, our actions are contingent on what seems to be the system. In the figure 27 the *systems intelligent intervention* in the invisible side of the system can refer, for example, to a minor intervention, like a positive smile at the right time and the right place. Sometimes minor interventions can create the so-called *butter fly effect* or the *positive virtuous circle* and thus effect positively to the output of the visible and formal side of the system. Smith and Stacey ((1997), 79-94) suggest that *the invisible side of*

the system could be exploited as a self-renewal system which can provide opportunity for the generation of innovative ideas and new strategic options.

Conceptual, metaphorical, and analytical systemic tools provide the means to explore and explain understanding of human issues characterized by interrelatedness and the possibility of emergence.

Human being is at the focal point when complexity, change and creativity are dealt: “One of the key starting points in systems intelligence is that human beings have a capability to muddle through and cope with situations where pervasive uncertainty and the need to act are simultaneously present” (Luoma, Hämäläinen and Saarinen (2007), 14). Furthermore, the scholars discuss the human existence and the interaction of people, their cumulative effects and effects with delay, even surprise. “Surprise can emerge from within systems as human agents locally express their spontaneity. In these settings, one needs to take action, knowing it will have some systemic effects and, yet, often without full knowledge of how a particular action will unfold”. (Luoma, et al (2007a) Systems intelligence assumes that these situations require a systemic perspective in which systems and action are focused upon at the same time.

The core idea of *rewarding* with regard to Handolin and Saarinen (2006) is that, mechanistically judged meaningless and materially unattainable issues can be decisive based on their rewarding value. In this approach, rewarding is considered as interpretation made by the individual in relation to the general context or *frame* to the *micro-behaviour*. Micro-behaviour refers to the possible butterfly effect and *frame* refers to the context where the butterfly effect can take place. Self-Determination-Theory (Deci and Ryan (2003) and Gagne and Deci (2005) In Hämäläinen and Saarinen (2007) define three basic human needs, which are: 1) *Competence* experience of meaning of the action and hope, 2) *relatedness* enriching interaction relationships and experience of communal belonging, and 3) *autonomy* of the action or experience of being respected and important. In immaterial rewarding these needs create the context or frame for

the micro-behaviour in which the meaning of the behaviour will be perceived and judged. For example, a smile can be interpreted as positive or negative rewarding based on the cultural or personal contexts.

Meta-communication-action (Bateson in Hämäläinen and Saarinen (2006)) or non-communication (e.g. an unwritten letter or choosing not to make an apology) relates to the previous three elements. It is crucial and can create the rewarding experience. Handolin and Saarinen ((2006), 151) used the notion of *intelligent communication system* in order to highlight the decisive role of the meta-communication-actions in human interaction and the fact that the conventional material reward-systems ignore or are unable to handle them. The system intelligent meta-communication-action is based on the systemic nature of the organisation. Hence, the behaviour of the individual will be affected by the system created in the very situation. Every communication situation is determined by the system, which the participants presuppose to be relevant. However, these postulates can be radically wrong. The existing postulated human system can be transformed by an unsubstantial intervention without any need to organisational structures, or management systems. (Handolin and Saarinen (ibid. 140-142)

Reward experiences are systemic. They are narratives, which are interlinked with the rest of the work related narratives. Handolin and Saarinen ((ibid., 140-142) apply the powerful idea of narratives in organisational context through Alice Morgan's ((2000), (2004)) method of interactions in narrative therapy. Morgan points out how an alternative story during the moment of unique outcomes can replace individual's dominant story. The moment of the *unique outcomes* refers to the dominant story's detail, which remain outside the story line. In management, they are used as means to transform the story line into accordance with the alternative story.

In organisational context these types of interventions based on minor material details, can create changes in the organisational narrative, and can thus be

considered as rewarding. To exemplify, one can assume that paying attention to the issues like tolerance of failure or humour can create the switch from the organisational dominant narrative of incremental thinking to the alternative story of radical thinking. Humour in this example acts as the "carrier" of the experience of reward that then creates the positive emotional-energy (Collins (2004)). According to Handolin and Saarinen (ibid., 153) the systems intelligent manager will set the scene for the increase of positive emotional-energy and experience of rewarding.

Rewarding experience is contingent of different micro-behaviours. Marcial Losada's (1999) groundbreaking research on *productive teams* found striking correlations (table 12) between a business teams performance and the micro-behaviour of the team members in business meetings. Three categories of micro-behaviour by the way people interact in a business meeting are as follows: *Positivity / Negativity, Inquiry / Advocacy and Others / Self*. They are called the Losada variables.

Hämäläinen and Saarinen ((2007), 11) referred to Losada and wrote, "A system of high performing team generated more positive behaviours, more inquire-mode behaviours and other –referring behaviours than the systems of low performing teams." The scholars of Systems Intelligence refer to the power of human intervention and the real opportunity for choice. Any leader or team member can choose whether to act throughout negative, advocacy and self-referring speech and to support the dominant existing "*systems dictatorship*" (Saarinen et al (2004)), or to act by means of positive, inquiry-mode and Other-referring behaviour in order to make an intervention towards the alternative, more positive and thus more emotional-energy generating system.

The potential emotional energy (Doz & Kosonen (2008)), is difficult to reach with the conventional mechanistic methods. Moreover and unfortunately, we often fail to see the hidden *emergent spaces* of the everyday life and thus we lose the opportunity to create a butterfly effect.

Table 12 Losada results on high performing teams (Hämäläinen and Saarinen (2007), 11)

	Inquiry/ Advocacy	Positivity/ Negativity	Others/ Self	Connectivity
High-performing teams	1.143	5.614	0.935	31
Medium-performing teams	0.667	1.855	0.622	21
Low-performing teams	0.052	0.363	0.034	18

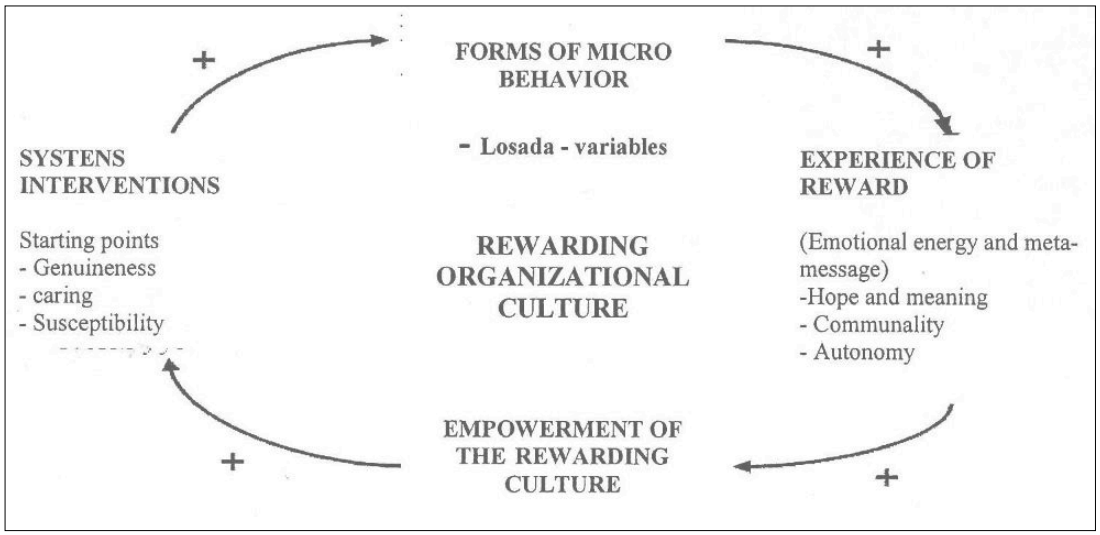
Another groundbreaking study shows similar results and epitomizes the importance and effect of micro behaviour. John Gottman's (2002) approach to happiness in marriage is striking in its results. "One of the major problems in marriage may be described as the *regulating* negative affect", writes Gottman and his co-workers in their impressive study "*The Mathematics of Marriage.*" (Hämäläinen and Saarinen (2007), 11). They point an attention to negativity-generating micro-behaviours in marital interaction. "The balance between negative and positive affect is absolutely critical in predicting the longitudinal fate of marriage". The happy stable couples had 30 seconds more positive affect (affection, humour, interest, or engaged listening) out of 900 seconds than the unhappy stable couples. (Hämäläinen and Saarinen (2007), 11-12)

To conclude, Handolin and Saarinen's ((2006), 155) model, in the figure 28, describes an *interconnection between changes in individual's behaviour (micro behaviour), the reward experiences, and the system's interventions*. The model is based on combination of the following research approaches and scientific findings:

- The systemic constituents (systems intelligence, systems thinking, and systems dynamics theories),
- on organisational culture (Schien's (1999) idea about the emergence of organisational culture),

- Collins (2004) micro-sociology and its view on emotional-energy,
- research on micro-behaviour (Losadas (2004) research on high productivity teams),
- theory on motivation (Deci and Ryanm (2000) Self-Determination-Theory), and
- interaction theory (idea of meta-communication-statement by Bates).

The model examines how the rewarding organisational culture emerges as a consequence of a restorative spiral of subjective (experience) and objective (micro behaviour) elements creating a self-restorative system. Whilst the macro process continues it produces emotional energy (Doz &Kosonen (2008) and reward stirs in the micro-sociological (Collins (2004)) level.



The previous Nokia Executive Board member, Dr J.T. Bergqvist's article "*Superproductivity: The Future of Finland*" (2007) refers to the systems intelligence with the notion of *Superproductivity*. He claims that, "it is overwhelmingly clear that the search for superproductivity jumps is the game

that the companies willing to remain competitive in Finland must concentrate on. (ibid, 97)".

Based on the systems intelligence view of company operations, combined with the lessons learned from know-how game, cost game and globalisation of markets, Bergqvist (ibid.) suggests that the future industrial winners are companies mastering both the *strategy and superproductive games*. "By the *strategy game* one means the selections a company has to make concerning its position in the market and against the competition, its targeted value-chain position and customer orientation, earnings logic and margin structures, required competences in leadership, managerial, engineering, marketing and other fields of expertise, target setting in terms of growth and profitability and means to reach those targets" (ibid., 96). "Continuous productivity gains are obviously necessary for any industrial enterprise when planning both revenue stream increases and advances in cost efficiencies. But whenever, through an individual or team innovation, a *non-linear productivity gain is reached; and a jump to a new development curve occurs, one talks about Superproductivity*." (ibid., 97) These jumps is an imperative for companies in countries like Finland since the Far Eastern companies particularly, have shown their superiority in relentless gradual improvements of productivity and in cost competition starting points (ibid.).

New sustainable company advantage can be yielded throughout innovations which change company processes, business models and value chain position or create new products. Bergqvist (ibid. 97) discusses the phenomena of superproductivity and records companies as examples of them as follows: The furniture corporation IKEA and sporting goods marketing wizard NIKE are examples of the company *business model and value chain* innovations. The original machine, room-less elevators from Kone Corporation represents an example of *superproductive product innovation*. *Process innovations* include retailer Wal-Mart, computer company Dell and mobile handset manufacturer Nokia. However, Bergqvist states that, it is difficult to deduce from the

examples how the superproductivity is created in the companies, but it is pivotal to study how the company works as system constituted by people and how the atmosphere of superproductive atmosphere can be set up. (Bergqvist (2007), 96-98)

The superproductivity atmosphere is based on the energy creation through human interactions and their amplified effect on energy creation, job satisfaction and, more than apparently, on innovation capabilities. Energy creation follows a multiplying, not an additive formula. "A consuming effect can be portrayed by an interaction coefficient having values below 1.0 and a generating effect by a coefficient with values above 1.0. When people with different attitudes and energy levels meet or interact, their coefficients are multiplied with each other. Example, a five-people brain storming session can yield a $0.8 \times 0.8 \times 0.8 \times 0.8 \times 0.8 = 0.85 = 0.3$ unit mental energy, evened out in the team, if negative behaviour models such as late arrival to the occasion, no listening, simultaneous e-mail checking or numerous small side meetings are prevailing. On the other hand, a similar meeting in a positive enthusiastic atmosphere can produce $1.2^5 = 2.5$ unit mental closing energy that is around ten times higher than in the previous example" (Bergqvist (2007), 98).

The final section of this chapter stands as a reminder to the things that can prohibit innovativeness in organizations. Davila et al (2006), 284-285), concluded that failure to *neutralize the organization antibodies, understanding the fundamental linkages between the parts of innovation, defining the role of business model change and technology change as well as identifying the innovation* strategy, may lead to less innovativeness of the company. The scholars (ibid.) are moreover reminding the importance of cultural bias against semi radical and radical innovation as things that can lead to less innovativeness.

Paradoxes, effectiveness and innovation in organisation. Since paradoxes seem to be inherent in innovation, this section will illustrate the literature

related to the connection between paradoxes and transformation at organisational context.

In spite of the fact that paradoxical characteristics in organisations have been identifiable, inherent contradictions have *seldom been explicated as paradoxes in organisational literature*. To point out this fact Cameron and Quinn refer to several examples in organisational theory as well as in everyday management, which ignore one side of the simultaneous contradiction and maintain a linear perspective and rational, logical view of organisational action. (Quinn and Cameron (1988), 292 and Cameron and Quinn (1988), 7-8)

Quinn and Cameron ((1988), 289) utilize a Paradoxical perspective in order to *enrich analyses and thinking about organisation and management* by forcing us to focus on the contradictory, dynamic, and transformational phenomena in organisational life which otherwise might not be recognized. As Starbucks (1989) points out, constantly changing organisations or social systems are generating opposing forces. Throughout employment of *paradoxical perspectives and polarities of systems, we can increase awareness of our blind spots*, the elements of the social systems, which we are prone to ignore since they are not in accordance with our predispositions. Starbucks ((1989), 78) adds that we need tools that extend our capabilities and "paradoxes help us to grasp small chunks of irrationality. Paradoxes do this by being true and false at the same time." Paradoxes might help us to explore the creative tension within our concepts and categories.

Ford and Backoff ((1988), 82) state that organisations are inherently paradoxical by referring to Gharajedaghi (1982) who stated that "in the acts of organizing distinctions are drawn that are oppositional in tendency: differentiation and integration, collectivity and individuality, stability and change, uniformity and complexity, morphostasis, the maintenance of structure, and morphogenesis, creation of new structure."

In order to draw attention to the need to make the organisational and management analyses richer and more complex, Cameron and Quinn ((1988), 8-16) furthermore refer to scholars who have *explicitly acknowledged the presence of paradoxes and thus identified paradoxical characteristics in organisations* that perform effectively. Furthermore Farson and Keyes ((2002), 9-12, 24-25, 36, 55) discuss how to manage the paradox of success and failure in today's business climate and global innovation environment, they first point out the importance of the *management of calamity*, since crises, adversity and upheaval can also benefit organisations and sometimes crises is the only thing that can move an organisation. Second, they underline the role of *mistake making* for learning and importance of the tolerance towards mistakes as preconditions for changes, experimenting, innovations, risk taking and entrepreneurial behaviour in organisations. Third, they point out that *success is as perilous for organisations as failure*. They furthermore suggest ideas such as recognizing that most situations contain elements of *both failure and success*, or that *all paradoxes can't be solved out,* and finally that instead of concentrating to winning or losing we should pay attention to the *intensity* we dedicate on our achievements. Concerning organisational paradoxes Cameron and Quinn for their part referred and discussed finding of such scholars as:

> 1) Cameron (1986): "[..] An *organisation must possess attributes that are simultaneously contradictory, even mutually exclusive*." Cameron motivated this statement based on his findings from educational organisations, which after decline were recovering successfully, and had engaged simultaneously in long-term proactive, entrepreneurial and innovative actions as well as short-term survival actions like self-protection mechanisms related to efficiency measures. Their management strategies were simultaneously oriented toward manipulating external environment and ignoring environmental constraints. (Cameron and Quinn (1988), 8);

2) "The management of *symbols and interpretations* was a critical difference between successful mangers and others who failed." (Cameron and Ulrich (1986) in Cameron and Quinn (1988), 9);

3) Successful "[I]institutions engaged in *domain defence along with domain offence*." This refers to the simultaneous processes of defending the institutions against the encroachment of external environmental events and stakeholders as well as aggressively initiating to influence the important stakeholders. (Miles and Cameron (1982) in Cameron and Quinn (1988), 9);

4) Simultaneous *destruction and creation* process typical of successful innovations were found in successful institutions. (Cameron (1983), (1984); Chaffee (1984) in Cameron and Quinn (1988), 9)

5) Furthermore Quinn and Rohrbaugh ((1983) in Cameron and Quinn (1988), 10-12) identified paradoxical characteristics in organisations that perform effectively. They suggested "*the competing values model*" which is pointing out the simultaneous opposition in the criteria that individuals use to judge effectiveness. The criteria were organised around two dimensions; the first dimension of *decentralisation and flexibility vs. centralisation and stability* and the second dimension ranging from *internal, individualistic focus to external, macro-level focus*. Based on this model "Quinn and Cameron (1983), Rohrbaugh (1981), and Cameron (1985) found that organisations do nor pursue a single set of criteria. Rather they *pursue competing, or paradoxical, criteria simultaneously*." (Cameron and Quinn (1988); 10)

6) Quinn, Dixit and Faerman (1987) found that "the most effective leaders were described by their subordinates as exhibiting seemingly *contradictory behaviours or styles*." (Cameron and Quinn (1988), 12)

7) Based on analyses on corporate performance Peters and Waterman (1982) found characteristics such as simultaneous *loose and tight coupling* or productivity through *participation along with non participation and concluded*: "[T]the excellent companies have learned how to manage paradox." (Cameron and Quinn (1988), 12)

8) "Successful new ventures require both high commitment to current products and *status quo* in an organisation (which establishes a firm groundwork for launching new ventures) as well as *radical change* and questioning of the status quo, which is needed to launch innovative ventures." (Schon (1966), in Cameron and Quinn (1988), 12)

Virtually all these writers confirmed the presence of various forms of paradoxes in organisations, and consequently it can be assumed that an entirely new manner of thinking, relying on integration of research on paradoxes and management of transition in organisations, could profit understanding on innovation. Subsequently, in order to lay ground for the Grounded Theory building on innovation, Cameron and Quinn's suggestions of the following principles derived from previous authors' findings to be taken into consideration in research and theory building will be introduced:

"1. Ignoring the contradictory nature of organisations may be dysfunctional for mangers and researchers. […]
2. *Theories of congruence have an order bias.* Synthesis is desirable but not required in organisations. Paradox need not always be resolved. Rothenburg proposed that the resolution of paradox led individuals to produce quantum leaps in insight and creativity. […] the mere recognition that two opposite elements are simultaneously true and present in a system creates flexibility and freedom that are not present in totally linear systems. […]
3. *Paradoxes are paradoxical.* […] disconfirmation, contradiction, and nonlinearity are inherent in all organisations […] Paradoxes also are

predictable and symmetrical by themselves. They are both confusing and understandable, common and surprising.

4. *Paradoxical criteria are not indicated merely by both high and low scores on and attribute*. […] in organisations, criteria of effectiveness may be independent of criteria of ineffectiveness, so both should be measured. Paradoxes are not indicated merely by the presence of high and low scores (bimodal distributions) on the same attribute.

5. Many inferential statistical procedures mask rather than uncover the presence of paradox in organisational research.

6. *Hypothesis should be generated that do not consider merely the rejection of null or not*. Contradictory hypothesis, or antithesis, is required for investigators to be sensitive to the presence of paradox. […]" Cameron and Quinn (1988), 12-16)

Quinn and Cameron ((1988), 291-292) furthermore discuss how *paradoxes arise in organisations* with regard to formal policies and procedures. "Innovation and creativity, which by definition imply the violation of current practices and procedures, are inhibited by adherence to organisational policies." Quinn and Cameron (1988) discuss the importance of balancing positive polar opposites (like predictability vs. spontaneity) in order to create effective functioning organisations.

Virtuous vs. vicious circles. Quinn and Cameron ((1988), 292-307) analysed the dynamics of paradoxes and the role of *polar oppositions in negative and positive perspective*; and pointed out how *vicious circle* can convert into the *virtuous circle* or vice versa. Some authors see the paradox as a circular, self-referential, or dynamic process, and view it as a dynamic problem to be solved. These authors tend to focus on processes and issues in organisations that lead to negative or positive outcomes. Quinn and Cameron ((1988), 292-293).

In addition to paradoxical problems Quinn and Cameron ((1988), 298) refer to *paradoxical virtues*, which can create a positive spiral, the *virtuous circle*, and

"help individuals become energized and propelled ahead". Complex contradictory forces are as present in this state but "they produce a source of creative energy." (by referring to Ford and Backoff (1988) and Thompson (1988)).

Flow and multiple frameworks. Quinn and Cameron ((1988), 299) make the following points about the state of flow: "1) it is paradoxical. 2) Reframing is prerequisite. 3) It eventually leads to routinization and the imposition of the rational model. 4) Some individuals experience the state more frequently than others. 5) It may involve holonomic information processing."

The metaphor of holography illustrates the way in which the brain stores information (Pribram (1982)), and human collective does so (Bradley (1988) in Quinn and Cameron ((1988), 303). Throughout these points, the scholars (Ibid. 302) highlight the importance of *multiple, paradoxical frameworks* in renewal of systems and refer to research suggesting that relatively few people have the ability to acquire and shift among multiple mental frameworks. They also suggest that, during the Flow "there is a kind of understanding, action, communication, and creation of reality that transcends the normal logic. Polarities and oppositions are experienced as one. There is an understanding beyond the verbal interaction." (Quinn and Cameron (1988), 303)

Quinn and Cameron ((1988), 304) refer to Ford and Backoff (1988) and conclude that "[T]he paradoxical frame suggests that organisations are dynamic. They exist within and are themselves dynamic streams of energy which are constantly transformed." They argue that the dynamic, paradoxical frame takes place when the transformation simultaneously take a form of vicious and virtuous circle and it is this moment which allows us to understand the transformation. Their theory suggests, "Long-term survival depends upon the *balancing of polarities though transformational stages*." The scholars (ibid., 306) state furthermore, that manager can occasionally reach the flow state by building creative tension

between polar values, for example, stability, control, and continuity which are contrasted with innovations, adaptation, and change.

A developmental learning process involving both cognitive and behavioural levels is a prerequisite to acquire “cognitive capacity to use multiple frames, and behavioural capacity to use skills to match the frames.” [..] “those who develop mastery have the capacity to balance polarities in a way that is difficult for someone to understand when they mired in the either/or frame.” Quinn and Cameron ((1988), 306-307)

To sum up, throughout this theses, it has been discussed how tensions, discontinuations and paradoxes as well as the phenomena like virtuous circle, butterfly effect, Flow (chapter 2.2), Systems intelligence (2.3.1), Superproductivity (2.3.1.), reframing (2.2.), peak experience (Csikszentmihalyi (1976)), peak performance (Eisenhardt and Westcott (1988)) and U-learning curve (2.1.) are engaged with the radical thinking and generation of innovations. They have been used to explain how the innovation related change in organisations takes place by utilizing the energy generated by the individuals, and their intrinsic motivation and capability to increase awareness and to learn from the emerging future. Not forgetting the other innovation prerequisites like, tangible resources and good knowledge and know-how.

Furthermore, the concepts of system Intelligence and Superproductivity are seen as relative since they all stress the significance of energy creation in systems. Energy formation is a prerequisite for creativity and innovativeness as well as learning (reframing or learning from the emerging future). Chapter 2.4 will further discuss the systems intelligence, along with the general systems theoretical approach.

2.3.2 System-of-innovation in national and regional levels

In this study the operative environment and the outward circumstances where creative work around innovations takes place has been considered as system-of-innovation. The systems-of-innovation consists of tangible and intangible elements. Individuals, companies, organisations, cities, regions and other institutions and their activities, affect it. Systems-of-innovation consists not only of different patterns but also of various overlapping layers (micro, meso and macro).

This section of the thesis focuses on the broader environment where the organisations and professionals operate together with the end-users or citizens in accordance with the open innovation principles. By introducing different approaches to the system-of-innovation, this section aims at developing conceptual framework for the inter-relation among innovation and its circumstances.

Both the concepts of *innovation system* (IS) and *innovation ecosystem* (IES) are relatively recent. Compared to the concept of innovation system, the innovation ecosystem is newer and more difficult to summon up from innovation research literature. The fast *development of these concepts* is a testimony of the rapid change in the reality that the managers and creative professionals are facing when innovating. Both concepts have first emerged in regional and national innovation policy, and have subsequently been adapted to the innovation research. This chapter will discuss the development and meaning of both concepts.

Before the more epistemic and social analysis of the concepts related to system-of-innovation approach, a preliminary look at the most recent and practical example of the notion of innovations ecosystem will be provided. In defining ecosystem, Hautamäki ((2007), 16), highlights the antipoetic and self-organising

nature of the innovation system and he points out that, “the ecosystem is a complex, self-regulating dynamic system without centralized decision-making”.

Rather than defining the *innovation ecosystem,* literature has illustrated it throughout examples like Silicon Valley. It has been considered that innovation system consists of various actors, institutions and activities. Some of these elements and dimensions are more formal and tangible, as others can be characterised as intangible, informal or invisible. With reference to Bahrami and Evans (2000), Hautamäki points out that, “Silicon Valley has been referred as an example that clarifies the meaning of ecosystem to the innovation economy. This is because, the place involves research institutes and universities for producing new knowledge, venture capitalists for funding start ups and the rapid growth of firms, sophisticated infrastructures (such as accounting firms, manufacturers and law firms etc), professional talent that is diverse from all around the globe and the pioneering spirit of relentless work ethics that encourage taking risks” (Hautamäki (2007), 17).

2.3.2.1 Epistemic and social analyze of the concept of system-of-innovation

Innovation system as a notion is still relatively young. Scholars consider it as heterogeneous, imprecise, and still open for new determinants and supplying a richer set of concepts. It has been said to be only a starting point for further research since the notion of i*nnovation system* has been used more often as an umbrella term or metaphor that provides a comprehensive but loose framework for technology policymaking and for discussions related to innovations management. Consequently, innovation system as a notion has been described as “transdiscursive” (Miettinen (2002), 133) because of its powerful nature in organizing discourse within research and policy making communities.

Since the systemic approach to innovation has a key role in this study, it is important to be aware of the *critical discussion among scholars* such as

Miettinen (2002), Edquist (1997) and Lundvall (2005) *on the relevance of the systems versus networks approaches*.

Miettinen (2002) claims that instead of focusing on the systems, one should study the interactions in technology of innovation specific networks, since through understanding them, the dynamics of trust, learning, and actual interaction can be understood. Lundvall (2005) supports the use of the notion "transdiscursive" in relation to the development of scientific notions. He also agrees with Miettinen and his "strong critical points" concerning some of the epistemological use of the NIS, or NSI as he refers to the National System of Innovation. Furthermore, Lundvall supports the idea of including other disciplines than economics, to the interactive learning and knowledge. Moreover, he emphasises that, detailed research is needed, rather than remaining at the "aggregate national system's level". He finally supports the fact that the "scientification approach" for the "complete and final explanation" is not recommendable. However, in contrast, Lundvall ((2005), 5) argues, as following:

> "[S]some of his [Miettinen] criticism takes on an unnecessarily polemic form – he repeats again and again a quote where Edquist says that the NSI-concept is 'conceptually diffuse and ambiguous'. He [Miettinen] contrasts it with academic work as aiming at 'conceptual coherence, empirical accountability and solid theoretical foundations'. Here I [Lundvall] see a risk that first Edquist and then Miettinen become victims for a different kind of scientification. Some of the conceptual openness of the term NSI refers to the fact that historical and local context affects where the limits of innovation systems are set. I [Lundvall] do not see this as being in conflict with academic ideals – on the contrary. If it would exclude analytical tools that may be adapted to historical and local context I [Lundvall] would accept to live without 'solid theoretical foundations'. This wide diffusion in policy circles is a mixed blessing. The concept has been both used and abused. Sometimes policy makers pay lip-

service to the concept while neglecting it in their practise."

However, Lundvall, in his counter criticism does not consider the goal of Miettinen's argumentation, which seems to be defending the quality assurance mechanisms of companies and universities. That is why Miettinen underscores the networking instead of new organisational solutions. Lundvall ((2005), 5) prefers the notion of NSI or the cumbersome 'national innovation socio-economic formations'. Because of the importance of the role of knowledge in the modern era, this critical discussion will be illustrated more in detail further in this section.

The emergence and content of innovation-system and similar concepts goes hand in hand with the development of the concept of innovation. Gradually, in the 1970s, when the interactionist approach (Freeman (1979)) replaced the linear concept of innovation, the focus of the research was at the *interaction* of institutions and actors, and at the contribution of that interaction to the emergence of innovations. By the 1990s, that interaction was conceptualized in the notion "national innovation system".

It is typical for the development of science that new notions appear in the scientific communities and become fashionable. They raise public interest and are criticized by the scientific communities on account of being loose and lacking adequate empirical foundation. These type of characteristics have been attached to all of the relatively new notions like

- "*national innovation system*", "*information society*" *or* "*knowledge society*" (Bell (1973), Masuda (1980) In Karvonen (2001)),
- "*mode two of knowledge production*" (Gibbons & al. (1994)),
- "*innovative milieu*" (Camagni (1995), Maillat (1995), Morgan (1997); In Sotarauta and Kosonen (2004), 114-139)), and
- "*network society*" (Castells (1996), (2000)),
- "*globalizing learning economy*" (Lundvall & Borras (1997)), or
- "*Triple Helix of Academia, Industry and State*" (Etzkowitz (2002)).

The development and use of the notion of national innovation system was thoroughly analyzed both in epistemic and in social contexts by Miettinen (2002) in *National Innovation System, Scientific Concept and Political Rhetoric*. Miettinen discussed the complexity and multiple meanings of national innovation system and various other similar terms. He (ibid., 18) highlighted the continuous development of the notions by outlining that "ambiguous terms are eventually replaced by scientifically more elaborated concepts" by referring to Canguilhem (1994), and stated that those once powerful terms will be complemented and finally replaced by other terms (Miettinen (2002), 150).

From the point of view of this study, the still developing nature of the concepts of innovation system and innovation ecosystem is an open invitation for the discussion of the content and meaning of the notions. It also yields to the use of grounded theory and challenges to explore whether the *human aspect* is embedded into successful innovation system. Referring to the transdiscursive nature of the notions, this section of the study discusses the system-of-innovation approach in different levels, namely at national, regional and organisational levels.

Observations related to the development of the real life innovation policy and its reflection to the conceptual development of the transdiscursive nature of *"National innovation system" (NIS)* will be introduced next. NIS is a concept, which has been settled in research as well as in policymaking. According to Miettinen ((2002), 132-133, 136-137), it is powerful in organizing the discourses. These *transdiscursive terms* "are used to reorganize and guide discourses within research communities and in policymaking, their emergence and development is dependent on interaction between the two."

Miettinen ((2002), 137) found six different social-epistemic functions or uses in the NIS discourses (table 13). They elaborate the idea of the unity of the

epistemic and the social in the use of transdiscursive terms in the borderland between science and policymaking.

Table 13 Social-epistemic functions of transdiscursive terms in research and policymaking (Miettinen (2002), 137)

1. They have traditional epistemic functions like presentations and as well founded accounts of reality.
2. They function as epistemic-organizers: terms and metaphors used as organizing or umbrella terms integrating in themselves various themes formerly regarded as separate.
3. They supply a world-view or a diagnosis of an era
4. They serve as boundary crossers by engaging various social groups in institutions in shared discussions
5. They save as ideological and consensus-creating functions
6. They mobilize and empower

With reference to the previous explanations in this chapter, it can be considered that *both operational and theoretical concepts* are needed to describe and understand the innovation circumstances. Kautonen (2006), who emphasized the distinction between *operational and conceptual systems,* supports this idea. He (ibid., 48) pointed out that, "an operational system refers to the real phenomenon, whereas a conceptual system is a logical abstraction, theoretical construct consisting of principles that explain relationships between and among variables".

This study uses the theoretical basis of system-of-innovation approaches (including the national, regional and organisation subsystems) as a conceptual framework for the empirical findings. However, when doing research on the innovators' experiences of circumstances, other theoretical perspectives could have been available, for example, "industrial district" approach (Garofoli (1991)), "innovative milieu" approach (Grevoisier and Maillat (1991)), the

"Californian school and high tech and technology district" approach (Castells and Hall (1994)) or "cluster model" (Porter (1990)). Nevertheless, for the purpose of Grounded theory (GT) building, the more general and open system-of-innovation approach was considered to offer a frame of analysis for the experiences related to innovation. Thus, the generic approach of innovation systems will now be discussed more in detail.

Kautonen ((2006), 47-48) refers to Lundvall and Johnson (1994), Edquist (1997), and North (1994) in order to highlight knowledge and learning and their social nature, as basic assumptions within the generic innovation systems approach. He (ibid.) points out that, "in the contemporary economy, the most fundamental resource is knowledge and the most important process is learning and that learning is predominantly an interactive and thus socially embedded process, which cannot be understood without taking into account its institutional and cultural context."

According to Kautonen ((2006), 47-48), *in the innovation systems approach*, the basic *elements of analysis* consist of the actors, the nature of interactions among these actors, and innovation processes that these actors and actor constellations perform. Generally, the systems analysis has been conducted through "lenses" like the national, regional, technological or sectored viewpoint. The viewpoint of the individual innovator has been exceptional in the literature on innovation systems. In the study in hands, all of the previously mentioned elements are relevant and the study uses the following lenses, which are individual, organisation, region, nation and supranational constellations.

Furthermore, as Kauttonen (2006) pointed out, institutions of the innovation system comprises of various elements. Some are more established and others more spontaneous, however they affect the generation and diffusion of innovation. These elements include "*intentional and emerged institutions*. Intentional institutions are, for example, the financial, educational, and science and technology institutions such as R&D funding and the venture capital systems,

universities, technology transfer agencies and different types of public policies among others. The approach also recognises the significance of different incentives conducive to innovation (Edquist (1997)). Emerged and non-planed institutions consist of a vast array of institutions affecting the creation, diffusion and adoption of innovation and technology. These refer more to an underlying social-cultural system of values, norms and common beliefs about, for example, Entrepreneurship, technological progress, cooperative versus competitive behaviour et cetera (on institutions and economic performance, see North 1994)" (Kautonen (2006), 47-48)

Nevertheless, Edquist (2005) has referred to different "*activities/function/factors*" influencing innovation. These factors are such as: "Research and development, Competence building, Formation of new product markets, Articulation of user needs, Creation and change of organisations, Networking around knowledge, Creating and changing institutions, Incubating activities, Financing innovation Consultancy services."

Additionally, Lundvall (2005) gives his contribution by adding; "competition, openness to international trade and capital flows, labour market dynamics, social welfare systems and the quality of social capital." He warns that "to conclude that agreeing on such a list is the most useful way to 'create rigour' and scientific progress might not be correct." (Lundvall (2005), 13).

The above mentioned list of institutions and functions included in the innovation systems analyses emphasise the economic, knowledge and technical capital, the *'hard' aspects of the innovation system*. They do however not include the intellectual and social capital in a broader sense; neither do they include issues like culture, leisure and environmental capital.

Other authors have emphasised the importance of socio-cultural institutions like media, theatres, and non-profit associations with concepts like "*Dream Society*"

(Jensen, (1999)) or "*Learning Region*" (Florida, (1995) In Sotarauta and Kosonen (2004).

The definition of the innovation system emphasises the economic, knowledge and technical capital, the hard side of system, but does not concern the individual or other related 'soft' elements. Yet, if the human centric and creative nature of the innovation is taken into consideration as suggested in the previous chapter, one can claim that the soft side of the innovation system is as compatible with the innovation as the hard side. Thus, the further development the concept of innovation system is one of the aims of this study. In order to face that challenge, the idea of the transdiscursive nature of the term should be kept in minds when exploring and suggesting new content to the still developing concepts. In the next section, a closer look will be taken to the system-of-innovation approaches, to the different meso and macro level environments, first at national and then at regional level.

2.3.2.2 National Innovation System (NIS)

While bringing in the development of the content of the national innovation system in both research and innovation policy, the aim of this section is to enlighten the rationale behind the existing operative environment of innovation. The worldview, basic rules and guidelines of the innovation system affect the priorities and ways how the NIS look at different types of innovations, whether it emphasises e.g. science-technology driven vs. non-linear innovations, or radical vs. incremental innovation.

The concept of national innovation system emerges. In the later part of 1990s, the term national innovation system was used by international organisations like OECD and EU in their science, technology and innovation policy (Miettinen (2002), 21). The Green Paper on Innovation by the EU was published in 1995 and Managing National Innovation Systems by OECD in 1999 (were published in 1995

and 1999). The OECD presented Metcalfe's (1995) definition of NIS, which stressed *interrelationship of institutions involved in knowledge creation and upgrading to innovation.* It is a combination of bottom up and governmental top down model. However, person, culture or other soft elements are not mentioned in this meso-level definition: "A set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which government forms and implements policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies" Miettinen (2002), 29).

The OECD's Managing National Innovation System ((1999), 23)) illustrated with one figure 28, how a country's performance is affected by the system of knowledge generation, diffusion and usage, global innovation networks, clusters of industries, NIS, RIS, macroeconomics and regulatory context, education and training system, communication infrastructures, market conditions and national innovation capacity. However, OECD did not provide additional explanations for the figure. In this early version of the IS, the human side can be found merely implicitly in e.g. education system. Interestingly, country performance did not include wellbeing, as the later IS illustrations normally showed.

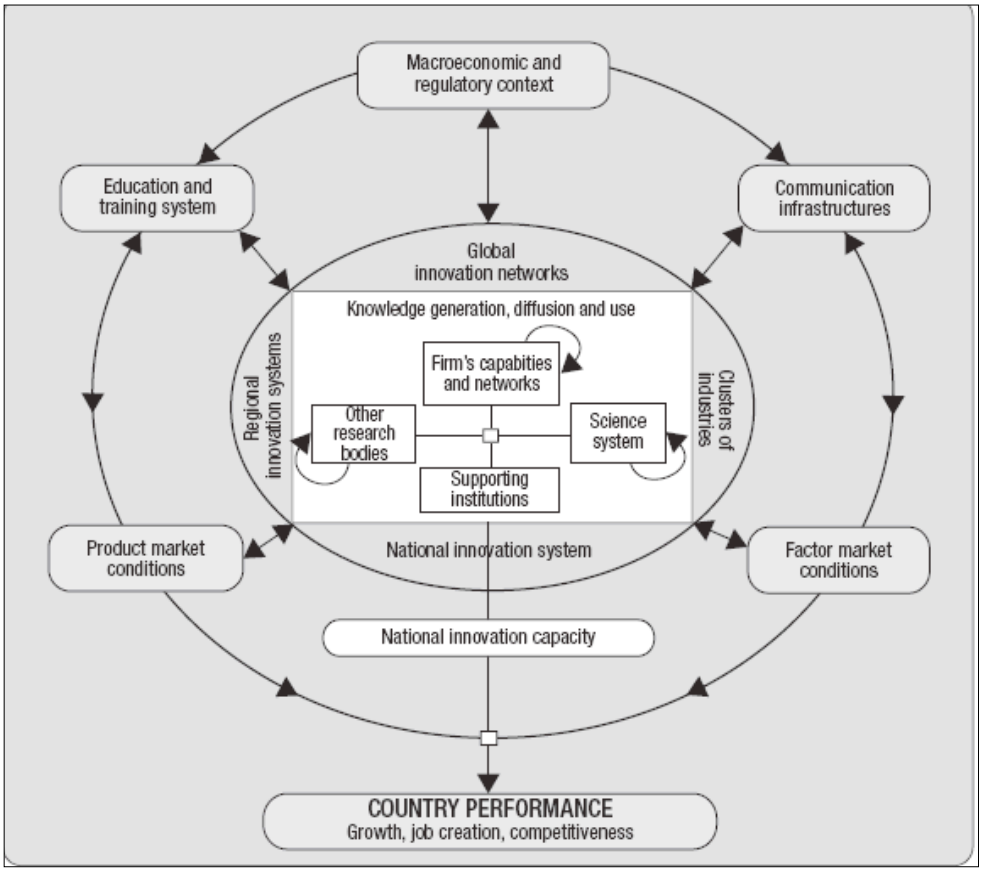


Figure 29 Actors and linkages in a national innovation system (OECD (1999), 23 in Miettinen (2002), 32)

Christopher Freeman (1987) first used the concept of national innovation system (NIS), in an empirical research to cover the features in the Japanese economy and society that could explain growth. He found five groups of factors, namely: 1) the role of government in the modernization of the Japanese economy, 2) education and training as key factors in this modernization, 3) intensive effort to import and improve the best technologies in the world, 4) close co-operation between the government and big industrial concerns, and 5) formation of vertically integrated groups of firms known as "*keiretsus*". *(Miettinen (2002), 41)*. According to Freeman, *NIS is a network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies*. Miettinen ((2002), 41) commented the definition,

"This ensembles his *interactive idea of innovation*. Interestingly, he defines the systems in terms of network"

In the 1980s, Lundvall (1992) and the Danish Aalborg group introduced an *interactive learning* concept of the national innovation system. The theoretical idea of interactive learning between producers and users was based on their research from the 1980s, when they found a tendency towards producer dominance in innovation. To compensate the lack of competence of users and to bring the users and producers together, they suggested changes in the innovation policy (Lundvall (1985), 44). Lundvall has later (Proactive (2006)) used the notion of DUI (Learning by Doing, Using and Interacting mode) to refer to the development from science-technology driven innovation to learning and co-creation driven innovation methods. Thus, one can envisage simultaneous congruity in the maturity of the notions of NIS and nonlinear, open innovation, whilst interactive learning has been at the rallying point in this conceptual development.

Miettinen (2002) distinguished two different kinds of methodological attitudes towards NIS: the *holistic scientist* attitude and a more moderate, *comparative attitude*. As an example of the comprehensive systemic approach, he introduces Edquist and Lundvall's (1993) strictly technology and economy oriented definition of NIS as follows: the "*National system of innovation as constituted by the institutions and economic structures affecting the rate and direction of technological change in society*" (Miettinen (2002), 47). In that regard, scholars have portrayed the essence of the national innovation system as a larger system whereby, in addition to research and development as well as systems for technology diffusion, it contains institutions and factors determining the technology capacity to increase productivity and bring economic growth. "At the same time, the system of technological change is, of course, less comprehensive than economy/society as a whole (Edquist and Lundvall (1993), 267)." (Miettinen (2002), 47).

From the point of view of the idea of systemic approach to the environment, it is worth stressing that Miettinen ((2002), 47-48) accepted the proposition of the importance of interactive learning and interactions between key institutions. However, he strongly recommended that research should focus on studying and understanding the nature and quality of these interactions, instead of constructing comprehensive, holistic, explanatory system models.

As an example of the comparative attitude towards NIS, Miettinen referred to Nelson's et al. (2004) empirical analysis of the innovation systems of 14 countries, which was published in *National Innovation Systems: A comparative analysis* (1993). While studied the national differences of innovation related institutions and their interactions, Nelson stressed the significant *historical differences* and seeks to learn from the results. (Miettinen ((2002), 49)

Additionally, for those who are striving for the development of the innovation concepts, Nelson and other scholars engaged in a valuable *critical discussion* of the limits of the concept itself. Nelson claimed first that, since the three broad terms (national, innovation and system) included in NIS could be interpreted in different ways and in such a broad definition, "it is difficult to regard 'innovation' as something other than the overall competitiveness of national economics. There are sets of intertwining terms and characterizations that make a focused analytical discussion difficult" (Miettinen (2002), 49-50). Secondly, he referred to the holistic and intervened nature of the environment and circumstances where innovation takes place, "no criteria have been agreed for defining the limits of a system or its essential subsystems or elements. The existing characterizations are mostly lists of different kinds of "factors" that cover not only institutions (firms, universities, education, banks), but also social qualities, cultural patterns, mechanisms and patterns of interactions" (ibid., 50). Thirdly, Nelson was sceptic towards the national aspect of NIS in the context of rapid globalization of the economic activity. Miettinen, furthermore, added to the critical inspection Mowery's and Rosenberg's doubt of our capacity to understand and master the innovation system: "Our understanding of the

management and organisation of the innovation process is so imperfect that that the debates over (…) 'efficient' and 'inefficient' innovation system will remain poorly informed for the foreseeable future" ((1993), 64, in Miettinen (2002), 51).

The critical debate gives space for the question whether the still fuzzy and transient nature of NIS should also include a discussion about a more human oriented systemic approach, with a less governance and managerial oriented and a more self-organised viewpoint on how the innovation environment is generated and developed.

Different aspects of national innovation system have been of interest to researchers. Miettinen (2002) analyzed the meaning of NIS in different studies and grouped them to those reflecting the *transitions from a linear into an interactive conception of innovation* and to those *attempting to understand the nation-specific factors* that cause differences in economic development between nations. Additionally, he identified those attempting to measure the effectiveness of national systems to define NIS as a social system, and those attempting to develop the notion of NIS as a foundation for a new, holistic, innovation policy, by connecting it to broader concepts, such as learning society and social capital.

In addition, Niosi's ((2002) definition of a national system of innovation is stressing the hard side (technology and economy) of the system. His definition provides the human being a role as a knowledge bearer, but not as a subject of the knowledge and innovation creation. His definition synthesizes the interaction between various institutions and activities in the following way. National innovation system is "a set of interrelated institutions; its core is made up of those institutions that produce, diffuse and adapt new technical knowledge, be they industrial firms, universities or governmental agencies" of which their links consists of *flows: "knowledge, financial, human (people being the bearers of tacit knowledge and know-how), regulatory and commercial*." (Miettinen (2002), 129).

In order to understand the true nature of non-linear innovation, the concern of other researchers is quite different, namely that the relationships between the system's various *components should be allowed to develop and emerge freely*. Begun ((1994) argues that, "methodologically, chaos and complexity theory teach us not to force relationship to fit linear models and not to label deviations from linear models as error or unexplained variance. Instead, we should assume that most systems do not and should not fit linear models, and it is dangerous to use methods that require us to do so." (Ståhle (2003), 42)

In order to illustrate different disciplinary sources of the systems approach, Miettinen analysed various ways of studying innovation networks and systems. He distinguished six levels of units of analysis for studying innovation-related network interactions (table 14). He used this typology to crystallise his own view of what kind of research is needed (instead of trying to understand the entire system at once). Therefore, he argued that, "understanding both the innovative activities and well-focused policy measures requires the study of innovation processes and the development of networks related to them (level 2), as well as the study of personal professional networks, which constitute an individual source of knowledge and know-how that can be used during an innovation process (level 1)." (Miettinen (2002), 37)

Table 14 Units of analysis within which innovation-related network interactions have been studied (Miettinen (2002), 35)

1. **"Personal communication networks:** communication networks in R&D laboratories (Allen 1977, Rogers &Kincaid 1981), networks of managers (Ostgaard & Birley (1996)); intentional networks (Nardi & al. (2002))
2. **Innovation or product-specific networks:** networks of actors who are participating in the construction of product or a new technology (Callon (1986), Law and Callon (1992), Latour (1996), Miettinen et al. (1999), Van de Ven et al. (1999), Biemans (1992))
3. **Interorganizational and interfirm networks:** interoganiszational contract-based relationships within the firm (strategic alliances, supplier networks, R&D contracts etc.): When related to innovations they are called "*networks of innovators*" (De-Bresson &Amase (1991), Hagedoorn (1995), Powell et al (1996))
4. **Regional networks, production networks** (Silicon valley, Third Italy), (Saxenian (1991, 1996), and Sabel (1989)) **regional systems of innovations.**
5. **Industrial clusters** (Porter (1990), Hernesniemi et al. (1995))
6. **National innovation systems** (Lundvall (1992), Nelson 1993)"

Furthermore, Miettinen (2002) concluded, that the methodological attitude towards the use of NIS has shifted. It has shifted from the scientific idea of defining the determinants of innovation and systemic development to *more moderate attitude to understand the particular historical and local circumstances of policymaking, the quality and mechanisms of interaction, and to recognize the bottlenecks and comparative benchmarking of policy means and practices.*

Miettinen et al. ((2002), 130-131) furthermore analyses the research in the following way: Research is theorizing technological and economic change and innovations (Ziman (2000)) and work on innovation activity and its central mechanisms. The sociology of economic institutions is focusing on the dynamics of social relationships and trust in economic activity (Granovetter & Swedberg (2001)) and regional studies on the spatial dynamic of technological and economic development (Storper (1997)). Sociology of science and technology is

focusing on knowledge creation and diffusion in laboratories and networks (Latour (1988)). Studies of learning in working life and in organizations are analyzing distributed and organizational expertise (Engeström (2002)) as well as learning and change in organizations and innovation networks (Engeström & Escalante (1995), Miettinen et al. (1999)).

Different viewpoints on the systemic approach on system-of-innovation. It is also important to pay attention that there is an *academic disagreement on the usefulness of the holistic approach on national innovation system*. Miettinen (2002) stressed that the attempts to theoretically substantiate the systemic nature of any national innovation system have constantly been in trouble and may be waning in importance. Edquist ((1997), 1 and 15 in Miettinen (2002), 47) however characterized the systems approach in innovation studies in the following way: "If we want to describe, understand, explain – and perhaps influence – the process of innovation, we must take all important factors shaping and influencing innovations into account. The systems of innovations approach – in its various forms – is designed to do that […], we will, for the time being, specify system as including all important determinants of innovation…"

Miettinen (2002, 47) argues that the holistic, comprehensive approach to NIS represents scientific hybris. "A dream of understanding and mastering all the factors influencing the technological change and including them in one systemic model is an expression of modern scientism".

Contrary to Miettinen, other scholars like Ståhle (2004), Maula (2004), or Jackson (2003) recommend the holistic approaches, especially systems-of-innovation approaches, to be used in understanding the complex relations between innovation and its operative environment. Modern organizations operating in the global and quickly changing world, which is difficult to anticipate, require wide understanding of the "big picture".

Ståhle ((2004), 222) argues that both companies and public organizations are facing the same challenges to increase productivity, quality and innovativeness at the same time. To be competitive and enhance continuous development and capabilities for radical renewals is required for both companies and nations. She (ibid., 222) states that, "the need for renewal has been recognised but too little research exists about practical requirements for renewal". In order to manage the complex and multidimensional reality, Ståhle applies systems thinking in her research.

In addition, Maula (2004) argues in favour of the systemic thinking, when trying to simultaneously match productivity and creativity in the organizational context. Commonly, productivity and creativity are considered as opposite phenomena that are difficult to combine. Nevertheless, the development in real life enforces more research on how productivity and creativity operate in organizations and business ecosystems: How do they appear simultaneously? What is the level of their interdependency? And how do they complement each other? With these questions in mind, Maula criticises the simple, one-dimensional research models by writing: "The models used to describe and understand how organizations operate, learn and renew are too simple compared to the true complex nature of these phenomena". (Maula (2004), 266)

In order to widen the narrow economic and productivity driven approaches to innovations systems, scholars have also stressed the importance of culture. Kainulainen ((2004), 190) points out that concepts of economy and culture have traditionally been considered mutually incompatible. However, recent research by, for example, Florida (2002) and Landry (2000), shows that flexible and holistic theoretical and methodological approaches are needed to be able to understand the *processual, multidimensional and hybrid relationship between creativity, culture and economy*.

As stated earlier, this study is using the systems-of-innovation approach to discuss the creative and entrepreneurial individuals' experiences and views of

innovation systems' inputs and outputs and the various subsystems possible facilitators and bottlenecks, especially during the transformation processes. A deeper look at the NIS throughout an example of Finland will take place next. The example of Finland has been chosen because of two reasons. First, because of the conceptual reason, Finland has been one of the leading countries in using successfully the strategy based on NIS. Second, because most of the data of this study comes from Finland and refers to the Finnish NIS and RIS.

2.3.2.3 Finnish system-of-innovation

System-of-innovation in Finnish national innovation policy

The discussion about innovation policy started as early as in 1970's (Rothwell (1986)), while the industrial era was still ongoing, but signs of the knowledge era were already emerging. The aim was to promote innovations by integrating science-, technology- and industrial policies. From the OECD countries, Finland has been a forerunner in the use of concept of NIS whilst composing and implementing the innovation and competitiveness policy (Miettinen (2002), 52). Finland adopted the concept of national Innovation system (NIS) as a basic category of its science and technology policy. In its 1990 review, The Science and Technology Policy Council of Finland took the concept as a starting point and gave it the following definition, which stressed the role of the notion when analysing interrelationship between the factors affecting innovation creation. "A national system of innovation means a whole set of factors influencing the development and utilization of new knowledge and know how. The concept allows these factors and their development needs to be examined in aggregate. In addition, it offers a framework for analysing interrelationships between different factors. These relationships are relevant to general development capability and they have proved to be essential for the creation of new innovations." (Miettinen (2002), 12).

According to Miettinen, in scientific and innovation policy discursion, there has been an interesting confusion and a widely spread misunderstanding concerning the linear innovation. The OECD was a key player when discussion about linear innovations took place. The idea behind innovation policy and innovation policy research was that interactive and systemic innovation approaches would replace the linear innovation model (Kline 1985, Kline and Rosenberg 1986, Rothwell 1992 in Miettinen (2006)) interestingly, according to Miettinen (2006) nobody had specifically suggested or presented linear model for innovation generation. However, in the 1980's innovation researchers, partly subconsciously, started to refer to the misguided linear character of industrial innovation and the official classification in statistics confirmed this mistake. In the 21st century, researchers' like Edgerton (2004) and Godin (2005) have questioned whether it is justifiable to speak about a uniform linear innovation model. According to this model (Kline, (1985) and Freeman, (1996)), innovation starts from basic research, and through applied sciences it proceeds to development work, which will create e.g. a new product. The discussions on the linear versus nonlinear nature of innovation, as well as the role of knowledge creation and science-industry collaboration have also been well represented in Finland.

Firstly, innovation policy was based on the idea of science and technology as the drivers of economy. Knowledge, research and product development have been seen as the key factors for wealth and wellbeing of any nation in the global economy. In this respect, Finland is not an exception. On the contrary, the change from an agrarian society throughout the wood processing industry and mechanical engineering industry to a knowledge and technology driven society has been rapid, and this very goal has been written with deep consensus in numerous industrial and innovation strategies. International competitiveness and innovativeness indexes from the last ten years have been considered as proof of the successfulness of these strategies and of the national innovation system in Finland. However, contemporaneously, various researchers, managers and politicians have warned about being too content with ones success. In the most recent (2008) national innovation strategy, criticism and warnings seem to be

taken into consideration, and the new and more human centric strategy aiming at an agile and self-renewable innovation ecosystem of Finland as a part of the global environment has been launched.

Along with the established technology centres and centres of excellence, concepts of learning, creative regions, as well as co-creation of knowledge and innovation have been adopted in Finland's most recent innovation strategies. Lately a new concept of Living Labs (LL), by Professor William J. Mitchell, of the MIT Media Lab and School of Architecture, has become widely used in Finland. Hence, human centric (or end-user driven) innovation aims at strategic agility. (see CKIR (2008)). Interestingly, these thematic or regional ecosystems have proved to increase agility, and the worldwide network of these ecosystems has quickly created a cross-cutting apparatus to integrate small innovative communities, cities, regions or nations to other units and levels, sharing the same interests in the supranational innovation ecosystem. (CKIR 2008)

Miettinen et al ((2006); (1999)) reminded about the specific challenge of a small and remote country, like Finland, namely the lack a developed venture capital market like, for example, the one existing in Silicon Valley. Bring Silicon Valley inside your organisation or region(Hamel (2002), 272), refers to the opportunity to learn from examples. However, scholars like Miettinen (2006) and Hämäläinen (2007) warn about copying any model as such, but encourage contemplating how the regional and international collaboration can be connected.

Finnish innovation policy papers describe and consider the Finnish innovation system as an example of a Triple Helix–model. Both the concept of national innovation system and regional innovation system has been widely adopted among organisations and people involved with innovations. The axiomatic nature of the innovation system and triple helix in the innovation policy implementation as well as in the innovation research has been, however, criticized by Miettinen and his innovation research team (Miettinen et al (2006) and Miettinen (2002).

Miettinen (2002) argues that these concepts are “loose” and lack scientific preciseness.

How does the Finnish national innovation system perform?

The idea in Grounded Theory building is that the contextual conditions that shape the nature of situations, circumstances and problems to which people respond will taken into consideration from the most macro to the micro level. As major part of the data of this study has been collected from Finland, Finland will be used as a case country, to analyse the National Innovation System and its output and impacts. Finland, and its metropolis Helsinki, will be compared with other countries (Sweden, UK, US, France, Ireland, Portugal, Japan), from which part of the data of this study was collected. In conclusion, this section compares the elements of the Finnish innovation system with the earlier discussed theoretical models.

Sabel and Saxenian (2008) pointed out that, “Finland is quickly becoming a *victim of its own success*”. The authors (ibid.) claimed that, “Finland *led the world*, along with Silicon Valley, in the transition to the “information society” (Sabel and Saxenian (2008), 122). They also emphasized that, there is a need for further steps towards much more sustainable development of Finland’s public and private sectors. “One crucial step towards doing this is surely for Finland to go beyond the current flurry of program creation and take the lead in exploring what a post-national system of innovation could be.” In addition, “If the national system of innovation, along with its counterpart at the EU level, is in crisis, as we believe it is, then the task for scholars, policymakers, and companies, is to develop institutions that encourage adaptation and learning instead of inertia and entrapment. In this way they can support firms in more open searches for customers, partners, and suppliers that can help define innovative and unanticipated new technologies, products, and industries” (Sabel and Saxenian (2008), 122).

Sabel and Saxenian ((2008), 5) thoroughly discuss the *trap of success* and Finland's efficiency improvement and incremental developments, which may result to the loss of Finnish industrial competence. Despite the continuation on optimizing the performance of the technology and processes, which Finnish companies recent success has depended on, Sabel and Saxenian (2008), 18) call for Finland's national system of innovation to play an important role in addressing "*the shift from optimization to transverse exploration*".

In the last decades Finnish firms in the forest products and telecommunications industries have become *world leaders* (Sabel and Saxenian (2008), 5, 13). In addition, Castells and Himanen (2002), had pointed out that Finland has uniquely created a *virtuous circle* out of its *information society and welfare state*, through the continuous finance from successful information society, whereas the state creates well-educated people in good shape for the information society's continuous success (Sabel and Saxenian (2008), 21). Sabel and Saxenian (2008), 13) have however, pointed out that, this success may be sustained for the future, only if the industries in these sectors could *concentrate in innovating radically*.

Furthermore Castells and Himanen ((2002), 141) introduced a model (figure 30) and pointed out that, the Finnish model of information society is a "*self-reinforcing process*", which comprises of "dynamic relationship between business and society" mediated by state. The major source for the social stability is "a society of citizens/workers protected by the state and anchored in its identity" (Castells and Himanen (2002), 146). The scholars (ibid., 46) have referred to ICT "hackers" to portray the people who prefers to take a role in realizing their creative passion. The role of *an individual* has been pointed out in various ways, especially when portraying that, an individual is the first spot, from where ideas are originating (ibid., 46, 76, 99).

Apart from the hard elements in support to innovation, Castells and Himanen (2002) outline the importance of the *softer elements of society*, like national

identity, social stability, social homogeneity, and values, in support to the inter-relatedness of Finnish model of the information society.

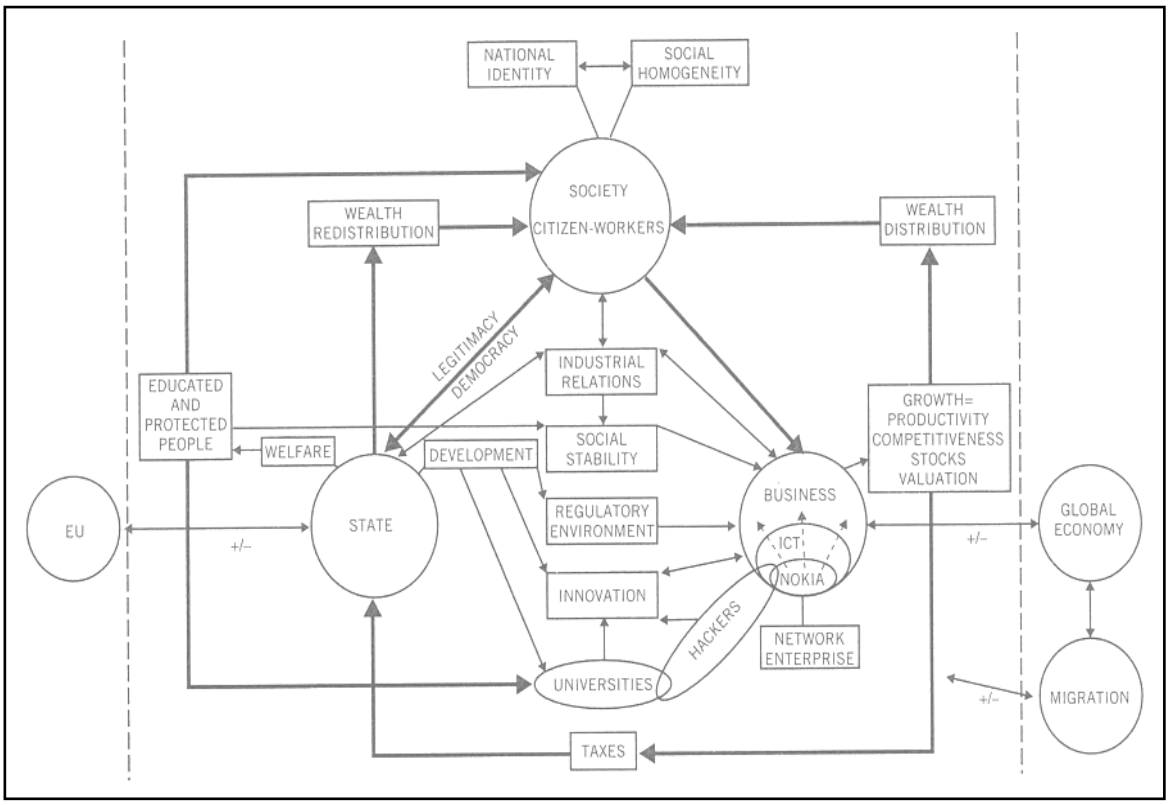


Figure 30 The Finnish Model of the information society (Castells and Himanen (2002), 142) (Arrows indicate the dynamic feedback loops between different elements. Some arrows represents negative feedback, and thus marked by a minus sign)

Figure 31 illustrates the latest idea of the key elements in Finnish innovation strategy. If comparing figures 30 and 31, it is evident that in the more resent figure the *individual* has turned more apparent. However, the more resent strategy does not in writing give as detailed explanation about the individuals' role.

The Finland innovation strategy (2008) (Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008)) defined innovation as an exploited, competence-based competitive asset, which, in addition to the application of technology, can be founded e.g., on new service and business models, working and operating

methods, or in the management of product concepts and brands. (Finland innovation strategy (2008), 2; Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008), 3)

The strategy suggested interaction between top down ("a national level definition of needs") and bottom up ("operator-level customer-oriented preparation of implementation") systems, since that would provide better opportunities for systemic and sectors crosscutting innovations. Top-down and bottom-up systems integrated together, have been considered important in achieving innovation of the highest social significance since it involves different operators and administrative branches (Finland innovation strategy (2008), 40) and Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008), 35).

The strategy sets out the following four fundamental aspects as illustrated on figure 31, the borderless world, the demand and user orientation, innovative individuals and communities, and systemic approaches (Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008) 15). These aspects clarifies the importance of the global networks of companies, ability to realise the needs of the citizens, knowledge of individual in requiring sufficiency of different phenomena on aspects relating to creativity, and the global challenges responsible for innovation policy (Finland innovation strategy (2008), 19; Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008), 15-19)

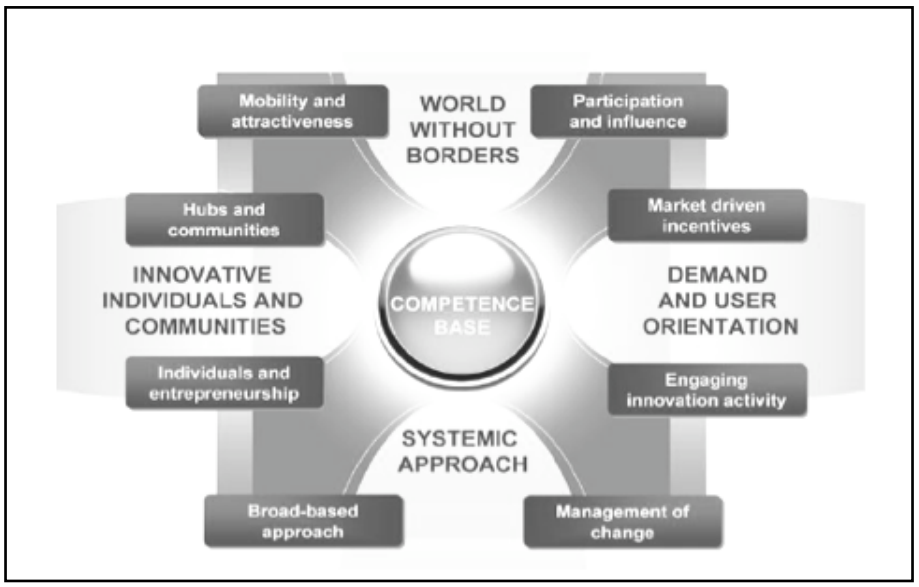


Figure 31 The basic choices and focus points defining the structuring of the action plan. (Finland innovation strategy (2008), 19; Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008), 15)

Castells and Himanen ((2002), 74-75) have outlined the *key elements* of the Finnish innovation system which turned the economy around after the recession in 1990s. These elements are:

- "An active public policy of innovation based on high investment on research and development under the guidance of the Science and technology Policy Council."
- "Business innovation, which is encouraged by public action but which is ultimately based on the company's ability to recruit, keep, and use its talented R&D people, providing the necessary financial basis for turning Innovation in to products through markets mechanisms, and a company's culture of innovation."
- *"Hacker innovation,* which is driven by talented individuals, who are often supported by public systems such as free universities and student grants, and has the hacker ethic and its innovation culture."

Notwithstanding, Finnish innovation system has been supported with different *key institutions* (e.g. STPC, Tekes), in enhancing dialog and interaction, among companies, public sectors, and knowledge creation and knowledge transfer

institutions. The Science and Technology Policy Council (STPC), which is lead by the prime minister, created a horizontal, public-private-university collaboration and dialogue at the national level (Castells and Himanen, (2002), 50-51; Sabel and Saxenian (2008), 68). The Finnish Research and Development Fund (Tekes) "along with Finland's universities and polytechnics, were the key institutional foundations for this national innovation system" (Sabel and Saxenian (2008), 111).

The Finnish *information society relies on well educated citizens*; however, concerning the history of the country, the education system does not have a very long history in the terms of public inclusion. The Finnish *higher education* had expanded rapidly in the 1990s, with the remarkable number of graduates especially in the top five engineering programs, whereby it doubled between the years 1986 and 2006 (Sabel and Saxenian (2008), 69).

With regard to entrepreneurship "the amount of *entrepreneurial activity* and corporate spin-offs ranks among the *lowest* in the OECD." Furthermore, "in spite of many favourable conditions, only 4.9% of the Finnish working age population was involved in new or emerging firms, compared to 12% in the leading countries for total entrepreneurial activity. This is what may be associated to the so-called "Finnish Paradox" (Sabel and Saxenian (2008), 116). The renewal of the financial and service system, especially the service system for the *growth companies will be developed as a whole*, in promoting the growth of entrepreneurship (Finnish innovation strategy (2008), 14; Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008), 30). This strategy stresses the importance of experienced capital investors, business experts, and corporate taxation and legislative measures especially concerning insolvency and bankruptcy and other related legislative measures. Himanen ((2007), 34) refers to the "Competitiveness paradox", when discussing Finland's middle class economical results based on the world leading innovation potential.

According to Sabel and Saxenian ((2008), 16) Finnish firms and public sector created the "*endowments*" that seem to sharply reduce the risk of crisis. The accomplishments include the following: 1) the firms in key sectors reached the world's technological frontier, 2) ensemble of university and industry laboratories and other institutions supporting the firms' created the most effective EU innovation system in the world, 3) The country is a leader in the development of the EU innovation system, 4) reformation of financial markets, 5) recognition of the country's K-12 public schools, reliably producing the largest share of all countries of top performers and the smallest share of low performers, and 6) "Finland also regularly scores at the top of the World Economic Forum's Global Competitiveness Index, which attests the prudence of its macroeconomic management, the independence of its judiciary, and the general efficiency and incorruptibility of its public institutions." Hence, they conclude, "Finland is as robust and adaptive as a modern economy can and need be."

Apart from the above mentioned achievements, and due to the risks facing the ICT industry, *rethinking innovation policy* in Finland has been reflected from "the changes of governmental structures and policy in 2007 and 2008". The new ministry of employment and economy had been formed in 2008, with responsibility on "employment, regional development, industrial policy, innovation and technology policy, energy policy, and competition policy" (Sabel and Saxenian (2008), 118). Furthermore, the important points have been noted on the "new focus on industrial sectors, or clusters" and the "increased attention to the development of regional capabilities" (Sabel and Saxenian (2008), 118). However, the scholars do not believe on the sufficiency of the ideas in preventing the "economic shocks to the large established Finnish corporations in forest products and ICT in the coming years" (Sabel and Saxenian (2008), 118). The outcome of the redefinition is under examination as to whether there will be an open up for new resources of knowledge and expertise among domestic firms and their partners (Sabel and Saxenian (2008), 121).

In Finland, the development of the ICT sector and the information society is highly interconnected. Castells and Himanen ((2002), 44), stressed that "*Finland's economy is partly driven by Nokia's innovation and competitiveness,* but they are both dependent on a World of Global networks in which their ties, for the time being represent a major asset both for the company and the country."

Daveri and Silva (2004) (in Sabel and Saxenian (2008), 114), have pointed out that, "Nokia was responsible for some 40 percent of total R&D spending in Finland in 2002 and held title to 70 percent of Finnish patents issued in the US, up from 40 percent in 1997". During the resent years, Finnish companies all together have increased their input to the R&D, and they represent 72% of the national overall R&D input (Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008). The resent low share of public funding has been considered to jeopardize the continuation of risk bearing and new knowledge creating R&D (Valtioneuvoston innovaatiopoliittinen selonteko Eduskunnalle (2008), 37).

Finland's *telecommunication history grew* out of "telephony and later radio engineering." The highly *decentralized and competitive market,* kept open to foreign telephone equipment manufacturers shaped the telecommunication sector. Apart from creating competitive pressure to the emerging manufacturers, it also enabled the local manufacturers to have an access to the most advanced technology. Early capability building was based on Finland's military effort in the 18^{th} and 19^{th} centuries because of the dominance of Sweden and the Russia. As a result, Finland was the first European country to establish domestic telephone in 1877 just a year after Bell patented the device. (Sabel and Saxenian (2008), 51, 57)

During the pre 1970s, the role of the state deregulation and open market for competition decentralised telephone network. Public owned companies were entrepreneurial and invested heavily in communications infrastructure in 1970s, furthermore the informal scientific and engineering community among

radiotelephone industry, universities, ministry of defence, and railways played on important role. Interestingly, in 1990s, the Finnish ICT firms got well-educated engineers, scientists and design talent whose salaries were one-third of those in Silicon Valley. (Sabel and Saxenian (2008), 56-58, 70)

The telecommunication sector benefited from the "extensive financial support from the state" and from the horizontal collaboration between public research institutes, state technology agencies, universities, colleges, and private firms (Sabel and Saxenian (2008), 51). Moen and Lilja (2005) found the close collaboration of Universities and industry successful in Finland, from the World ranks in technological and research collaboration (Sabel and Saxenian (2008), 71). This collaboration portrays the triple helix model of university state and industry especially in the ICT field.

Take Nokia for an example, its competitive advantage lies in a "highly optimized manufacturing system that combines logistical excellence with the efficiencies of large-scale production" (Sabel and Saxenian (2008), 75). Despite being the state led investment of 1980s, and the National innovation system of 1990s, it has been collaborating with the public research universities (Sabel and Saxenian (2008), 74). Its collaboration with the universities however, had not portrayed a true research partnership; rather projects were more like contract work (Sabel and Saxenian (2008), 79-80).

Sabel and Saxenian ((2008), 115-116) in their report claimed that the Finnish ICT industry is characterized by "dearth" of the small and medium enterprises (SMEs). One can therefore assume that, there is a need to enhance a better collaboration among the firm (Nokia), and the rest of the economy. This may enhance the emergence of the SMEs from the support that is born through inter-firm collaboration.

Nokia is aware of the dangers of entrapment (trapped with success) and has in some extent succeeded to relax its constraints (Sabel and Saxenian (2008), 82).

It faces fierce competition from producers in both emerging and advanced markets regardless of maintaining its profitable status (Sabel and Saxenian (2008), 111).

Notwithstanding, Sabel and Saxenian ((2008), 81) have stressed that, by placing "software and services at the core of Nokia's research and strategic direction, it does not clearly resolve the challenge of managing an organization that simultaneously pioneers innovative, breakthrough high end services and software, while also reaping the benefits of economies of scale in "emerging markets, multimedia and enterprise-featured phones". These goals demand different organizational incentives and business models."

The performance of the Finnish innovation system is evident if looking at the history. Only a few generations ago Finland was a *poor agrarian society* dependent on its forests in international trade. The "Finish society has strong ties of identity and communal feelings based on its history of survival" (Castells and Himanen (2002), 146). First, Finland was part of Sweden, and then (from 1806 to 1917) part of Russia and finally since 1917 as an independent country.

Biological, economical, political and cultural survivals have been, according to Castells and Himanen, the key drivers of the Finnish national culture. Biological survival refers to the fact that in the cold climate, more people have died of hunger than in wars, *approximately 120,000 Finns (or 6.5% of the population) died of hunger* (1867–1868). Still, in the early 1950s, agriculture provided a living for half of the population (Castells and Himanen (2002), 129). Fight for economical survival has continued in the country's history until 1980s, and still, in the beginning of the 1990s it suffered from a deep depression.

Struggle for political survival has continued first as part of Sweden and Russia, and then during the WWII what concerns the political relationship with Soviet Union and Germany. Still in 1984s, when the European science and technology network Eureka was established, Finland's participation was questioned in the

West, because of the *Agreement of Friendship, Cooperation, and Mutual Assistance*, also known as the YYA Treaty with the Soviet Union. Finally, the cultural survival and identity become possible at the end of 19th century when Finnish language replaced Swedish as the main cultural language. (Castells and Himanen (2001))

These survival elements can be seen as *bifurcation points*, which developed the national identity and tradition of consensus decisions. They have also affected the innovation culture as well as the attitudes towards future.

Castells and Himanen ((2002), 131-132) refer to Finland as a more future oriented country than most of matured nations. They (ibid.) furthermore, describe Finland as a technology oriented nation, which because of its climatic conditions was among the first nations in the world to adopted technologies, like electric lights and telephone.

Apart from Finland's history and technological competence, Himanen ((2004), (2007)) has portrayed the importance of the *enriching community* in furthering creativity. He has emphasized on the big challenges related to the fast changing information society, whereby the routine production jobs are declining while the importance of the symbolic analytical work, which bases on creative problem solving and personal-service work is increasing. With the "*Finnish competitive paradox*", he refers to the good R&D input with an average economical output.

According to Himanen (2007), *enriching community* enables the Society or its subsystems, to realize their creative passion; it furthermore highlights the importance of a more cooperative working culture. The environment that contains values such as caring, confidence, communality, encouragement, freedom, creativity, courage, visionary, balance, and meaningfulness, could serve as the basis for the continued combination of the welfare state and the information society. According to Himanen (ibid.), the experience of omnipotence or impotence is related to all incidence of interaction. Therefore,

he highlights the importance of emotional energy related to psychological experiences listed on the right hand of the figure 32. Himanen (2004) suggests economical reformation based on extensive creativity due to the emotional energy that is generated by people who value their work and to the collaboration among strong and modern spearheads and the newly emerging sectors.

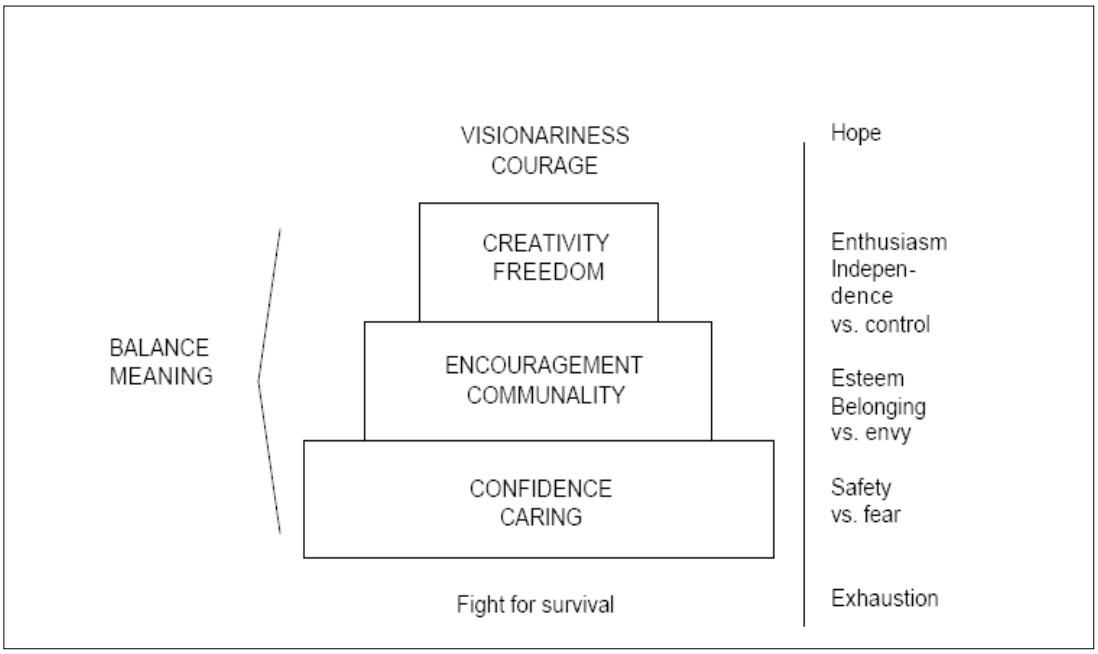


Figure 32 The Pyramid of values from the psychological perspective (Himanen (2004) 8)

Finland innovation strategy highlights the change from science-technology driven innovation to the variety of sources of new knowledge and the role of arts and nature. The innovation strategy ((2008), 13; Valtioneuvoston innovaatiopoliitinen selonteko (2008), 4), emphasised "the significance of individuals, enterprises, public operators and user communities as producers of knowledge and competence, alongside the academic world of research" as well as "the arts and nature" as the sources of experiences and new ideas when discussing about the broad based innovation policy.

The idea of new sources of knowledge and expertise is additionally supported by Sabel and Saxenian ((2008), 121). However, Sabel and Saxenian claim for

concrete measures. The concern on the need to bridge the gap between the current success and the substantial long-term change has been emphasized in order to avoid the disparity. They argue that “in the leading firms and in the public institutions which support and surround them, the efforts at reorganization needed to bridge the gap between the kinds of collaboration that make for success today and the kinds needed to flourish tomorrow are hesitant and uncertain.” (Sabel and Saxenian (2008), 14)

Next part of this section concerns the ***results and impacts***, specifically the ***competitiveness*** of the national innovation system and regional innovation system of Helsinki metropolis. The analysis is through different qualifications that different key organization such as Organisation for Economic Cooperation and Development (OECD), World Economic Forum (WEF), World Wildlife Fund (WWF) and Programme for International Student Assessment (PISA), have outlined for eligibility of a competitive nation or region.

Scholars like Saari ((2006), 43-47) agree that Finland’s success is good in different international indexes and comparisons, and the nation is *at its best in competitiveness, sustainability and transparency*. Finland gets relatively poorer results concerning economical freedom and quality of life, however even in these indicators Finland is among the best 15 nations.

The Nordic countries (with an exception to Island), U.S., Canada, Australia, and sometimes The Netherlands are among the world leading countries in many of the indicators. According to Saari ((2006), 49) *Nordic countries represent a society model which has a capacity to reunite competitiveness with social development*. They furthermore adopted the sustainable knowledge society better than many other countries. Based on World Value Survey, he (ibid.) states that in these countries a high confidence in public sector and fellow men is a characteristic.

Competitiveness indexes measure governmental policies from the point of view of companies and industrial life. The World Competitiveness Index (WCI) by World Economic Forum (WEF) is the leading competitiveness measure. In 2005 WCI, Finland ranked first out of 104 countries, (later in 2007 and 2008 Finland has ranked in the sixth position). In Business Environment Scores Finland ranked seventh (year 2005, N=60). This index measures companies' operational preconditions, like political and institutional environment, industrial policy, and institutional environment.

With other indexes, a more versatile picture of the impacts of the system of innovation is possible. Considering environmental issues, (Environmental Sustainability Index by the University of Yale) Finland was the leading country (year 2005, N=74). The Networked Readiness Index Rankings by the World Economic Forum evaluates nations' capabilities to adopt and utilise the knowledge society. In this index, Finland ranked third (year 2005, N=104). With regard to Composite Risk Rating index, which evaluates countries' political and economical risks from the investors point of view Finland was placed on the sixth position (year 2004, N=140).

Finland ranked 15th position (year 2005, N=177), in the United Nation's Development Index, based on life expectancy, literacy and gross national product. UN index is an established way to measure social development, and it has been compared with the competitiveness indexes.

In the Quality of Life – index, Finland ranked 12th (year 2005, N=111). This index has been developed by The Economist, and it relies on statistics about standard of living, health, participation, and safety of employment. Furthermore, Finland was the fourth (year 2000, N=102) in the World Index for Social Progress; the index which is based on variety of variables like education, health, economy, or population. This index has been considered as one of the most well known indicators measuring social development and wellbeing.

In the Transparency – index (year 2002, N=102) Finland appeared as the less corrupt country, and the Index of Economic freedom, which analyses companies' operational preconditions, Finland had ranked on fifteenth position (year 2005, N=58).

OECD's Programme for International Student Assessment (PISA) index, evaluates the youngsters' knowledge and know-how in mathematics, problem solving and literacy. Finland has been doing well in this evaluation. (Saari (2006), 43-47)

With regard to The Living Planet Report ((2008), 14), the measures for ecological footprint ranked Finland 16th, preceded by United States (2nd), Ireland (10th), and the United Kingdom (15th) (N=74). This index "measures humanity's demand on the biosphere in terms of the area of biologically productive land and sea required to provide the resources we use and to absorb our waste"

Table 15 Finland, Sweden, Great Britain, United States (US), France, Ireland, Portugal and Japan in different indexes.(modified from Saari (2006) 47-48 and 50; (2) Wold Economic Forum (2008), and (5) Living Planet Report (2008))

	Finland	Sweden	Great Britain	US	France	Ireland	Portugal	Japan
(1) Wold competitiveness Index (2005)	1	3	11	2	-	-	-	9
(2) Wold competitiveness Index (2008)	6	4	12	1	16	22	43	9
(3) Business Environment scores and ranks (2005)	7	11	8	3	13	10	-	-
(4) Environmental sustainability index (2005)	1	4	-	-	-	-	-	-
(5) Ecological footprint per person (2005)	16	18	15	2	21	10	28	22
(6) The Networked Readiness Index (2004)	3	6	12	5	-	-	-	8
(7) Composite risk rating Index (2004)	6	7	-	-	-	12	-	13
(8) United nation Development Index (2005)	13	2	12	8	-	10	-	9

(9) Quality of life (2005)	12	5	-	13	-	1	-	-
(10) WISP Index of Social progress (2000)	4	1	9	-	12	13	-	-
(11) Transparency International corruption perception index (2002)	1	6	-	10	-	-	-	-
(12) Index of Economic freedom (2005)	15	14	6	13	-	5	-	-
(13) Gender gap Ranking (2005)	5	1	8	-	13	-	-	-
(14) Government effectiveness (2005)	3	-	8	-	11	-	-	-
(15) Pisa; mathematics (2003)	3	-	-	-	-	-	-	7
(16) Pisa: problem solving	4	-	-	-	14	-	-	5
(17) Pisa: literacy	1	8	-	-	-	7	-	14

Also Castells and Himanen (2002) considered that Finland has been performing well. With regard to *productivity index* (Etla (2001), Finland scored 99, behind the United States (100), whereas in the percentage of R&D investment per GDP (IMD (2001), Finland ranked 3rd (3.1%) ahead of United States which scored 2.6%, among others.

Alongside the scores, Himanen (2007) had portrayed that Finland invests only 5.5 Billion USD in R&D compared to the US which invests 312.5 Billion USD for the same purpose. Finland launched the plan to increase its R&D, investment percentage to 4% towards 2011. (Himanen (2007), 33; Valtioneuvoston innovaatiopoliitinen (2008), 11)

Florida (2005) has made an analysis of the competitiveness of the region, based on their *creativity index* as well as the measure of creative occupations, called the *creative class*. As explained in chapter 2.3, Talent, Tolerance and Technology indexes are equally weighted in the creativity index. Whereas in the creative class, aspects relating to total employment, creative class average annual growth and the creative class percentage of the work force are considered in association with the Global Creativity Index. Concerning European Union countries the competitiveness and creativity has been additionally

discussed in Europe in the Creative Age and the results have been introduced in table 16. (Florida and Tinagli (2004)).

Table 16 The EU member states and USA competitiveness: The Euro-Creativity Index. (Florida and Tinagli (2004), 32).

	Finland	Sweden	Great Britain	US	France	Ireland	Portugal	Japan	
Points	0.72	0.81	0.52	0.73	0.46	0.37	0.19	N/A	
Creativity index	4	8	5	1	n.a	6	14	N/A	
Human capital index	6	7	3	1	11	10	13	N/A	Talent
Scientific talent index	1	2	8	3	5	9	14	N/A	
Innovation index	4	2	9	1	10	11	15	N/A	
High technology index	2	3	6	1	8	12	15	N/A	Technology
Research and Development	2	1	9	3	5	1	4	N/A	
Attitudes	3	2	8	n.a	11	5	9	N/A	
Values	5	1	9	13	7	15	14	N/A	Tolerance
Self-expression	10	1	6	4	11	7	15	N/A	

Finland, as other Nordic countries, has been performing positively in the Global Creativity Index, and especially in talent index: Finland ranks first out of the forty-five countries, whereas in technology and tolerance indexes, it ranks fifth and ninth, respectively. Finland's performance in tolerance index has not been as good as in the technology and talent indexes.

Sweden is a top-performer and Finland ranks third in both Euro-creativity and Global Creativity Indexes. Japan and United States maintain the position among the four best ones. With regard to the tolerance index, Finland's low performance rank can be seen in values and self-expression (table 16). Despite

the decline, Florida and Tinagli (2004) had stressed that, there is a distinctive competitive advantage for Finland, similarly to Denmark Netherlands and Sweden. However, there is a need for these countries to liberalize their immigration policies in order to become "more open for talents from around the world" (Florida and Tinagli (2004), 27- 28)

Florida ((2005), Florida and Tinagli (2004)) had considered the sub-indexes, which represented under Talent, Technology and Tolerance indexes. With regard to talent index, Human capital, Creative class and Scientific talent index were included. *The Human Capital Index* was based on the "percentage of population age 25-64 with a bachelor's degree or above (= degrees of four years or more)" based on OECD data. *The Scientific Talent Index* was based on the "number of research scientists and engineers per thousand workers", data from the European Commission. (Florida (2005), 144, 273, and Florida and Tinagli (2004), 42))

Nevertheless, Florida and Tinagli (2004), 42) have mentioned that, "Nation's differences in the educational systems may affect the comparability of the data". Alongside education, the ministry of finance through the summary report on Finland's competitiveness (2002) has mentioned Finland, as doing well: However, "the duration of the studies in Finland is long compared to the international average, and students embark on university studies fairly late". The report had suggested for the further improvement of the Finnish education contents and effectiveness for the education to be maintained as a real strength. (Ministry of Finance (2002))

Technology index Florida ((2005), 273) and Florida and Tinagli ((2004), 43) combines Innovation Index (patents), Research and Development Index and High-Tech Innovation Index. (The later has been included in the Euro-Creativity Index, but not into The Global Creativity Index). The *Innovation Index* has considered "the number of patents granted per million people," which has based on the data from the U.S. Patent and Trademark Office, whereby the *R&D Index*

measures R&D expenditure as percentage of GDP and is drawn from European Commission data and from World Bank. “The High-Tech Innovation Index is based on the number of high-tech patents per million people and is also based upon USPTO data.” (Florida and Tinagli (2004), 43)

Tolerance index, which was derived from the 1995-1998 World Values Survey, combined three measures: *The value index* “measures to what degree the country reflects traditional as opposed modern or secular values” (Florida and Tinagli ((2004), 27). Attitudes towards religious, God, nationalism, authority, family, women’s rights, divorce and abortion are the main considerations in this index (Florida ((2005), 274). *Self expression index* considers the degree on which a nation “values individual rights and self-expression” (Florida and Tinagli ((2004), 27, Florida ((2005), 274). Its essence is based on the attitudes towards “self-expression, quality of life, democracy, science and technology, leisure, the environment, trust, protest politics, immigrants and gays.” (Florida and Tinagli ((2004), 27, Florida ((2005), 274). *Attitudes Index* refers to “the percentage of population that express tolerant attitudes towards minorities” based on European Monitoring Center on Racism and Xenophobia, the Institute for Social Research Analysis 2001. Attitudes Index is included in Euro-Creativity Index but not in The Global Creativity Index.

The Lisbon strategy with its aim of making the European Union “the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion” by 2010, had given its evaluation based on the 27 EU member states. The evaluation aimed on assessing the extent of *competitiveness of the 27 EU countries*, in comparison to the international standard. This evaluation is different with indexes given by other organizations, for its survey was carried out among the “CEOs and top executives” in the countries concerned. Its results concern the business perspectives in relations to their relative performance and meeting Lisbon Goals. (Lisbon review (2008), 1) With relation to this strategy, few countries were making the progress, although the Nordic members, and such

as Sweden, Denmark and Finland have been in the lead (Florida and Tinagli (2004), 8; Lisbon review (2008), 2, 7).

The sub-indexes have comprised of Innovation and R&D, liberalization with network industries, financial services, social inclusion, sustainable development, and information society.

Finland ranked 1st on Improving the Enterprise Environment, Innovation and R&D as well as in sustainable development, whereby, increasing the social inclusion it ranked 2nd, (N=27). Furthermore, Finland ranked 4th in the creation of efficient and integrated financial services, and 6th in both liberalization, outperformed by Sweden (3rd) and network industries, outperformed by Sweden and France (4th and 3rd) (N=27). Regarding the creation of the information society Finland ranked 7th, outperformed by Sweden and United Kingdom: 1st and 5th respectively. (This evaluation did not include United States and Japan, as they are not members of the European Union.) (Table 17)

Table 17 Ranking and Scores of EU Countries (modified from Lisbon review (2008), 8).

	Finland	Sweden	Great Britain	France	Ireland	Portugal
Enterprise environment (2008)	1	7	8	13	2	16
Innovation and R&D (2008)	1	2	7	9	10	16
Liberalization (2008)	6	3	11	10	7	18
Network industries (2008)	6	4	9	3	16	12
Financial services (2008)	4	1	11	10	6	16
Social inclusion (2008)	2	3	15	14	10	18
Sustainable development (2008)	1	2	12	11	9	15
Information society (2008)	7	1	5	10	14	16
Final index (2008)	3	1	9	8	11	14

Competitiveness of Helsinki metropolis regional innovation system: Florida (2008) had pointed out that, polarisation between the regions has increased and "there are still at most two dozen places worldwide that generate significant innovation. These regions have ecosystems of leading-edge-universities, high-powered companies, flexible labour markets, and venture capitals that are attuned to the demands of commercial innovation - and there aren't many of them." (Florida (2008), 27)

Helsinki is referred to be a "home to Northern Europe's premier concentration of biotech and information science companies", a metropolis with the population that has self-confidence and managed to harvest the talent, as well as bringing excellence to their schools, and motivation to their own scientists and entrepreneurs. (Kao (2007), 68). One of the key drivers of the Helsinki Metropolitan area is the Otaniemi Science Park, where research and higher

education institutions' collaboration with companies is supported by the public sector.

The Economic Map of Urban Europe ((2007), 26) discusses the coordination among the municipalities in Helsinki region. "Regional level decision making concerning regional land use, housing, the environment, education, migration policy and other topical matters having strong regional dimensions presents a major challenge. However, in Finland municipalities are both strong and independent with respect to land use and provision of local public services. Currently, regional cooperation and decision making in the Helsinki region are based on voluntary, networking cooperation between the 14 municipalities and the state, without heavy regional bureaucracy or detailed legislation, which gives municipalities a significant scope for managing local initiatives. This will also be the basis for future development towards rational and more effective regional coordination"

In the comparative study of 45 European metropolises, the economic map of urban Europe (2007) presented different competitive comparisons of the European cities including Helsinki region. In this empirical study, which included 29 European countries (all 27 EU countries, Norway and Switzerland), Helsinki ranked on the 11th position among the 45 European metropolis, in the year 2006. Ranking is based on the Gross Value Added (GVA) per capita ratio. Finland's ratio is slightly over two times as high as the mean of the 27 EU countries (ibid., 24). Helsinki has been considered to be a productive and prosperous city (ibid., 16). Between 1995 and 2000, it was among the three fastest growing cities out of 45, with respect to population, GVA per capita, and employment growth. Despite its deterioration of the economy in 2001-2003, Helsinki had managed to regain its strength in the years 2004 onwards. (Ibid., 24) In addition to GVA, the Urban audit perception survey by EU (2008), 8) ranked Helsinki 11th (N=31 EU Cities), in the survey that was based on the local perceptions of quality of life.

The competitive ICT sectors, the expansion of the private sector and the vibrant property market have portrayed the economic prospects of the region (The Economic Map of Urban Europe, (2007), 24). “The Helsinki region has one fast-growing cluster, information technology, which is significant by international standards and supported by local universities and research establishments. The core of this cluster consists of Nokia built around an extensive and dynamic network of corporations in the same line of business. Other strong sectors in the region include shipbuilding, specialised business expert services, financing and insurance, the media, pharmaceuticals and hospital technology” (Urban Audit). According to Florida, cities are competing for smaller niches. Helsinki, driven by Nokia Corporation, is competing with other telecommunications headliners such as San Diego, Silicon Valley and greater Chicago, which are the headquarters for Motorola. (Florida (2005), 164-166)

Nevertheless, the location of Helsinki may look remote: a constraint that has “effectively been eliminated by sophisticated communications technology and a modern transport infrastructure.” The city, which is an International connection for the rest of Finland, has become “a major air traffic bridge between Europe and the Far East.” “A well trained labour force coupled with systematic investments in R&D and in other human capital has enabled considerable specialisation in high technology export products, in which the transport costs to the main market areas are not a crucial factor. […] Helsinki is located optimally both from the point of view of Finnish national markets and the markets of north-west Russia, Poland and the Baltic states” (The Economic Map of Urban Europe, (2007), 24-25).

Florida ((2008), 25) argues, that the global innovation (by patents granted worldwide), shows a world composed of innovative peaks and valleys. According to Florida (2005) Helsinki is as one of the 13 cities, which stand out, with an exception of metropolitan regions around Tokyo, Soul, New York and San Francisco who are the world’s leading innovation canters.

The combination of “strong technology and creative sectors with relatively low levels of inequality, good schools, low crime, safe streets, and high levels of social cohesion stability” are the favourable strengths for Helsinki competitiveness (Florida, (2005), 261). “Considerable investments in research and development both by the private and public sector are among the evident strength of Helsinki.” Basic research is mobilized to “the benefit of urban research and planning, and to bring feedback from these fields back into basic research.” These two facts together promote the dynamic and fruitful economic environment. (ibid, 25, 26)

Huggins et al ((2004), 25) write, "When it comes to competitiveness, this Northern metropolitan [Helsinki] area ranks the highest in Europe in terms of creativity, knowledge economy, sectoral productivity performance and economic performance." They furthermore claim that lifelong learning could favour the innovativeness of the Helsinki region by supporting people in all educational levels to develop their skills. The aspect of lifelong learning could equip the individuals with the knowledge suitable to conquer the fast changing environment and to capture developed techniques for the further innovativeness.

The macro contextual conditions of innovation, similarities and differences between the theoretical models and the Finnish innovation system

Previous section introduced the macro contextual conditions to which a great deal of the participants of this study respond when reporting their innovation related experiences. The main macro context relied on the *success of* the case-country of Finland, through its competitiveness in creativity and innovation aspects. Despite the best performance in evaluation statistics, it has been highlighted that Finland can run into the risk of being the *victim of its own success*.

To avoid the trap of success, it has been suggested by Sabel and Saxenian (2008), that the Finnish innovation system should support the transfer from optimization to transverse exploration and generation of radical innovation. Whereas the scholars and official documents thoroughly discuss the need of user driven innovation, interaction and various ways to promote the innovation environment, the origin of radical innovation however remained fuzzy. The documents concerning the Finland did not explicitly answer the question whether the future radical innovations are supposed to originate in science or in the market. However, the discussed material postulates that the answer relies in the combination of both the science and market.

The development story of the Finland's innovation system is about the existence and inter-dependence between *the hard and soft elements* of the system. It has been claimed that the reunion between welfare and information society has created the good bases for innovation. Various drivers of the system-of-innovation like science and technology, elements of open innovation and co-creation of knowledge resided in the various developmental phases of the Finnish innovation system. Development that is more recent has highlighted the human side of innovation and it suggested that the support of freedom of creativity, confidence and encouragement would lead to the successful experience of new ideas, as well as the identification of opportunities.

In addition to the analysis of the innovation context and its pragmatic pros and cons, it is the aim of this study to develop understanding on theoretical models and concepts. In order to realize the coherence between the different theoretical models of knowledge creation and innovation and the real-life innovation models of Finland and Helsinki, some of the features related to the facts and comparative results from Finland and Helsinki region will now be discussed.

Firstly, based on the comparison between the observations from the real-life facts and the theoretical models one can state that Finland's high investments

on R&D give an idea of a strong 'Science and Technology (ST) innovation model', whereby research and development has been the key for innovations during the past decades.

Secondly, more recently (table 16) the feedback from the market to the basic research has been highlighted, something that can be assumed to be a common aspect with Wessner's (2005) non-linear-model, as presented earlier in the (Figure 29). Furthermore, the recent Finnish strategy papers refer to the importance of entrepreneurial activities, which may be considered as another similarity between Finland's and Wessner's thinking about innovation ecosystems. So far, the number of knowledge based start-ups and growth companies have however, remained in a relative low level in Finland. (Making Finland a leading country in innovation (2005), Finland's innovation strategy 2008)

Thirdly, intensive collaboration among the universities and the market has been highlighted as one of the theoretical indications and practical strengths of the Triple Helix Model of Helsinki region and Finland. Furthermore, Finland's way of highlighting the aspect of collaboration can be seen as a parallel with the knowledge creation Mode 2. As discussed earlier, these theoretical models of Triple Helix and Mode 2 refer to the cooperation and co-creation of knowledge among the universities, business sectors and local public sectors. Knowledge co-creation can be perceived in the Helsinki metropolitan area as well as in Finland in general. The private sector participates in the governance and funding of the new Aalto University, which can be considered as a development of a hybrid university and industry model that will most probably further deepen the Triple Helix Model.

Fourthly, the latest innovation strategy (2008), stresses the importance of user oriented innovation and the role of human beings, which can be seen as indicators of the Doing-using-innovating (DUI) –model. The DUI -model has been referred as an experience driven model as an alternative for the STI -model.

As a conclusion, one can anticipate that, in spite of fact that, the official documents of the country and the region prefer to refer to the Etzkowitzian Triple Helix model common elements and similarities can be found between other theoretical models and the Finnish national and Helsinki region innovation systems.

Interestingly, alongside the hard, economic and technological emphasis, in addition the soft human oriented elements have appeared with time into the national and regional innovation strategy documents. The notions of innovation ecosystem, as well as the innovation community have often been used in the more recent documents. According to Saari ((2006), 343) the national system of innovation has been one of the core socio-political concepts in Finland after 1990. Saari (ibid.) pointed that, after the year 2000, it has been highlighted in Finland, that alongside with the technological innovation systems, social innovations, and renewal of the institutional structures are needed. The recent documents all stress the importance of systemic development in the innovation environment.

2.3.2.4 Knowledge creation and universities in the system-of-innovation

Relationship between knowledge and innovation was discussed earlier in chapter 2.1. In this section, knowledge together with the role of universities will be examined in the wider context of system-of-innovation.

In bringing an understanding of knowledge creation and innovation, there is a need to distinguish between tacit and explicit knowledge (Hakkarainen et al. (2004) see 2.1.4). Nonaka et al. (2000) had pointed out this distinction (in Hautamäki (2007), 3-4). “Explicit knowledge can be expressed in formal and systematic language and shared in the form of data, scientific formulae, specifications, manuals, and such. It can be processed, transmitted, and stored

relatively easy. On the other hand, tacit knowledge is highly personal and hard to formalize. Subjective insights, intuitions, and hunches fall into this category of knowledge. Tacit knowledge is deeply rooted in action, procedures, routines, commitments, ideal, values, or emotions. It "indwells" in a comprehensive cognizance of the human mind and body […] [T]acit knowledge and explicit knowledge are complementary to each other, and both types of knowledge are essential to knowledge creation." Hautamäki ((2006), 6) refers to the scientific, theoretical knowledge as deep explicit knowledge and summarizes the concepts of knowledge in the figure 33.

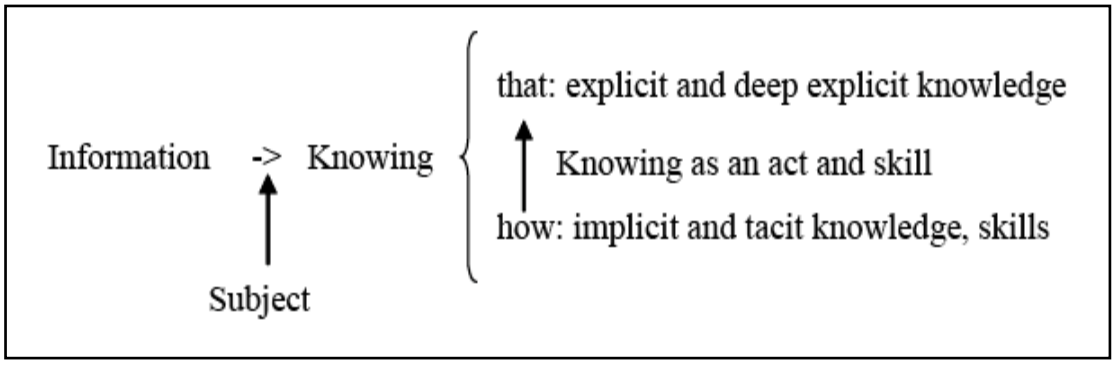


Figure 33 Information, know-that and know-how (source Hautamäki ((2006), 6))

The role of knowledge in the creation of innovation has been considered focal by researchers and policy makers. During the last decades, knowledge became most valuable asset for organizations and nations. The increasing commercial value of knowledge created a real gold rush to analyze and discuss the role of the intangible, ethereal, explicit and tacit knowledge. Discussion papers for the political purposes and the research on knowledge creation and transfer throughout the innovation system are numerous. Thereby, also higher education (HEI) and research institutions are considered as vital elements in the innovation ecosystem (Goddard (1999), Goddard et al. (2003) In Sotarauta and Kosonen (2004)), in Sotarauta and Kosonen (2004); OECD, IMHE in Valencia (2007)).

Industry-academy networks. After having introduced the concept of deep explicit knowledge (figure 34) in order to stress the central role of scientific

research and theories in knowledge economy, Hautamäki ((2007), 15) refers to Geiger (2004) in introducing ways that scientific knowledge has an effect on the growth of the economy and firms competitiveness. In figure 34, adapted and modified from Geiger, the pathway A refers to the traditional research relationship between universities and firms. B represents the public subsidization of technology development (public, non-profit research centres). The pathway C represents creative local infrastructure, like the one in the Silicon Valley ecosystem. (Hautamäki (2007), 15) Referring to the previous discussion about LivingLabs, additionally the pathway D has been added to the figure to highlight the users' role in creative innovation ecosystems.

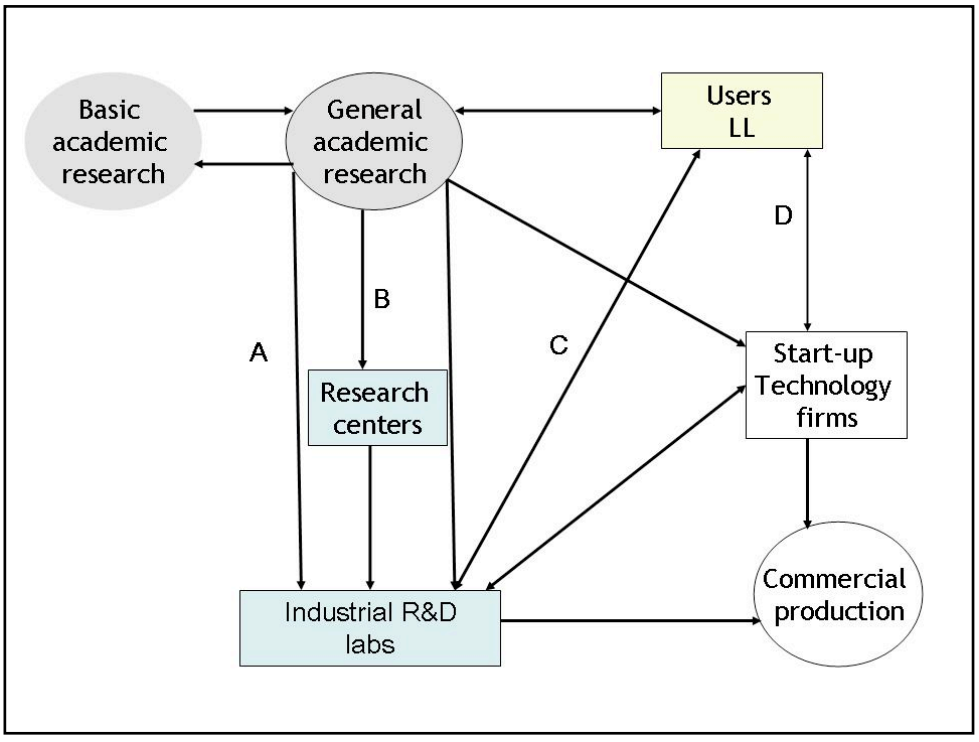


Figure 34 Pathways form academic research to industrial production (based on Geiger (2004), Fig. 15) with an addition concerning the users' role in the LivingLabs (LL).

In next section, the attempt is to discuss the *industry-academy models* together with the earlier discussed variation in innovation in order to understand the role of knowledge creation in regional and national levels of the system-of-innovation.

The decision to merge three universities in Helsinki epitomises the importance of industry-academy relationship for the national system-of-innovation. School of Economics, HSE, University of Technology, HUT and University of Art and Design, Taik in the capital of Finland create a new internationally competitive innovation university (Aalto Unvieristy). In public, the discussion about the science philosophical and funding consequences has been vivid. (Helsingin Sanomat, (2008a-2008d) Form the point of view of this research, the question would be, what is the specific principal vision about the type of innovation the new construction aim at, that is to say, whether the contribution of created knowledge is intended to generate short-term incremental innovations or future radical innovations or both?

What is then, the higher education institutions' deeper role in creation of knowledge, innovation and wisdom creation, in terms of future innovation policy? Moreover, how does that role actualize? During the 1990s, research on innovation policy has made efforts to create understanding of the changing role of universities and science as a part of the knowledge society. Most well-known models to describe this change are the Knowledge Creation Mode 2 (Gibbons et al (1994); Nowotny et al (2001)), Triple Helix of Academia, Industry and State (Etzkowitz (2002)), Entrepreneurial University (Etzkowitz (2003) and Science II (Hollingsworth and Müller (2008)). Taking knowledge and innovation creation as a starting point, they all analyze the societal role of universities and science in global competition.

According to Miettinen ((2002), 145) "triple helix" and "new production of knowledge" (or "mode 2 of knowledge production") belong to the new conceptions of science and technology policy of 1990s, in spite of the fact that some scholars have questioned their foundations.

Shinn (1999) (in Miettinen (2002),145) has pointed out that "the new model for the production of knowledge states that the traditional institutions of science, universities, disciplines and the professional academic sciences will soon

disappear". Miettinen criticises that the authors of the new models do not have much to say in concrete terms about the university as an institution. Furthermore the new models postulate imaginatory space or interstitial space lying between the institutions and "research takes place at deinstitutionalized, fluid and amorphous environment" (Shinn (1999), 151) called *agora (*"an open public space that follows the model of ancient Greece, where people meet with science in variety of exchange" (Nowotny & al (2001), K*rücken (2002) in Miettinen (2002), 145-146)*. For Miettinen, "the metaphor of *agora* as a kind of postmodern market-place, composed of educated individuals who co-produce, share and discuss science, is misleading" (Miettinen (2002), 146*)*. Miettinen claims that in his review of "mode 2 of knowledge creation", Shinn (1999) could not find any empirical foundation for the extensive emergence of "hybrid institutions" (Miettinen (2002),146)

Moreover, Gibbons (1994) who originally discovered and named the "*mode two of knowledge creation*" suggested that the knowledge creation has changed substantially in the knowledge society. Since, the traditional, science discipline based academic knowledge (mode one) has been replaced by knowledge creation in multidisciplinary research taking place in context of using the knowledge (mode two) and hands-on expertise. Whilst the mode one of knowledge creation aims at the understanding of the 'fundamentals of the earth', the mode two of knowledge creation aims at production of determined appliances and understanding of the mechanisms related to them. Owing to the mode two, research problems will no longer be solved in the hierarchical academic and scientific community but in collaboration with much different type of actor groups. That is to say, various professionals join the process of knowledge creation and evaluate the validity of the knowledge based on their own needs. They represent different interests in society and bring new economical and political aims to the evaluation of the quality of knowledge.

The main features of the mode one and two of knowledge creation are summarised in table 18.

Table 18 Knowledge creation mode one and two (Modified based on Gibbons et al (1994), 3)

Knowledge creation mode one	Knowledge creation mode two
Problems are set and solved in context governed by the largely academic interests of a specific community	Knowledge are carried out in context of application
Disciplinary	Transdisciplinary
Homogeneity	Heterogeneity
Hierarchical organization which tends to preserve its form	Hierarchical organization which is transient

Additionally, Etzkowitz (2002) argues that knowledge is no longer created in the autonomous universities but in a new type of interaction, *a triple helix of universities, state and the industry*. Each institution has a specific task of its own in the model; universities are responsible for the research, companies responsible for production and the state for the firmness necessary for the interaction and knowledge transfer. Furthermore, the boundaries of the institutions have grown dimmer; universities participate in commercialization of knowledge, and companies recruit personnel with PhD to run research activities. As a result of the intertwining of the operations new hybrid methods and organizations has been born; joint research centres, co-operation networks of universities, companies and state owned research institutions, and the so called entrepreneurial universities (Etzkowitz (2002), in Miettinen et al (2006)).

Scholars argue whether these models are based on empirical evidence or are they merely abstract conceptual constructions or ideal models aiming to describe the strategic aims. As evidence, the scholars (like Etzkowitz (2002) and Gibbons (1994)) behind the new models point out that the universities, which adopted the legislative third task (meaning that universities provide services for the economy and society, and promote regional development) represent the true origin of Entrepreneur University. They furthermore argue that the

commercialization of knowledge is a proof of the worldwide development towards entrepreneurial universities. The science parks, patent and license offices, and incubators are expressions of this development. In addition, some of the university professors have adopted the commercialization viewpoint towards their own work. Cambridge University supports and provides incentives for the commercialisation of research. (Cambridge Summer School (2007)). In the same juncture, in Finland, the concepts like Triple Helix, or Mode 2, and Entrepreneur University are mentioned in governmental documents and in evaluation reports concerning the universities of applied sciences. (Ministry of Education; FINHEEC (2008)).

Based on more than ten years research on innovation and analysis of other scholars work about the contradictory pressures on scientific research, Miettinen et al. (2006) suggested a more concrete way of analyzing the co-operation relationship between university researchers and other actors. Namely, a model called *mosaic of multiform and problem oriented collaboration structures*. The multiform collaboration embraces the end users in the dialog with science and other knowledge creators. That is, the problem oriented collaboration structures and networks are the forums where the collaboration between the university researchers and other societal actors naturally takes place. In this mosaic of collaboration, the dialog does not lead to a hybrid organization, but it relies on the existing organizations and their rules and standards. Miettinen et al. (ibid.) emphasized the importance of independency and public accessibility of scientific research. Since, only *throughout independency, the scientific control will ensure the quality of the research and more importantly, the scientific knowledge will remain publicly accessible*.

2.3.2.5 Regional innovation systems (RIS)

In the following paragraphs, the geographically spatial regional innovation system approach is presented mainly based on Kautonen. Kautonen (2006), 44-45) argues about the Finnish perspective on Regional innovation system that,

there are several ways to pursue the regional innovation systems. He analyses the basic methodological perspectives within the regional innovation system approach and classify them as *top-down, bottom-up and grassroots perspectives*. The focus, method, advantages, and pitfalls of these perspectives are as illustrated in Table 19.

Table 19 Basis methodological perspectives within the RIS approach (Kautonen (2006), 44-45)

	Focus	Methods/data	Advantages	Pitfalls
”Top-down”	“Key clusters/System level; may be also comparison between regions to find out their distinctive structural features what are the main characteristics of a certain region as an innovation environment?	“E.g. Statistics on industrial development; interviews with regional key actors such as executives in large firms, universities and innovation support organizations incl. policy-makers”	“Bird’s –eye” view on key features of the region from the RIS perspective; an effective way to begin to study a certain region or to compare regions in broad outlines	“May lack enough Depth; may focus on the most advanced sectors and thus give a biased picture; may be based on an realistic assumption that firms in the region has mutual linkages that do not exist in reality”
”Bottom-up”	“Firm/Network level; May be also a comparison between regions to find out their distinctive features What different types of innovation environments there are for different types of firms?”	“E.g., Survey of the firms in a region, interviews among different types of firms and other relevant actors in the region”	“Possibility to find out how ‘systemic’ the linkages and interactions are within a region and about multi-scalar interdependencies between various geographical levels”	“ If many key firms are missing from the data, it may lead to a distorted picture; Surveys may not give information about e.g. crucial intangible institutional factors”
”Grassroots”	”Innovation process level. What specific innovations are there and how have they emerged in an innovation environment?”	”E.g. Ethnographic studies tracking development paths of single innovations.”	”A detailed understanding of actual innovation processes and of their key determinants”	” Do not give information on the broad characteristics of a region; isolated cases”

Applying Kautonen's classification, the empirical study in hands has the "grassroots" perspective to innovation ecosystem. However, rather than using ethnographic method, this study lay ground for understanding with the Grounded Theory. However, utilizing the professionals' experiences as empirical data, this study moreover discusses the system level questions like the bottlenecks and facilitators of innovation. The discussion about the top-down versus bottom-up perspectives is relevant when exploring whether systems, including NIS, RIS and organisations have capabilities for self-organising. This question is discussed throughout this thesis.

Cooke ((1998), 24) referred to the regional innovation approach as an "outcome of partial overlap of regional science or regional studies and the national system of innovation approach in particular". According to him, regional science is intersected in explaining the local distribution and impact of regional high tech industries as well as their environment and innovation networks. This idea is concurrent with another definition of RIS, by Cooke and Schienstock (2000), highlighting the geographically defined, and administratively supported innovative networks as well as the institutions, which interact with innovative inputs of firms in the region. (Kautonen (2006), 51- 52)

When Cooke et al. ((2000), 21) discuss the concept of RIS, various knowledge related actors are at the core. However, they concentrate on the hard side of the system, stressing the interaction and systemic nature of RIS. Kautonen (2006), 52) writes about RIS, as "a concept drawn from evolutionary economics, which stresses the choice firm managers have of choosing the trajectory of their firm, by learning and changing as a consequence of social interactions focused on economic issues. Such interactions move beyond the business sphere, especially where innovation is the firm-function in question. It reaches the public sphere of universities, research labs, technology transfer and training agencies. Where knowledge flows through networks of innovators, for example,

or a skills deficit may be met by augmentation of training opportunities, 'seamless' interaction is systemic. Where many or all of these functions are available and operating in reasonable proximity, backed by judicious regional governance and administration, we can speak of regional innovation system. Of course, these always exist in interaction with systems at other governance levels."

The previously mentioned aspects highlight the *public sector's role* in creating conditions for innovative firms to be established and managed, as well as in enhancing the private firms learning and developing innovative activities. Later, scholars like Cooke ((2002), 135-137), Saxenian (2006), and Hautamäki (2007) have put more weight in more *market- and venture-capital-driven model* of a regional innovation system, significantly in the need of developing technological solutions and innovation as sources of competitiveness. As stated earlier, only in the most recent phase, the *role of citizens* has become more central in the discussion about the regional innovation system. Next section will illustrate some of the elements and approaches to the human side of the innovation system.

2.3.3 Innovation ecosystem (IES)

The previous chapters have discussed the meaning of national and regional innovation systems, which have been the core concepts of innovation policy and related research during the last decades. Consensus has been attained on the importance of the interaction between firms, universities and other relevant organisations. However, what would be the optimal level of the interactions has not reached consensus; some researchers (Etzkowitz (2002), Gibbons (2005)) are in favour of deep integration between the parties, the so called hybrid organisations, in order to create integrated forums where universities, firms and public sector participate in innovation. Others, like Shinn (1999) in Miettinen (2002) agree with the need to the interaction but demand that all parties should be faithful to their original mission (science versus profit making) and to the rules based on that mission in order to guarantee the quality of collaboration. As

discussed previously the systemic nature of innovation-environment relationship and the adequacy of systems approach and methodology have awakened criticism among scholars. (Miettinen (2002), Edquist (1997), Lundvall (2004))

From the point of view of this research, the question is, whether the NIS/RIS approaches would be a sufficient framework for the experiences of the innovators or whether they would be too limited for the purpose of this study. That is, would their mechanistic, institution oriented nature and more or less top down approach provide enough space and understanding for the experiences of the creative knowledge professionals?

In order to provide space for the social and cultural aspects related to the innovation, this section discusses the more recent development of innovation system approaches, namely the wider concepts like *innovation ecosystem*. Furthermore, Johansson's notion of *intersection* and Florida's *3T's model* will be considered in connection with various systemic levels namely the nation, region, and organisation and their combinations since, innovation originate at one place but spread beyond organisational, local, regional and national borders.

Florida ((2002), (2005), and (2008)) introduced his well-known approach to regional development and wellbeing. It has been Florida's interest to explore the macro level differences between regions. He has concluded the differences firstly from the human viewpoint and only then from the viewpoint of the firms and regions.

Based on wide statistical data, Florida found that if a region attracts the "*creative class*" (the creative educated professionals), it will also have the capacity to create new economical activities. *Talent, technology, and tolerance* (the 3Ts) are the key theses for wealth and wellbeing for the region. Florida (2005) refers to technology as a key to growth, due to its contribution to the economic growth. Talent refers to the emphasis of creative occupations through the typical "educational-based" measure of human capital. Lastly, tolerance

refers to the way of accepting flow into and out of places through the integration and openness, as well as proactive inclusion of people and their creative abilities (Florida (2005), 38-39).

By shedding light on the experiences of creative professionals, this study discusses the focal aspects of innovation system. To lay ground for the exploration one more concept will be introduced.

The concept of *innovation ecosystem (IES)* has been lately used by scholars like Wessner (2005), Hautamäki (2007) and Bahrami and Evans (1995) to discuss innovation in the economic environment. However, the usage of the notion is not yet established and the research references are less frequent than those related to NIS and RIS.

As a possible indication of the "transdiscursive" nature of concept, it was found that the use of "ecosystem" is until now more frequent in innovation policy papers than in research. The notion of ecosystem can be found at least in governmental documents in the U.S., Finland and in conference presentations (Global Innovation Ecosystem workshop (GIES) (2007), Centre for Knowledge and Innovation Research (CKIR) workshop (2008) and Techno Policy Network (TPN) conferences and workshops (2005, 2006, 2007).)

U.S. governmental innovation policy papers refer to ecosystem and while doing so they have adopted Wessner's notion of innovation system. For Wessner (2005) the bottom-up concept of ecosystem highlights the importance of public-private collaboration. "Innovation, like regional competitiveness, will not be achieved by fiat but rather through a combination of public and private initiatives" (Wessner (2005), 68). According to him (ibid., 68) a national innovation system can better be understood as an "*eco-system*". He (ibid., 67) defines *it as a network of institutions in the public and private sectors, whose activities and interactions initiate, develop, modify, and commercialize new technologies.* Wessner (ibid.) states that governments around the world view the

development and transformation of such systems as an important way to promote innovation, thus improving the competitiveness of domestic industries and services.

Instead of the notion of national innovation system, Wessner ((2005), 68) recommends the concept of innovation ecosystem as "a slightly different approach which captures different nuances to understand the economy as the National innovation ecosystem". Ecosystem for him refers to the economic environment where innovation takes place; his concept of ecosystem is more about creating fruitful circumstances for commercialization of innovation than e.g., about culture, atmosphere, values and other preconditions for creative people to create and change ideas.

Wessner ((2005), 68) furthermore refers to systemic nature of the environment, since for him an ecosystem is characterized by dynamic linkages among multiple sub-systems. He (ibid.) states: "this approach [eco-system] can help us to understand, first, *that the system is not fixed but evolutionary, growing and evolving* according to new needs and new circumstances and, second, that the *system is susceptible to change as a result of new policy initiatives.* The ecosystem approach highlights the complex *inter-linkages* among a variety of participants in an innovation economy (including individual entrepreneurs, as well as corporate actors such as large businesses and universities) and the importance of the *incentives* the various actors encounter as they push towards an "innovation friendly environment." [Italics added by the investigator]

One of Wessner's (ibid., 70-71) starting points is to break the myth of innovation as a linear process. For him, innovation is a complex process in which major overlaps exist between basic and applied research. According to Wessner, the process from discovery to commercialisation associates challenges and market signals, which often remain hidden or even absent.

Wessner explains how systemic learning in the process takes place throughout the *feedback loops between the various stages*. The technological breakthroughs may proceed, as well as stem from the basic, "curiosity driven research". His model highlights furthermore the "need driven research", the real life questions, derived from the industry or social needs. Basic research has moreover an important role since based on the information from the feedback loops; basic research is accountable for the needed discoveries and the new ideas and solutions to solve longer-term issues. Based on these statements Wessner presents the *non-linear model of innovation* in figure 35.

Compared to Lundvall's experience based DUI –model, Wessner's model is considered broader, since it highlights the scientific inventions needed for long-term radical innovations. Both models are broader than the conventional Science-Technology-Innovation model.

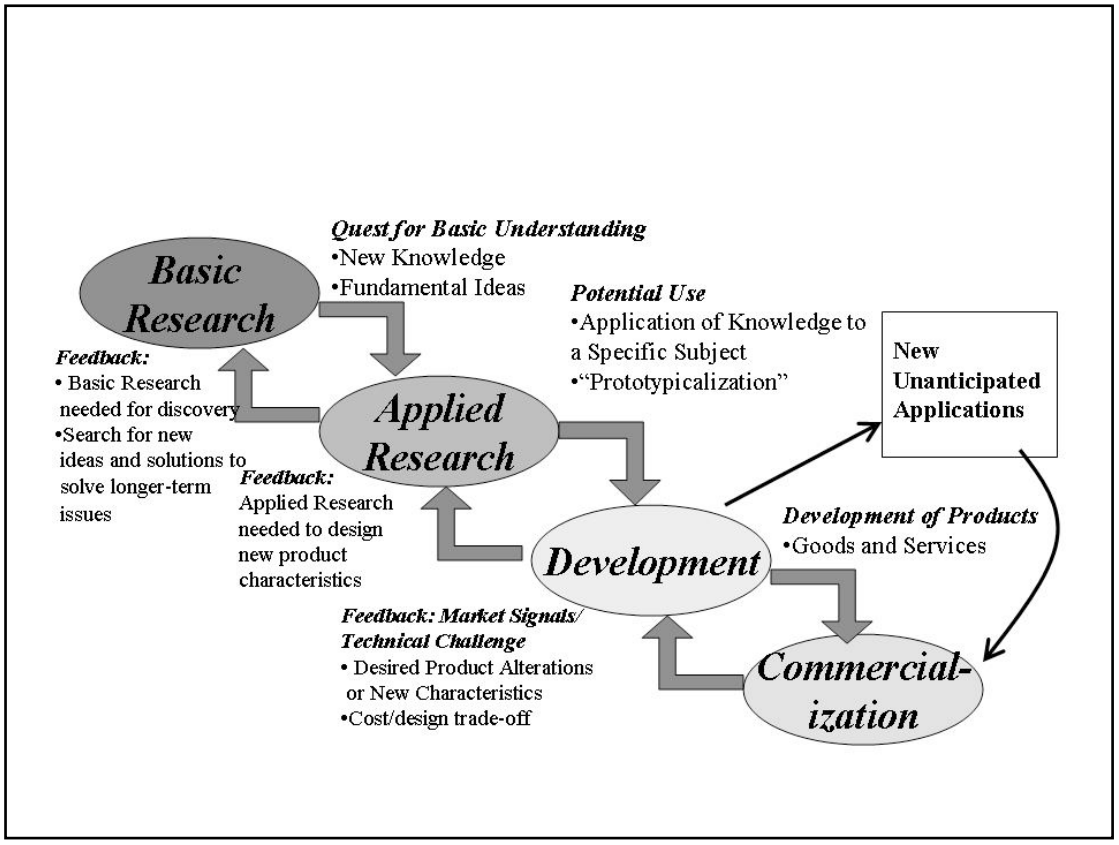


Figure 35 A non-linear model of innovation (Wessner (2005), 71)

In his writings concerning "*innovations ecosystems*" also Hautamäki ((2005),(2007)) referred to the systems thinking, specifically to those approaches relying on the self-regulating nature of system, namely the Complex adaptive systems theory (about Complex adaptive systems see Maula (2004)). Hautamäki uses the innovation ecosystem referring to the interaction and the "life of firms." Compared to Wessner's "national innovation ecosystem", Hautamäki put more emphasis on people. For Hautamäki, innovation ecosystem is based on the assumption that people innovate best in an environment where *creativity, enthusiasm, and encouragement are present*.

As all the system-of-innovation related notions stress, knowledge, structures and institutions, which provide an infrastructure, are prerequisites for innovation. They are, however, insufficient. In the worst-case scenario, structures can slow down or even prevent innovation from developing, since conflicts occur between hierarchical organisation and creativity (Peebles (2003), Martins & Terblanche (2003), Deci and Gagne (2005)). In this juncture, Hautamäki (2008) puts the tension between culture and structure into the centre and argues that the dilemma of innovation lies in this tension. Hence, the dynamic of innovation environment can be better described with the concept of innovations ecosystem. According to Hautamäki, the concept has proven fruitful.

By referring to Brown and Duguid ((2001), (2002)), Hautamäki (2007), 11-14) argues that knowledge is created in social networks and for innovations to emerged, *communities of practice (Cop)*, where people work in close collaboration, are important. For the development of social interaction and exchange of tacit knowledge, *local proximity* is important. Hautamäki also refers to how Florida (2002) has stressed the importance of creative individuals for the innovative environments to bloom.

Hautamäki (2006), 13-14) argues that the development of the innovation ecosystems is based upon *social networks*. He (ibid.) refers to *trust* (Granovetter (1985), Sabel (1993)) and *social capital* (Putnam (1993)) and

stresses that, researchers agree that networks can only be created if both trust and good social capital exist in communities. Moreover, creation of social capital is a learning process. Whereby, entrepreneurs, companies, research, funding, as well as the dynamic elements, like mobility, social networks and entrepreneurial culture, which promote interaction, will form the innovation ecosystem. (Hautamäki (2006), 14)

Hautamäki (2007) underlines the dynamic nature of the concept of ecosystem, borrowed from biology to the evolutionary economics. "In ecosystems, elements (like firms) are interacting and interconnected […] [T]there is cooperation and competition between them. *The ecosystem is a complex, self-regulating dynamic system without centralized decision-making.*" (Hautamäki (2007), 17) "Informal networking, face-to-face interaction, and recycling form the basis of the dynamics of the ecosystem. But, what makes this kind of ecosystem productive is the "life of firms". *The ecosystem is a huge experiment in which the best ideas and technologies are tested by the success and failure of firms.*" (Hautamäki (2007), 18) [Italics added by the investigator.]

Hautamäki (2006), 90-91) states that, most probably, the creation of innovation demands a special ecosystem, which consists of high amount of elements and processes that fuel the progress of innovations. *An ecosystem has the following features*: 1) adaptability to environmental changes, 2) self-direction, which means the capability to maintain oneself when changes take place, 3) relative autonomy and simultaneous interdependency of the elements, and 4) the never-ending process of birth, transformation, and disappearance of elements. Compared to the previously discussed notions of NIS and RIS, one can find how the role of governance and management has been replaced by adaptability and self-organisation.

The publications Kvartti and Quarterly published by City of Helsinki Urban Facts are important opinion leaders in Finland's capital region. Through Kvartti (2) (2006), 7-15), Hautamäki encouraged the city of Helsinki to develop the

innovation ecosystem. He stated that, in addition to the structural factors, the development of dynamic factors is furthermore important.

According to Hautamäki (2006) encouraging interaction throughout the urban structure, development of culture and leisure-time services, development of public spaces, entrepreneurial education, and development of entrepreneurial communities are the means, which affect the dynamic factors like mobility and networking of people and encourage entrepreneurial atmosphere in society. That is how the competitiveness of the innovation ecosystem increases and the innovation and new companies will be established. From the perspective of social capital, the concept of *local buzz and the role of temporary networks are crucial*. (Maskell et al 2005 in Hautamäki (2007), 18)

Based on the literature, innovation policy documents and real world observations "innovation ecosystem" is a flexible notion and used to refer to as well macro level as to the local innovation environments. Research and innovation policy development have struggled in order to learn from the fast developing and competitive nations, regions and local solutions. Hence, to conclude, one can claim that in absence of scientific evidence, the notion of innovation ecosystem is based on real life policy papers from the world's leading innovation hubs.

In the global economy, firms are looking for effective channels to acquire knowledge hence, knowledge creation has become a crucial competitive factor. The more elusive tacit knowledge and favourable culture, both prerequisites for innovation, can often be acquired in innovation hubs, based on proximity. Well known innovation hubs are Boston Road 123 and Silicon Valley in U.S, Cambridge in UK, or Sophia Antipolis in France. Impact on regional development has been reported also from other hubs like Otaniemi and Oulu in Finland, or Tagus Park in Portugal. (TPN (2005); TPN, (2006a), TPN (2006b)

Bahrami and Evans used the concept of ecosystem, when analysing the innovation environment in *Silicon Valley* as follows: "In much the same vein as a

natural ecosystem, Silicon Valley's growth and success can be attributed to the incessant *formation of a multitude of specialised, diverse entities* that feed off, support and interact with one another. The constituents of this ecosystem include *venture capitalists, a global talent pool of knowledge professionals, universities and research institutes, a sophisticated service infrastructure, as well as many customers, lead users, and early adopters of new technologies*" (in Hautamäki ((2006), 11) .

Systems theorists and innovation researchers have puzzled with the *equation of status quo and change in social systems*. Interestingly, this equation has been brought up by Hautamäki, who referred to Bahrami and Evans (2000)) on the importance of the balance between stability and change, from the perspective of new start-ups in Silicon Valley. Bahrami and Evans ((2000), 167) stressed that, "This ecosystem provides an anchor of stability within which incumbent firms and new start-ups can flourish and become a source of innovation and employment, and yet remain sufficiently flexible to accommodate the constant stream of kaleidoscopic change."

Many of the scholars support the notion of geographical proximity as a key element in innovation ecosystems. Hautamäki ((2007), 7, 16-17) stressed the importance of *proximity, networking and mobility* of professionals from the viewpoint of creativity. He (ibid.) refers to Bahrami's and Evans' (2000) findings that the "Silicon Valley ecosystem functions through an interconnected network of personal relationships" and states, "mobile resources tend to agglomerate because proximity provides several benefits not achieved by distance. The agglomeration concerns people as well as firms. Creativity attracts creativity." Furthermore he (ibid) states that "networking and recycling of people" is the reason which facilitates the ecosystem through the circulation of "ideas and knowledge" in the entire region. Despite the informal nature of the networking – restaurants, parties and leisure organisations are the agoras of networking - Hautamäki ((2007), 17) points out that it is "the life of firms" that makes the ecosystem productive.

Saxenian ((2006), 34) describes how in the richness of the ecosystem the decentralised and fragmented elements complement each other, and the ecosystem steers its own development by itself throughout trial and error. "The ecosystem is a huge experiment in which *best ideas and technologies are tested by the success and failure of firms*" […] "even more, in a rich ecosystem there are markets for highly specialized firms, which provide services, components and subsystems needed by other firms. Final products emerge from the collaboration between these specialized firms. So the *production system is decentralized and fragmented,* like in biological ecosystems" (in Hautamäki ((2007), 17-18).

Wolpert (2003) continues the discussion about networking by pointing out the importance of trust in inter-organizational collaboration and suggests "the use of *independent intermediaries* to facilitate the exchange of sensitive information among companies, without revealing the principles, identities or motives and without otherwise compromising their interests. […] a network of innovation intermediaries would be in a unique position to visualise new opportunities synthesized from insights and technologies provided by several companies – ideas that might never occur to businesses working on their own" Wolpert ((2003), 50)

The previous analysis of the notion of innovation ecosystem provides some ideas for to be discussed with the empirical findings. Firstly, the idea of the self-organising and bottom up environment is embedded in innovation ecosystem.

Secondly, the differences between the bottom-up hubs like Silicon Valley and the Nordic top-down oriented model of innovation systems. In what concerns Silicon Valley, scholars stress its *bottom-up or self-regulatory* nature. The question of bottom-up vs. top-down approach to the development of an ecosystem is vital since nations, cities, and regions, likewise companies, should develop their strategic agility in order to cope in the complex and fast changing environment. (Doz and Kosonen (2007)).

Thirdly, the system-of-innovations history is a subject to be taken into consideration. According to Benneworth (2004), 153), the dense socio-technical networks in Silicon Valley, Boston Route 128 or Cambridge cluster are unique results of their historical backgrounds and that is why they cannot be found elsewhere.

2.3.3.1 Evolving the idea of innovation ecosystems

During the last centuries, the driver for economical development has changed earlier, physical power, land, energy, and raw materials were more important while knowledge or creativity are the more resent drivers. The most recent notion of innovation ecosystem, even though clearly connected to economic development, stresses also softer elements like human resources and culture.

Benneworth ((2002), (2004)), on his research on the role of culture in regional innovation, has paid attention to the fact that most of the research on regions like Silicon Valley and Cambridge underline too much working life, whilst home life and leisure time activities get short shrift. Benneworth ((2004), 150-151) writes that in many cases cultural residual contribute to economic growth, it can promote entrepreneurship, however sometimes a region is deadlocked in the past. What causes these differences it not yet clear.

Research on innovative regions is based on an assumption that it lies in the culture of places that innovators enjoy participating on innovative activities. Benneworth (2004) models equate (figure 36) the supportive activities of innovating at work with the activities taking place in leisure time. Innovating is partly based on skills, which have been developed during leisure time and at home. In innovative regions, innovators can meat and share their ideas also during their leisure time; activities in one walk of life will then be utilized in another walk of life. Activities at home and leisure time, or related to culture, will develop skills, which can accelerate economical growth. An ‘intelligent’ municipality provides context and places where creative individuals can

exchange their ideas and engage their creativity. Likewise, Välikangas (2008) uses a descriptive notion of *idea market* to describe the context and places where people meet for breakfast or for other out-of-office purposes, and where ideas are presented, exchanged, criticised and developed.

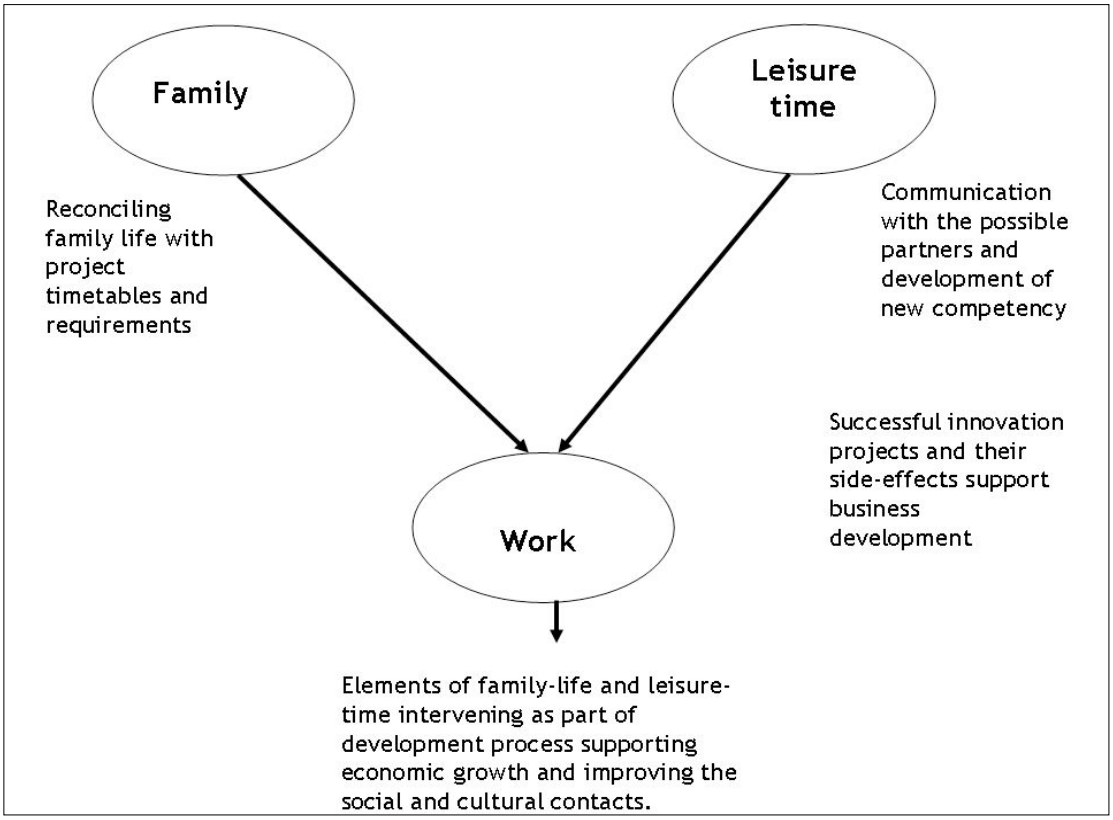


Figure 36 Relationship between culture and innovation into relation to a typical cluster example (Benneworth (2004), 157)

According to Benneworth (ibid.), culture can be seen as a *silver thread* with which the same skills can be utilized in such walks of life which earlier has been considered as incompatible. On his research in the North East of England he (ibid.) found that culture increased the impact of non-economic knowledge and other related skills in creating economic success. However, Benneworth reminds that more research is needed to verify these findings. Evident is that cultural activity plays an important role in dissolving regional deadlocks. (Benneworth (2002) in Sotarauta and Kosonen, (2004), 157).

According to Kainulainen (2004), soft factors based on culture have an increasing role in attracting companies and investments to the regions. Kainulainen provides, as examples of the importance of these soft factors, the city of Limerick in Ireland, and the situation in Germany. When cities make an effort to provide the stimulation, diversity and richness of experiences for the citizens, creative industries have proven to be the source of this richness. Moreover, they have an overall positive impact on the regional economical development. Based on literature research analysis, Kainulainen states that, there is a positive connection between creative industries and regional economical development; creative industries created a dynamic development atmosphere which fostered new ideas and innovation, and attracted professionals and investments.

Traditionally, culture and economy has been seen as somehow mutually incompatible categories. Recent studies, however, has been able to cover and find synergy between both categories. According to Thorsby (2001), the concept of *cultural capital* is the connecting factor between economic and cultural values. "We define cultural capital as an asset which embodies stores or provides cultural value in addition to whatever economic value it may possess." (Thorsby (2001), 46)

Kao (2007), in his *Innovation Nation,* is worried about America losing its innovation edge and stresses the importance of both home-grown and imported talent. Major effort by national, regional, and metropolitan communities is demanded for the hunt of talent. The most important qualities of an innovation hub are *quality of life*, *opportunities to specialize* and a *reputation for tolerance* (ibid., 123-126). When writing about the innovativeness and attractiveness of the physical environment, he also refers to the spiritual aspect of the place and its connection to the creative work and quality of life.

When discussing a physical place Kao ((2007), 133) refers to the *wisdom of place*, and to the fact that humankind has always been drawn to special places, like Machu Picchu, Stonehenge, and the Pyramids, where one could tap into "the

mysterious unknown". People need places where imagination can soar, and "organisations need a place where specific opportunities and projects can be explored in freewheeling, no-intellectual-holds-barred manned. They need spaces designed to elicit questioning, discover, experimentation, and prototype development. They need spaces that expand the mental boundaries that balance openness with intention" (Kao (2007). 135).

Another scholar, Florida ((2005), 38), argues that the *openness, diversity and tolerance* are the critical factors for regions to generate, attract and hold technology and talent, which are mobile factors and flow into and out places.

Finally, before closing this chapter, the way how *Florida* ((2002), (2004), (2005), (2008)) looks at regions, cities and nations around the world adapting to the global creative economy will be discussed. In a wake-up call to business, political, and cultural leaders alike, Florida's literature weave these issues together in the macro-level analysis. His ideas about creative age and his findings on the importance of technology, talent and tolerance for the creative class will be discussed in order create understanding about the important factors of the environment where individuals prefer to work and live.

Florida (2005) has been considered to be the first researcher putting emphasis on the individual at the core of regional economical development, while stressing creativity as the basis of that development. He is often known, and also misunderstood, for his concept of *creative class,* which is referring to around 30% of creative workers in developed societies. However, in *The Flight of the Creative Class,* Florida (2005) specified the discussion of creative capacity to each and every person. He pointed out that, he is "arguing for a broadening of the very definition of creativity, one that will enable and encourage the everyday efforts of "ordinary" occupations".(Florida (2005), 247). He (ibid) especially stresses the creative potential, which "the low-skilled" immigrants have when a "mosaic society" (like Canada or Sweden) hunts for the "high-skilled" immigrants. "

We must begin to think of creativity as *a common good,* like liberty or security. It's something essential that belongs to all of us, and thus must always be nourished, renewed, and maintained - or else it will slip away" (Florida, (2005), 269). He truly means that, open, tolerant societies, which are building up people's creative capital, are essential in the transition from industrial to creative age. These concepts will now be discussed more in detail.

In his book *The Rise of the Creative Class,* Florida (2002) describes the change taking place in the global economy; how creativity has become the driver of economical growth and regional development and creative economy directs the development of professions, content of work, living conditions, lifestyles, habits, values and the development of identity (Florida (2002), 13). In *creative age*, creativity appears in individuals and in the fundamental spirit of culture and socio-economical processes. Creative environments enable emergence and diffusion of innovations. Thus, creativity has become a factor of production like knowledge or other tangible raw materials.

Jensen's (1999) notion of "*dream society",* the society emerging after the knowledge society, which emphasises storytelling, culture, values and ethos is very similar to Florida's (2005) message about cities. Cities are the key economic and social organizing units of the creative age, the incubators for innovation. "They promote economies of scale, incubate new technology, and match human capital to opportunities, ideas to places, and innovations to investment. They capitalize on the often-chaotic ecosystem that creates previously unforeseen financial, scientific, social, political, and other linkages to one another. Urban centres are therefore a vital element of infrastructure of creativity and competitiveness.[..] A strong urban policy is as important to our nations' future as a strong innovation policy." (Florida (2005), 259)

Based on wide statistical data, Florida ((2002), 69) recognised the rise of the *creative class* of "scientists and engineers, university professors, poets and

novelists, artists, entertainers, actors, designers and architects". The creative class is characterised by *creativity, individuality, diversity, and merit (Florida (2002), 8)*. Either called *creative workers or creative class*, these individuals contribute most to the development of the cities because regions attracting "creative class" create also new economical activities and, since creative professionals have specific demands on their living environments, regions try to make efforts to attract these people *(Florida (2002), 288)*

Florida´s (2005) three Ts (3 Ts), referring to talent, technology, and tolerance, are the key theses for wealth and well being for the region. The *Global Creativity Index (GCI)* has been used by Florida to compare different countries. GCI is a composite measure that combines the scores of Talent, Technology and Tolerance Indexes and it correlates powerfully with Porter's Innovation Index, as well as with the *Foreign Policy's* Globalization Index, and with The United Nations Human Development Index. Finland ranks third on the GCI; Sweden tops the list, followed by Japan, whereby U.S.A ranks fourth. (Florida 2005, 154-157)

Instead of using statistics on education, Florida, together with Tinagli, (2005) 135), defined and tracked the world's creative class by using detailed workforce statistics from the International Labour Organisation (ILO) to estimate the creative class of the "forty five" world's most advanced nations. ILO's data is breaking the workforce down to job categories, whereas Florida and Tinagli (ibid.) quantified the creative glass in two ways, using the broad definition and narrow definition (Florida (2005), 135). "The broad definition includes scientists, engineers, artists, cultural creatives, managers, professionals, and technicians; whereby "the narrow definition excludes technicians". (ibid. 135) For the most part, Florida uses the narrow definition to discuss the global creative class because of discrepancies in ways countries classify their technicians.

According to Florida (2005), 139-143), the other relevant index, namely the "Global Technology Index has employed two conventional measures of technological competitiveness – and R&D index (which is based on research and

development expenditure as a percentage of the gross domestic product), and innovation index (that employs the number of patent applications per million population)". Furthermore, "R&D and Innovation are two conventional measures of the technological competitiveness" (Florida (2005), 139). Therefore, with regards to technology index, the United States and Sweden rank first and second respectively; Finland (fifth) and other countries, such as Japan (fourth) have as well portrayed the technological strength. This may be as a result of both extensive innovation index and research and development (Florida 2005, 275.

Florida's third index, the Global Talent Index, "concentrates on the conventional measures of human capital (percentage of the population aged twenty-five to sixty-four with bachelor's or professional degree) and scientific talent (he number of research scientists and engineers per million people) as well as the creative ranking of the researchers" (Florida 2005, 144). Regarding Talent index, Finland ranks first followed by Japan and Norway, whereas Sweden and the U.S.A have portrayed talent strength (seventh and nineth respectively) (Florida 2005, 275).

'In economic development, Tolerance is a critical aspect to a region or national ability in attracting and mobilizing creative talent. Openness to people enables places to compete more effectively for talents from other countries as a result of establishing (harness) own talent across race, ethnicity, gender, age, sexual orientation and class position' . This index concentrates on values (spiritual and humanity matters) and self expression ("captures the extent to which the nation values individual rights and self expression"). (Florida (2005), 149 -150). Tolerance index had considered aspects of values and self expression (based on the World Values survey). Sweden and Denmark have portrayed strong tolerance (first and second) where as Finland, Japan and USA has portrayed a weaker tolerance. (Florida (2005), 275).

In connection to the 3 T's, Florida (2005), states that, in spite of the overall success in creative index, some cities (e.g. Helsinki, Oslo, Lisbon) are

“challenged by their lack of appeal to global talent and will need to improve their diversity and tolerance if they wish to compete at global cutting edge” (Florida (2005), 173).

According to Florida (2005), 27-28) the number of people in highly creative occupations has increased dramatically. Today some 30 percent of the U.S. workforce is employed in the creative sector that accounts for the 47% of wealth generation, as well as nearly half of all wage and salary income in the U.S. Based on U.S. Bureau of Labour Statistics, the respective numbers in other sectors are as follows: Percentage of workforce in the Service Sector 44%, Manufacturing sector 26%; Percentage of Wealth Generated in the Service Sector 30%, Manufacturing Sector 23%. According to Florida, “There is a broad agreement that the growth of the overall economy will come in the creative knowledge-based occupations and in the service sector.” (ibid., 29)

However, it is not enough to take care of the creative class. We must strive to tap the full creative capabilities of every single human being. Florida (2005) justifies this necessity with the need to prevent “widespread social unrest” and the wish to “benefit economically from the creative input of the maximum number of citizens.” For that, “countries have to find ways to bring the service and manufacturing sectors more fully into the creative age […] We must improve act to improve the pay, content and working conditions of the second great source of jobs in today’s economy – service sector jobs – The port-of-entry jobs to the creative economy.” (Florida (2005), 246, 247). One can consider that the previous statement is not fashionable at these times when so many working places have been lost to countries where the salaries are clearly lower. According to Florida (2005), 186), “the United Sates faces levels of income inequality unseen since the 1920s whereby t[T]he top 1 percent of households earned 20 percent of all income and held 33 percent of all the net worth”. With regard to this inequality rates, U.S is today seen as one of unequal nations of all advanced nations; the trend that has been signified as a “significant long-term

vulnerability" for the U.S. economy by the Council of Competitiveness, whose members include the CEOs of leading U.S. companies (Florida (2005), 186)

Contrary to some other scholars, Florida's (2005), 266) perspective on building creative economy and society in the era of globalisation will necessitate a "truly international effort." He states that we should start collecting comparable global statistics, comparing the best practices of creative canters, discussing the business of more open societies with competitive people climate (Florida's (2005), 266-267).

In emphasizing these ideas, Florida had pointed out that, "more opportunity, more entrepreneurship, more investment in people, more investment in our natural as well as humans assets – the United States can reclaim a status as a truly open society and lead the world in becoming a more integrated and prosperous place. […] Perhaps it's time to establish something like Global creativity commission which could be the first step towards formulating the kind of regional, national, and international policies required for success in the creative age." (Florida (2005), 268)

From this study's point of view, it can be concluded that Florida's open-mindedness and broad perspective on innovation ecosystem may help to distinguish the points where the national innovation system and other concepts might be too locked into the industrial-age material and mechanistic mindset and fail to account for the benefits of the intangible creative age.

In this study we look to the scientific, educational, economic, artistic, cultural, social, and other mutually reinforcing or deteriorating parts of the creative whole - exactly as they appeared in the experiences and opinions of the creative knowledge professionals. For Florida, the cast collective pool of human creativity represents an enormous ecosystem "where the traits of one type of being are complementary to and symbiotic with those of another. Diversity is not merely enjoyable; it is essential (Florida (2005), 35)."

Furthermore Johansson ((2004), 147) discusses the importance of diversity in societal and organisational levels. He emphasises both the role of creative individual and the different aspects of environment that may affect innovativeness. Johansson ((2004), 18-19,), distinguishes “intersectional innovation” from “directional innovation”, which “improves a product in a fairly predictable steps, along a well-defined dimension”. Intersectional innovation are radical and “change the world in leaps”.

Johansson (2004), 21-32) discusses the forces behind intersectional innovation. He firstly points out the power of the “movement of people”, on producing cross-cultural ideas. Secondly, the “convergence of science”, which empowers the cross-disciplinary scientific discoveries. Thirdly, the “leap of computation”, which has advanced communication, that enabled individuals, groups and organisations to share their expertise and backgrounds.

Johansson illustrates the importance of intersectional fields, by counteracting Christensen’s idea of “value networks” as tools which portrays organizational success within a field. Christensen (ibid. 148) points out that, “as firms gain experience within a given network, they are likely to develop capabilities, organizational structures, and cultures tailored to their value network’s distinctive requirements”. Johansson insists that value networks may influence directional innovation (thorough set up processes and procedures) and may prohibit the intersection of fields and the intersectional innovation something that can lead the upstarts companies to overtake the existing companies (Johansson (2004),149).

As it has been proven with the mosaic index (the composition of foreign-born population) international combinations in different attributes do result to the innovative incidence (Florida (2005)). Johansson (2004), 35) explains the essence of low associative barriers as the result to the ability to be able to connect different concepts from different fields and result to a whole new complete

idea. Moreover Hautamäki (2007), 7, 26), insists on the importance of knowledge combination for the innovation to reach its climax. He (ibid.) refers to the notion of intersection of ideas and knowledge exchange (he uses agora, alliances and guilds) which can be permanent or temporarily; in finding the solution to problems, something, which is not different from what Johansson, had been explaining.

In the empirical part of this study, it has a human centric approach to innovations and the environments where innovations take place. Before we can appreciate that, however we need the understanding of how the concepts related to environment have evolved in the system theoretical frame; the subject that will deeply be discusses in the following main chapter (2.4).

2.3.4 Summarising discussion on innovation context

A small number of empirical research results was found about creative professionals' experiences on innovation in different environments. Since the literature on system-of-innovation is however rich, the review was completed in a more conceptual level.

Earlier, research referred to the general organisational innovativeness and later, to the specific innovation processes and systems. It was interesting to find that, studies on organisational level sometimes specified either the broadness or the type of innovation that was however not found common in research concerning the wider systems-of-innovation, namely the regional (RIS) and national (NIS) levels. That is to say, the system-of-innovation research concerning the macro level does not discuss much the possible contradictions based on the different requirements of different type of innovation.

It was of the interest of this section to learn if any dimension of the system-of-innovation had the power to reinforce or deteriorate radical versus incremental

innovation. As said, the literature has not paid much attention to whether the elements of innovation environment fit with radical or incremental innovations. However, based on what has been learned from innovation literature, it is suggested that in addition to the tangible assets also the intangibles, like the adopted values and worldviews, basic principles and guidelines of organisations and the society in general most probably affect the innovation priorities. That is to say, it matters whether the system emphasises e.g. science-technology driven or experience-driven innovations, radical or incremental innovations, or no innovation at all.

Based on the literature review, this section furthermore suggests that, the innovation concepts used in the innovation policy, may indirectly lay ground for the priorities behind the decision-making, for example concerning the financial support. That is to say, as using one specific measure like Gross Domestic Product (GDP) to evaluate the achievements of economy has an influence on our behaviour (Stiglitz, Sen and Fitouzzi (2009)) likewise; this study claims that, using alone the notion of National Innovation System (NIS) to discuss the favourable innovation environment might have a biased effect on our decisions. Apart from the GDP, wellbeing in the knowledge era can be measured with versatile indicators e.g., Genuine Progress Indicator or Human Development Indicator. The later indicators makes the more invisible and intangible side of welfare society more visible. In the same way, the notion of innovation ecosystem brings forward the soft, human related elements of the system.

The conceptual discussion distinguished possible points where the notion of national-innovation-system might be locked with the industrial-age and its material and mechanistic mindset, thus it fails to account for the benefits of the intangible creative age. This calls for open-minded inspection of reality in order to find all the scientific, educational, economic, artistic, cultural, social, and other mutually reinforcing and deteriorating parts of the creative whole. For that purpose, the Grounded Theory method provides an open-minded tool.

Furthermore, this chapter illustrated how the new notions related to innovation environment have appeared and been tested. Literature stressed that in science even powerful terms may later be complemented and finally replaced by other terms.

1. Therefore, the *first proposition* states: *Notions related to the circumstances where innovation takes place, in micro-, meso-, or macro levels "are used to re-organize and guide discourses within research communities and in policymaking, their emergence and development is dependent on interaction between the two". Notions' transdiscursive nature is thus highlighted in order to increase awareness for the potential development of concepts related to the system-of-innovation.*

Hence, the system-of-innovation, national-innovation-system, and regional-innovation-system, are all transdiscursive terms, which have developed almost parallel and in synchronisation with the different aspects of the innovation concept.

In spite of the weaknesses associated with the *systemic approach*, like the accusation of the "scientific hybris" related to the attempt to create a comprehensive understanding about the environment, it can however be argued that the system's theory is a widely spread approach. It moreover seems to fit to the development of concepts and methodologies in order to enlighten how both organisational creativity and productivity can occur simultaneously and how the systems could increase awareness and potential to handle the tensions between the mainstream and radical innovations. Furthermore, the systems approach stimulates the perception of similarities and dissimilarities between and among the different subsystems, and can thus help to discover the blind spots in the inspection of the innovation-environment.

2. The *second proposition* states: *Notions of system-of-innovation are not established, they have been considered differently by different scholars at*

different times. Following aspects (table 20) have been considered when elaborating different components of system-of-innovation in various levels. However, it is argued that, scientific agreements about these lists might stiffen and limit the scientific progress and understanding about evolvement of creative environments. Hence, the list of components rather illustrates the evolving nature of the system-of-innovation, than aims to provide a complete description of the components.

Table 20 Components and qualifications in association of the system-of-innovation

Actors, elements, structures	Activities, functions, factors	Qualifications
• research and technology institutions, • firms and clusters of industries, • educational and knowledge transfer institutions, • financial institutions, • governmental bodies, • municipalities and other public organisations, • global networks, • infrastructures, • product and market conditions, • macro economics, • regulatory context, • socio-cultural institutions • systems of values, norms and common believes, • people, user, client, citizen • complex structures linking individuals	• research and development, • competence building, experience and science and technology based knowledge creation and transformation, • formation of new markets, • articulation of user needs, creation • change of organisations, • networking around knowledge, • creating and changing institutions, • incubating activities, • financing innovation consultancy services, • competition and collaboration • openness to international trade and capital flows, • labour market dynamics, • social welfare systems • social, intellectual, artistic, leisure and environmental capital, • technological forecasting,	• creativity, • dynamic, • tolerance, • adaptability, • flexibility, • complexity, • self-regulating and freedom with bottom-up approach, • support and ample recognition, • sufficient time and resource, • sense of challenge, • co-operative, • open and trust worthy, • taking initiative – • risk taking, • transparent, • safe, • intrinsic motivation, strategic agility, • learning and tacit knowledge

3. In addition, the *third proposition* has been related to the transdiscursive nature of the development of the NIS, RIS and IES, which appeared in different times. Third proposition states: *The development of the theoretical notions of system-of-innovation has mirrored the change in the real-life goal setting. In the current phase, the concepts become more human-centric, holistic, and illustrated the processual, multidimensional, and hybrid relationship between technology, economy, education, creativity, culture and ecology.*

The literature review illustrated how earlier the innovation policy goal setting has highlighted mainly wealth creation, commercial success and competitiveness of the region or the country, whereby the aspects of wellbeing, including quality of everyday life, creativity and ecological elements have just lately been included into the goal definitions. Furthermore, it can be seen how, the development of the concepts (NIS/RIS/IES) have adapted to this change by first highlighting the hard elements, (like technology, knowledge transfer and financial aspects) and only later the soft and human elements (socio-cultural aspects). Recently, the development of the concepts has identified interaction and processes, such as the flow of knowledge and people.

In relations to the development of the notions of system-of-innovation, scholars have first, argued whether knowledge creation and transfer models like "Triple Helix of Academia, Industry and State" and the "Knowledge Creation Mode 2", are based on empirical evidence, or are they only abstract conceptual constructions or ideal models with metaphoric functions to illustrate the strategic aims. Secondly, scholars have discussed different models' capabilities to support the quality in both research and businesses. Whereby the importance of open access to knowledge in societies has been highlighted. Systems' capacity to boost quality and the open access to knowledge are both most evidently important in societies aiming at future radical innovations.

4. *Fourth proposition* is based on the statistics on country comparisons, and it states: *Finland is one of the leading countries in innovation, creativity and*

competitiveness in the world; however, the statistics concerning social wellness does not score as high as the other measures. This statistical discovery is taken as a hint for exploring the intangible side of the system since the tangible side of the system has already proven its competitiveness.

5. Based on research of innovation in organisational context, which has been considered as a subsystem of the wider systems-of-innovation (such as NIS and RIS), there are interlinks of circumstances around the organizational elements and functions, like individuals, cultures, management, and policy makers, among all the levels of the systems-of-innovation. This inter-relatedness has an essence in the organisation innovativeness, which can happen differently, depending to the circumstantial nature, of the organizations and individuals involved. This inter-dependence leads to the *fifth proposition* which states: There is *a two-way connection among various levels of systems-of-innovation. Different system levels effect each other, hence different tasks, problems and innovation fit to different organisational (or systemic) solution, at the same time the (radical) innovation has the power to effect the systems in all levels*.

In businesses, there is an obvious need of communication of the innovative ideas. The culture and the role of top managers are at the core in deteriorating or reinforcing creativity and innovation in organisations. Among others, failure tolerance and organisational learning are pivotal for innovation in organisational context. Innovations, and especially radical innovations, business innovations, and managerial innovations can drastically change rules of the business environment. In order to adapt to the new rules companies and organisations have to reinvent themselves as a consequence of those innovations.

Management of innovation in organisational level is a well-known phenomena compared to the management in regards to the wider systems-of-innovation. The notion of *managerial innovation* is relatively new and rare despite the fact that, it is of great interest for those who want to understand the true and hidden nature of management in innovation environments in order to take the front-

runners position. In absence of scientific evidence, it can only be assumed that, the managerial innovations, as well as the product innovations, can be considered in terms of incremental or radical innovations. Furthermore, it is rather the radical than the incremental managerial innovations, which might have a capacity to change the operative environment of the companies in depth.

Notwithstanding, it can be assumed that the radical managerial innovation can refer, for example, to strategic agility or to new managerial styles, but it could also refer to *absence of* conventional management, which could be seen as a change from the "management *of* system" to the "management *in* systems". The later refers to the self-organising and self-renewal capability of the systems (which is the core of chapter 2.4).

The notion of living composition refers to the way an organisation utilizes internal self-organisation in order to facilitate creativity and to create new knowledge and capabilities. Holistic "systems intelligence" relies on the intelligence embedded in individuals and highlights how in the positive atmosphere intelligence and productivity flourishes and thus lays ground for self-renewal as well as for its extension from individuals to the more collective levels. Intelligent and self-renewal systems may thus recall for new managerial innovation.

The notions of "systems intelligence" and "Superproductivity" highlight both the visible and invisible subsystems they furthermore support the idea presented previously (chapter 2.1.5.) about the shift of management logic from the either-or -solution into the both-and-principle.

Organisations and companies face simultaneously the challenges related to the mainstream and both radical and incremental innovations. Concerning the innovation requirements with the organisation's capabilities, it has been illustrated (figure 24) that both autonomous and mainstream organisations are necessary for innovativeness in an organisation. This can be through considering

right force (process, values, organisation, and spinouts) for the right problem to be solved in the organization. Different types of teams may work with either mainstream or autonomous organisations in solving either routine or complicated challenges in the organizations. Differentiation can be considered as a practical solution to solve the paradoxes related to the simultaneous requirements of both the mainstream and the development of radical innovations. Concerning isolation of the radical innovation from the main organisation, scholars have presented both the pros and cons.

Proposition one, in chapter 2.2.4, concerning the fact that an individual is a prerequisite for innovation, got support from the literature on innovation in organisations. Concerning the role of an individual and innovation, the organisational context may enhance the creativeness. This is through the creation of channels for individual's potential for creativity, and by supplying the individual with required support during the various stages of innovation. Nevertheless, it can be noted that, differences in individuals in an organization, will enforce different types of innovations in the same organization.

Interestingly, there exists indication for the possibility that individuals play the key role in the so-called self-renewal of systems. This is because, first, human beings are adaptive, and in spite of the inconveniences, they have a capability to perform. It has been referred to human beings' capability to muddle through and cope with situations where pervasive uncertainty and the need to act are simultaneously present. Second, human beings have a capability to generate emotional energy for the social system, and it has been found that positive energy changes micro-behaviour and thus reinforces collective performance. With systems' self-organisation and self-renewal, it has been referred to the situations when a system is far-from-equilibrium or when innovative ideas or new strategic options emerge from systems invisible part. The capability to tolerate inconveniences helps individuals and the social systems to perform during the chaos preceding the breakthrough relating to any problem solving, the radical innovations or other type of changes, which may lead to the self-renewal of the

system. Metaphorically speaking, an individual operates like a conductor, through his capability to remove the tension related to chaos, which prevents the system from performing. The capability to generate positive emotional energy to social systems may have a positive impact on other individuals and thus, a small individual intervention can generate the so-called butterfly effect that can help the entire system to renew itself. Therefore, an individual can be said to operate as "leverage" for the change in the entire system.

Through an insightful identification of opportunities, companies and organisations need to be strategically agile in order to reach the needed transformation in the fast changing business environment. Creation of innovation platform, idea market and internal market place with Corporate Venture Capital and Angel investors have been recommended for insuring the productive internal innovation system as well as enhancing sustainable communication, efficiency, coordination, alignment and learning. This is parallel with the propositions number three and four in chapter 2.1.5.

6. Despite the essence of the inter-dependence among management, culture and potential actors, innovation in companies may be radical or incremental depending on the extent to which the innovation process has been carried out. Nevertheless, regarding incremental or radical innovations in the organizations, different steps and qualities are emphasized throughout the innovation process.

In this regard, and based on previous proposition which states that, different organisational settings fit to different innovations, and especially in relations to the radical innovations, the *sixth proposition* claims that: *Radical innovation, especially in its early phases, (i.e., during the ideation), relies on an autonomous, ambitious, explorative and self-organising organisation where support rather than reward is pivotal.*

As stated earlier, radical innovation requires time, persistence, tolerance of inconveniences and intrinsic motivations for the individual innovator. As

"systems intelligence" approach states, systems rely on intelligent individuals, whose intrinsic motivation and reward experience has been assumed to promote the emotional-energy generating system, as well as the system's capability to renew itself. Therefore, tolerance of inconveniences and other prerequisites of radical innovation can be supported by the positive emotional energy, which will enhance persistence in facing the challenges and failures for radical innovation. Furthermore, positive emotional energy increases job satisfaction, happiness and capabilities for innovativeness.

Although it is obvious that, regions and organizations are interrelated, or innovative organisations have capacity to create innovative regions and vice versa, it is, however unclear if the rich research results about innovation in organisational systems applies also to the wider systems-of-innovation, like in regions and nations. Research could be broadened in order to test the previous proposition as to whether in a wider system-of-innovation, like NIS or RIS; the radical innovation will be flourished with exploration, autonomy and self-organisation as how it seems to be in organisations.

7. Parallel to the paradoxical and controversial nature of innovation and creativity proposition (chapter 2.1.5), there are paradoxes also in system level. The following paradoxes related to organisational and wider system-of innovation were identified from different literature used in chapter 2.3.

1. *The paradox related to the contradiction between the simultaneous efficiency of established processes and the need of the change*.

   Peters and Waterman (1982) has referred to the *dilemma of management*, which states that, in order to run the organisation effectively, the processes are established so that employees perform recurrent tasks in a consistent way. They are not meant to change or to change through tightly controlled procedures. The very mechanisms through which organisations create value are intrinsically inimical to change.

2. *The paradox of the culture embedded values and processes preventing the change*.

   This paradox is based on Christensen's ((2003), 195) statements which portrays that, *when capabilities have come to reside in processes and values and especially when they have become embedded in culture, change can become extraordinarily difficult*.

3. *The paradox of the opposite effect of the organisational structural variable's during different phases of innovation*.

   The paradox is based on "each of the organisational structure variables may be related to innovation in one direction during the initiation phase, and in the opposite direction during the implementation phases" (Rogers (2003), 412-413).

4. *The paradox of the critical incidence that can create both tension and creativity*.

   It emphasizes on the organizations strategic reactions to critical incidents outside and within the organization environment as an important key for the organizations creativity enhancement (Tesluk et al. (1997).

5. *Paradox of hiring the wrong people turning into the increase of creativity*.

   The paradox is based on Davila's idea that hiring wrong people will help in finding the people who will challenge the status quo, increase diversity and creativity as well as higher level of innovation in the organization (Davila et al. (2006), 254).

6. *Paradox of the failure punishment in deteriorating the potential success.*

   It emerges from the following: “Risk taking behaviour is necessary for successful innovation, but it can be killed if the failure is punished either economically or socially” (Davila et al (2006), 205).

7. *Paradox of becoming the victim of company’s or country’s own success.*

   The paradox is embedded in the following, “Companies naturally become the victims of their own success: As they grow and become successful they lose some of their adaptive capacity”. (Doz and Kosonen (2008), 6)

8. *Paradox of the tension between strategic agility and operational excellence* embedded behind the rational of Doz and Kosonen ((2008), 218).

9. *Paradox of rewards and incentives in deteriorating peoples’ passion.*

   This *paradox originates at the following lines* of Davila et al. ((2006), 182): some *people have a passion in their work therefore; a reward is not a push towards their motivation*. It is not easy to use incentives to radical and semi radical innovation, since their targets are not well defined as in incremental innovations: radical innovation relies on recognition as its reward (Davila et al (2006), 182).

10. *Strategic paradox of renewal arising from the conflicting forces of change and stability.* (Baden-Fuller and Volberda, 1995).

11. *Paradox of simultaneous open and closed living organizations* indentified form Maula’s idea of an organisation’s self-renewing throughout a continuous self-renewal of the organisation’s components. Concerning the

knowledge, a company is simultaneously open and closed (Maula (2006), 186-187)

12. *Paradox of the surprise based on spontaneity and lack of rational knowledge*

The paradox refers to "Surprise can emerge from within systems as human agents locally express their spontaneity. In these settings, one needs to take action, knowing it will have some systemic effects and, yet, often without full knowledge of how a particular action will unfold" (Luoma, Hämäläinen and Saarinen (2007), 14). And, as a consequence of this paradox the following one emerges

13. *Paradox of rewards experience based on materially unattainable issues.*

This is supported by the notion that, mechanistically judged meaningless and materially unattainable issues can be decisive based on their rewarding value. In this approach, rewarding is considered as interpretation made by the individual in relation to the general context or *frame* to the *micro-behaviour* (Handolin and Saarinen (2006)).

14. *Paradox of organizational learning in turning the radical innovation into a routine*, embedded in Rogers's idea of how, over time organisations learn and become more accustomed and the radical innovations become less radical and more routine. (Rogers (2003))

15. *Paradox of lost emotional energy and lost butterfly effect as a consequence of the failure in seeing the hidden emergent spaces*, **e**merging from the notion that the potential emotional energy is difficult to reach with the conventional mechanistic methods. But unfortunately we often fail to see the hidden *emergent spaces* of the everyday life and

thus we lose the opportunity to create a butterfly effect. (Losada (1999) and Saarinen et al. (2004)).

2.4 Systems theoretical framework for integrating the different perspectives

This study looks at the creativity and innovation from different perspectives, namely from the viewpoint of the innovation itself, the individuals innovating or applying innovations in creative ways, the organisations fulfilling the purpose of their existence by producing and utilizing innovations, and finally from the circumstantial perspectives. In order to integrate these different perspectives under one theoretical framework the systems approach will be explored.

"Systems approach provides a basis for integration by giving us *a way to view the total organisation in interaction with its environment* and for conceptualization of relationships among internal components and subsystems" (Kast and Rosenzweig (1985), 102). Systems view has been used in addition to look at the individual as dynamic system influenced by the environment (Kurt Lewin) or to relate personality to the socio-cultural system (Kast and Rosenzweig (1985), 105). Chin (1976) argued that, "the system model is regarded by some system theorists as universally applicable to physical and social events, and to human relationships in small and large units." (in Kast and Rosenzweig (1985), 105)

Within the broad field of the system thinking, this study focuses on innovations and their relationship with a system. Notions like innovation system (IS) and innovations ecosystem (IES) have been discussed in chapters 2.3, however it has to be remembered that there resides no coherent theory on innovation-individual-context inter-relation. In order to communicate the fundamental concepts of systems thinking and their possible relation with innovations, systems theory will be explored in this section.

"What do we then mean by system?" *System* is used liberally and with limited demands of a precise definition in everyday language, as well as in large parts of the scientific literature. According to Edquist (2001), 4) there is, however, a common answer in everyday language as well as in scientific contexts:

- "A system consists of two kinds of entities: There are firstly, some kinds of components and secondly, there are relations between these".
- "There should be reasons why a certain array of components and relations has been chosen to constitute the system; they form a whole".
- "It must be possible to discriminate the system in relation to the rest of the world; i.e. it must be possible to identify the boundaries of the system. However, only in exceptional cases is the system closed in the sense that it has nothing to do with the rest of the world. That part of the rest of the world that in some sense is important for the system is called its environment." (Ingelstam (2000), 9)

With regard to Ståhle ((2004), 223) there are two trends in systems theory namely, *General System Theory and Cybernetic*. These two approaches have created grounds for the development of systems thinking and multidisciplinary research on systems. However, since the Second World War, the systems thinking have created a number of diverse and contradictory approaches.

This section gives an overview on the development of systemic theories, particularly in emphasizing the theory of open systems and those systemic approaches, which are relevant for the exploration of innovation. Moreover, this section introduces the theoretical grounds of the system. The section discusses also the human nature of the innovation environments, as Katz and Kahn (1978), 37) stated, "social systems are anchored in the attitudes, perceptions, beliefs, motivations, habits, and expectations of human beings."

This section explores whether the core of creativity and innovativeness could be reached throughout the holistic views of system and its sub-systems. In this

regard the first task is to establish the theoretical bases of innovation circumstances of which is intended to be done in to two phases.

In the first phase, in order to relate the organizational, management and innovation discussions to systems thinking, the open system approach to organization will be introduced based on Kast and Rosenzweig's (1985) *open, socio-technical system model*. Open system approach provided a new paradigm for social organizations and their management discussions during the last decades. While introducing open, socio-technical system approach also the basic concepts of 'systems language' will be explored. System language consideres aspects of *sub-systems (components of the system*) and *supra- or super-systems (system's environment*), *input-transformation-output* model, *entropy, equilibrium, equifinality, autopoiesis and self-renewal* (to mention some of the key concepts).

In order to portray the relation among innovation and circumstances, the second phase refers to the more *recent developments of systems thinking*. Due to many, contradictory and dissimilar approaches to the system the development of different categories will be explored. Furthermore, the basic differences of various approaches will be discussed by introducing the most recent development of the systems theories, which establish the theoretical bases for innovation systems, these theories include specific concepts such as *autopoiesis, self-organisation, self-renewal, self-referential and bifurcation zone and far-from-equilibrium.*

2.4.1 Organization as a transformations system consisting from subsystems

Ludwig von Bertalanffy ((1952), 201) explored the evolution of various field of modern society and found that similar concepts have been used in different disciplines of science, he stated "In modern science, *dynamic interaction* is the

basic problem in all fields, and its general principles will have to be formulated in General System Theory."

Systems approach has been applied in various fields of science *to understand parallelism of ideas* and to formulate and develop principles that hold for systems in general. Chin (1976) states "Thus, the system model is regarded by some system theorists as *universally applicable to physical and social events, and to human relationships in small and large units*." According to Senge (1990) in a system a group of issues or subsystems operate together as one entity to fulfil a common goal.

For the purpose of understating social entities as systems, the forerunners Katz and Kahn (1978), 20) presented a comprehensive theory of *organisations using an open-systems theory*. In their theoretical model an organisation is "that of an energic input-output system in which the energetic return from the output reactivates the system. Social organisations are flagrantly open systems in that the input of energies and the conversion of output into further energic input consist of transactions between the organisation and its environment."

In their earlier works, system scholars Katz and Kahn ((1978), 23-30) have discussed open systems characteristics whereby in Social Psychology of Organisation the common characteristics for all open systems are as follows:

1. "*Importation of energy*. Open systems import some form of energy from the external environment. Social organisations draw renewed supplies of energy from other institutions, or people, or the material environment.
2. *The throughput*. Open systems transform the energy available to them. In organisations this refers to the creation of new products and services, or processing of materials, or training of people. These activities entail some reorganisation of input. Some work gets done in the system.
3. *The output*. Open systems export products into the environment, 'whether it be the invention of an inquiring mind or a bridge constructed by an engineering firm.'

4. *Systems as cycles of events.* The pattern of activities of the energy exchange has a cyclic character.
5. *Negative entropy.* To survive, open system must reverse the entropic process: they must acquire negative entropy.
6. *Information input, negative feedback, and the coding process.* Inputs are also informative in character, providing feedback from the environment. Coding makes it possible for the systems to be selective concerning the reception of information inputs.
7. *The steady state and dynamic homeostasis.* Open systems that survive are characterized by a steady state, which is based on the constancy in energy exchange. However, the steady state is not motionless or true equilibrium, but the system is rather in dynamic homeostasis with its environment.
8. *Differentiation.* Open systems move in the direction of diffusion and elaboration.
9. *Integration and coordination.* As differentiation proceeds, it is countered by processes that bring the system together for unified functioning.
10. *Equifinality.* A system can reach the same final state from differing initial conditions and by variety of paths."

Furthermore Katz and Kahn ((1978), 51) discussed the tendency of functions to create distinctive subcultures in ways that also reflect the cross-organisational commonalities of subsystems within an organisation. They described the facts of organisational functioning with respect to five basic subsystems. Katz and Kahn (1978).51) defined *throughput or a transformation of the energetic input* by refereed to Parsons (1960) as "those activities concerned with the throughput have been called *production or technical subsystems*". So the production subsystems are concerned with the work that gets done.

Two different types of production-supportive structures provide a continuing source of production inputs. One is related to activities that produce raw materials and dispose of the product. The other type of system is "the more

complex level of maintaining and furthering a favourable environment throughout relations with other structures in the society- the institutional function" (Katz and Kahn (1978).51). The second basic subsystems are thus called *supportive subsystems of procurement, disposal, and institutional relations*.

From the point of view of innovation, the aspect of maintaining and furthering a favourable environment is interesting and goes in same vein with the notion of innovation ecosystem. One can even see some connectivity with Florida's notion of learning region and his attempt to stress the importance of attractiveness of the region. However, the difference is that Florida (2005) is putting the individual before the organisation while Katz and Kahn (1978) have the perspective of the organisation.

In organisations, "special attention must be given to maintenance input, that is, to insuring the *availability of the human energy* that results in role performance," (Katz and Kahn (1978), 51). The third basic subsystems are the maintenance subsystems for tying people into their functional roles (ibid. 52).

Since the organisation exists in a changing environment, it must adapt constantly to the changing needs. "*Adaptive structures* develop in organisations to generate appropriate responses to external conditions" (Katz and Kahn (1978), 51). The concern of the fourth type of subsystems is thus the change, for the reason that these patterns of behaviours need to be coordinated, adjusted, controlled and directed to hold the systems together.

The fifth type of subsystems, the *managerial systems*, is an integral part of social patterning of behaviour, and thus "the direction, adjudication, and control of the many subsystems and activities of the structure" (ibid. 52) are the concern of the fifth type of subsystems.

Once more, attention will be drawn to the fact that in the open system approach a strong role is provided for the management system, which is based on the determinism of controlling the environment. From the viewpoint of the top-down versus bottom up approaches, concerning the innovation ecosystems the question of the management system is important. Furthermore, the question of what really happens while in discontinuation calls for further exploration of the dynamic equilibrium and the need to control the environment.

In order to do so, other concepts like self-renewal and autopoiesis are needed and will be discussed in section 2.4.2. However, before that, a more thorough overlook at the open systems approach is needed because of two reasons. Firstly, to remind of the basic thinking, this has intensively affected our views of management during the last decades. Secondly, open systems approach may help to understand both radical change and productivity of the mainstream as simultaneous phenomenon. With Katz' and Kahn's idea about the relationship of the system with is environment the attempt is to enlighten the role of circumstances for innovations. Secondly, another open-systems-view on the organisation as a socio-technical system will be discussed.

Katz and Kahn ((1978), 63) stressed the importance of widening the scope in organisations by writing, "The first step should always be to go to the next higher level of system, to study the dependence of the system in question upon the suprasystem of which it is a part, for the suprasystem sets the limits of variance of behaviour of the dependent system." Furthermore, according to these researchers (ibid.), "Social systems are dependent on other social systems; their characterisation as subsystems, systems or supersystems is relative to their degree of autonomy in carrying out their functions […] From the societal point of view the organisation is a subsystem of one or more larger systems, and its linkage or integration with these systems affects its mode of operation and its level of activity." When discussing the suprasystems, systems and subsystems, Katz and Kahn (1978) referred to Singer (1961) in order to consider the

international relationships as a relevant suprasystem and nations as the subsystems.

The question, of what is then the relevant unit for the particular interest in this study, has been solved by enlightening the various layers of systems. That is to say, the study starts from the innovator as a subsystem of an organisation (or company or a network within a more or less geographical proximity) and investigates these systems as subsystems of the national innovation system and then finally, as a subsystem of global environment. Hence, this study analyses the innovation system as multi-level scheme as Salmenkaita (2004) call the constellation consisting from individuals, organizations and societies. The global innovation ecosystem is the highest level, national and the regional innovation ecosystems (RIS, NIS) are the next levels and they consist of the organizations (including companies and HEIs) and people creating the knowledge and ideas. However, the layers should not be considered as rigid boundaries and but as overlapping and intertwined systems.

The next issue to be dealt is **organisations as open socio-technical systems**. In their book 'Organization and Management - A Systems and Contingency Approach', Kast and Rosenzweig ((1985), 5) discussed the relationship of organization theory and management practice in specific situations.

The systems view of organisation and their management served as the basic conceptual framework for Kast and Rosenzweig when developing the *contingency* (environment and organisation in congruency) *view of organisation*. They view an organization as a system that consists of *"1) goal-oriented arrangement, people with purpose, 2) psychosocial systems, people integrating in groups, 3) technological systems, people using knowledge and technique, and 4) an integration of structured activities, people working together in patterned relationships"* ((1985), 5). Kast and Rosenzweig have considered the organization in terms of a general open-system model (figure 37).

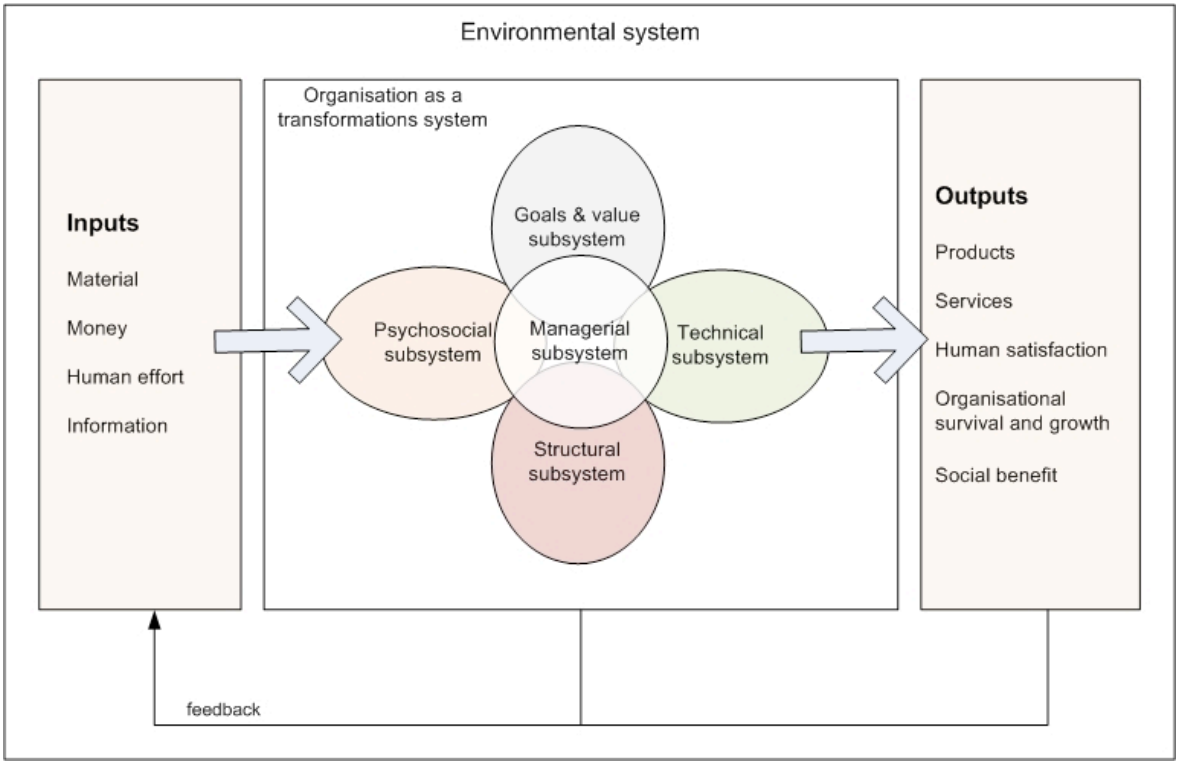


Figure 37 Organization as a transformations system consisting from subsystems modified from Kast and Rosenzweig ((1985), 17,114)

In addition, Kast and Rosenzweig ((1985), 15) defined *the system* "as an organised, unitary whole composed of two or more interdependent parts, components, or subsystems and delineated by identifiable boundaries from its environmental suprasystem." Thus, organisations are open systems that can be conceived as a set of interacting subsystems and they need management to balance internal needs and to adapt to environmental circumstances.

In defining *management*, Kast and Rosenzweig (1985) urged that "managers convert diverse resources of people, machines, materials, money, time and space in to useful enterprise. […] M[m]anagement is a process where these unrelated resources are integrated in to a total system for objective accomplishment. Managers get things done by working with people and physical resources in order to accomplish the objectives of the system. They coordinate and integrate the activities and work of others." Kast and Rosenzweig ((1985), 6)

In their view, the open system is in continual interaction with its environment and achieves a *"steady state" or dynamic equilibrium*. Kast and Rosenzweig ((1985), 15) motivated the importance of the systemic approach to organizations and their management as following: "The systems approach facilitates analysis and synthesis in a complex and dynamic environment. It considers an interrelationship among subsystems as well as interactions between the system and it suprasystem and also provides a means of understanding synergistic aspects. This conceptual scheme allows us to consider organizations-individuals, small-group dynamics, and large-group phenomena-all within the constraints of an external environmental system." Kast and Rosenzweig ((1985), 15)

Even though Kast and Rosenzweig (1978) warned about the relative nature of openness versus closeness of the system, in order to underline the open nature of organisation and the importance of steady state, they (ibid., 112) stated that "survival of the system, in effect, would not be possible without continuous flow, transformation, and outflow." In order to provide a general definition and a conceptual model of organisations that will be appropriate for all types of organisations.

Kast and Rosenzweig ((1985), 113) regarded the *organization as "an open, socio-technical system composed of a number of subsystems"*. The subsystems of an organisation are as summarised in figure 38.

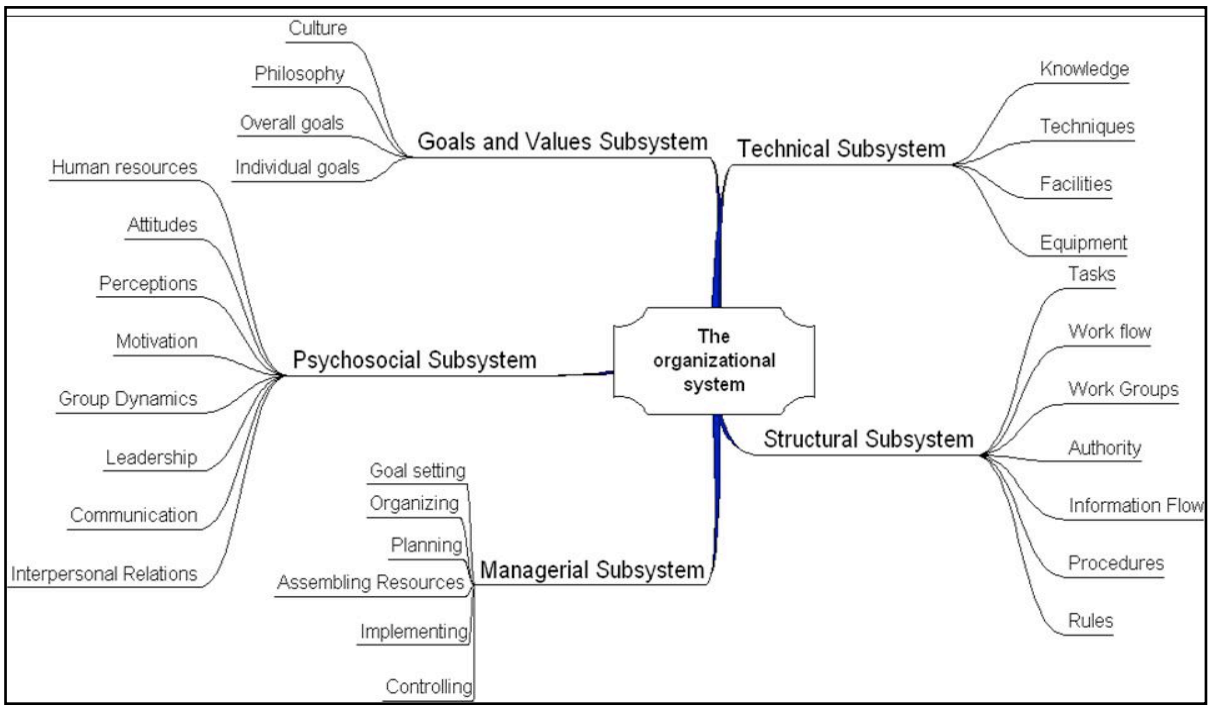


Figure 38 Organizational subsystems, based on Kast and Rosenzweig ((1985), 114)

Based on the above open socio-technical-system view on organisation, the following basic premise was stated as a guideline for the empirical analysis of this study: *The organization, as a subsystem of the society, must accomplish its goals within constraints that are an integral part of the environmental suprasystem*. Hence, in this research, *organisation's environmental suprasystem can be found in the continuum of the global, national and regional innovations ecosystems as the internal organization is viewed as composed of several major subsystems*. Some of the subsystems are more important from the viewpoint of change and radical innovations, whereas others are important from the viewpoint of the maintenance of organisations static functions like finance, accountancy or logistics. In the following section the subsystems will be discussed more in detail.

According to Kast and Rosenzweig ((1985), 113) organisation's *goals and values* represent one of the most important subsystems. Many of the organisation's values are taken from the socio-cultural environment. However, it is a two-way process and the organization at the same time influences the societal values.

Individual participants' goals and their relationship to organizational goals are the concern when the radical innovators and their circumstances are investigated. Here, one can refer to Florida's (2005) creative class as an example of the importance of focusing on the individual's goals when composing the value and gaols systems for any organisation, region or nation in order to attract these creative knowledge workers and their ideas. Hence, the reciprocation between individual, organization and society when developing a goal system will be analyzed together with the results of the empirical data of this study.

"The *technical subsystem* refers to the knowledge required for the performance of tasks, including the techniques used in the transformation of inputs into outputs" Kast and Rosenzweig' ((1985), 113). The task requirements of the organisation determine the technical subsystems content. Organisational technology refers to techniques, equipment, processes and facilities used in the transformation of inputs into outputs.

In consideration of innovation, the Technical subsystem plays of crucial role. Most of the innovation deteriorating factors due to the technical subsystem originate in the failure in management system to relate the organisation to the environment and set new goals. As discusses throughout the study, knowledge is vital for innovation. With regard to the open innovation of the modern era, one should stress the importance of technical subsystems in the form of knowledge networks. Hence, knowledge networks create both physical and psychological circumstances for the innovation, helping the innovator to find both tacit and explicit knowledge to accomplish their ideas to innovations or presenting the ideas to the right quarters.

"Every organization has a *psychosocial subsystem* that is composed of individuals and groups in interaction. It consists of individual behaviour and motivation, status and role relationships, group dynamics, and influence systems." (Kast and Rosenzweig' (1985), 114). As considered in chapter 2.1 and 2.2, both individuals

and group dynamics are of great interest when studying the factors facilitating and inhibiting innovations.

Structure is concerned with the ways in which "the tasks of the organization are divided (differentiation) and coordinated (integration). In the formal sense, structure is set forth by organization charts, by position and job descriptions, and by rules and workflow. It is also concerned with the patterns of authority, communication, and workflow" Kast and Rosenzweig ((1985), 115). From the point of view of this study, it is important to perceive how the differentiation and integration takes place in systems. Furthermore, as discussed earlier, in order to be successful with radical innovation, especially in the ideation phase, the demands for the structure are specific and they differ from those of the mainstream.

"The *Managerial subsystem* spans the entire organisation by relating the organisation to its environment, setting the goals, developing comprehensive, strategic, and operational plans, designing the structure, and establishing control processes" (Kast and Rosenzweig ((1985), 115).

Research (see chapter 2.1.) is unanimous about the importance of managers' role on innovations and especially radical innovations. Without the support from the executive, radical innovation is rare. Nevertheless, the question of the management concerning innovation ecosystem seems to be controversial. As discussed earlier, scholars argue that the bottom-up model with minimal managerial interventions has proved to be successful in many of the world's leading regions like Silicon Valley, Boston Road 123, and Cambridge cluster. Due to this challenging subject, the issue of self-renewal will be discussed in the following section (2.5.2.).

Before that, the contingency view of organisations will be introduced, in order to demonstrate the difference between static and dynamic approach on systems. In opening the discussion about the different viewpoint on the successfulness of

the system, Kast's and Rosenzweig's concept of productivity and other related notions will be discussed.

Contingency view of organizations supplements the systemic approach of organizations, by emphasizing more specific characteristics and patterns of interrelationship among subsystems, along with underlying the genius nature of specific situations and uniqueness of the environment and internal subsystems. "An underlying assumption of the contingency view is that there should be congruence between the organization and its environment and among the various subsystems. The primary managerial role is to maximise this congruence. The appropriate fit between the organisation and its environment and the appropriate internal organisational design will lead to greater effectiveness, efficiency and participant satisfaction." (Kast and Rosenzweig (1985), 116).

In order to create fruitful conditions for the future radical innovations two remarks are presented. First, since we cannot know what the future environment will be like, there is a considerable likelihood for the management system to relate the organisation with the existing environment. Awareness of this tendency makes it easier to perceive the contradictions related to innovation. Second, when stressing the importance of congruence, one should not ignore the potential for change provided by momentum of disorder and chaos, which will be discussed later. Since, when environment changes the subsystem will furthermore, go through a phase of disequilibrium in order to reach a new level of equilibrium.

Based on contingency view Kast and Rosenzweig (1985) suggested that there is an appropriate pattern for relationship for the stable-mechanistic and adaptive-organic organizations as initiated in table 21.

Table 21 Comparison of stable-mechanistic and adaptive-organic organisations based on Kast and Rosenzweig (1985), 116-117).

	The stable-mechanistic organisation form is appropriate when	The adaptive-organic organisational form is appropriate when
The environment	relatively stable and certain	relatively uncertain and turbulent
The goals	well defined and enduring	diverse and changing
The technology	relatively uniform and stable	complex and dynamic
Nature of activities	routine activities and productivity is the major objective	many non routine activities in which creativity and innovations are important
Decision making	programmable and coordination and control processes tend to make tightly structured, hierarchical system possible	Heuristic and decision-making processes are utilized and coordination and control occur through reciprocal adjustments. The system is less hierarchical and more flexible

From the perspective of the discussion related to the various aspects of the innovations' environment, which is continuously ongoing in this study, the question of bottom-up versus top-down perspective on the management of the innovations' system can be examined also in the framework of stable-mechanistic and adaptive –organic framework. If applying the content and meaning of the table 21 to this discussion, one can conclude that the right hand column and thus the adaptive-organic view of the innovations' environment both at organisational, regional and national levels applies to the era we are living. This study explores the open-adaptive systems.

System adapts to the environment. It is like a sensitive organ, which is scanning the environment and hence, it is prepared for the changes. Already in 1978, Katz and Kahn (1978) stressed the importance of organisations adaptability since successful organisations search for interstices and gaps from the market. A system adapts to the environment by changing the processes, tasks and

structures. Organizations as autopoietic systems are autonomic and throughout the interaction with the environment they can control themselves (Leinonen (2003); von Bertalanffy).

Applying Open Systems approach into innovation ecosystems and developing the idea toward complexity. The global economy provides a turbulent environment for NIS, RIS and organizations. In the constantly changing environment the innovation systems and subsystems try to achieve the "steady state". Radical innovation however pushes the systems towards disequilibrium. Moreover, during the non-linear developmental phase, the radical innovations can be seen as the systems' means of obtaining a new steady state. In order to create innovations, one should consider, as most valuable, the creative individuals capability to sense the needed change.

The open systems approach fails to explain how the devastating changes with the overlapping truths of the old and new can be managed. What kind of leadership is needed in the moment, when the entire system effectively performs by following the rules aiming at the maintenance of the old steady state, when at the same time, a new order is emerging and yet nobody knows what are the new rules and logics? For that, the thinking around the adaptive subsystem introduced by Katz and Kahn has been developed further in more resents systems approaches (e.g., Jackson (2007)) and will continue in this study.

Since the general open systems thinking is insufficient in managing the change related to radical innovation, the basis of systemic thinking in the next section will rely into the *complex adaptive systems*, which has been used for description specifically complex social systems. Complex adaptive systems have the following characteristics: sensitiveness for minor changes, adaptive for the changes in the environment, determinism, complexity. (Elliot and Kiel (2004), Chiva-Gomez (2004), Harris and Zeisler (2002)

Open systems, which are in interaction with their environment, can learn. Since learning system's own goal and will develop whilst the system changes, it is difficult to foresee system's development based only on its history. Shared goals makes system's learning process effective. One of the main characters of the systemic thinking is complexity. It is difficult to manage a system as an entity, but if a subsystem is separated from the entity, it is difficult to get a realistic view of its operations. It is crucial to find the critical characters of the system. There is plenty of information around the system which does not affect it, or to which the system has got used. Critical information refers to information, which affect the system and which the system has not got completed means. Manmade systems need visions to be able to learn and to adapt to new circumstances (Senge (1990), Kamppinen, Kuusi and Söderlund (1999), Rubin (2004)).

According to the *soft system methodology (SSM)* the complexity is increasing in man-made systems. That is especially true in social changes. As the complexity increases, the old methods and practices become inadequate. Interaction is not only between the operators but it includes the interaction of values, interests, norms and rules. (Flood (1999))

According Metcalfe (1995), the innovation ecosystem is the set of market and non-market institutions, which contribute to the development, diffusion and application of new knowledge and provide a framework for governments to implement policies to influence the innovation process. Based on previous, it is concluded that open systems approach and innovation ecosystem are of the same vein.

2.4.2 A deeper look at the systems thinking

Our views about societies, organisations and success have changed over the decades. Scholars argue that since knowledge become an important economic asset the structure of society has transformed (Drucker (1999), Castells (2000)),

and changed also the logic of creating value or doing business (Ståhle et al. (2003)).

Individuals, organisations, regions and nations have to take into consideration many simultaneous but dissimilar realities when striving for survival and facing dynamic models of worldwide competition in rapidly transforming and unpredictable environments. From one hand, these systems, in all levels, have to maintain their basic functions and take care of the everyday efficiency. On the other hand, in the turbulent environment, their capability for self-renewal, the ability to adapt to the changes in the environment or even to act as a forerunner changing the rules of the market (Hamel, (1996)) is becoming more important.

When organisations are preparing themselves for fundamental changes or future opportunities, they must create conditions for radical innovations, and on the other hand, companies' renewal capacity will determine how well they can respond to radical changes of the market (Edvinsson and Malone (1997) in Ståhle (2003).

Scholars argue that systems concept allows the inherent characteristics of complexity and dynamism of organisations. Especially dynamic systems approaches offer promising possibilities for studying organisational and social issues, which are beyond the reach of other types of approaches (Ståhle et al. (2003), Maula (2006)).

Moreover, scholars claim that system thinking should be adopted by companies to be strategically innovative on sustainable bases (Hamel (1998)) or for achieving fast adaptation in unpredictable environments (Eisenhardt and Brown (1999)). Jackson (2005) suggests those companies confronting the complex, diverse and rapidly changing problem situations not to be locked into a particular, limited way of seeing the world, but to employ creatively, in an informed and ethical way the various systems approaches at different times.

According to him, (ibid.) *creative and holistic way of applying systems approaches* promotes the overall improvement of organisational performance, and this is the essence of creative holism.

Thus, understanding organisations as social systems consisting from subsystems and operating as a complex network of interrelationships, allows reviewing of simultaneous complex realities, which are the environment for innovation. (Ståhle et al. (2003))

System related concepts have a long history, dating back to the philosophical thoughts of Aristotle and Plato, and since then they have been refined in a variety of different disciplines. Systems language has been developed and applied for managerial and research purposes in organisational context since the Second World War.

General Systems theory (by Ludwig von Bertalanffy) and Cybernetics (by Norbert Wiener) dominated systems thinking at that time and they have generated grounds for systems thinking until today. Since then, the conceptualisation of organisation-as-system and research on organisations and other systems in the changing circumstances of the real-world operative environments have become rich and a myriad of different systemic approaches on organisational life have been developed. According to Checkland ((1983), 13) systems approaches had been developed and applied both on America and in Europe, however in Europe their role have been stronger. Sociologist Talcott Parsons, a researcher of the Tavistoc Institute, social psychologists Katz and Kahn, contingency theorists Lawrence, Lorch, Burns, and Stalker are the early supporters of system based view of organisation.

Widely spread *systemic view of organisation* can be reduced to Morel's and Ramanujam's (1990) definition as an example: "organisations are now viewed as dynamic systems of adaptation and evolution that contain major multiple parts which interact with one and another at the environment." Current views of

organisation portray organisations as complex and dynamic systems and the key concepts in resent literature encompass notions like dynamic change, adaption to complex environments and evolution (Ståhle et al. (2003), 31).

From innovation point of view, it is important to focus on the fact that at the 1960's, awareness of the complexity of the systems and their capability for endogenous change started to develop. What these approaches (System Dynamics (Forrester), Soft Systems Methodology (Checkland), Learning Organisation (Senge)) offered for the understanding of change and its nature and how they developed ground for understanding of innovation will be taken in to consideration further in this study based on Ståhle (1998), Ståhle et al (2003), Ståhle (2004), and Jackson (2005).

In order to first cover general ground for the theory building of this study, two different ways (Jackson's (2005) and Ståhle's (2003)) of introducing and classifying the main approaches of innovation system will be considered. Both ways are relevant form the point of view the empirical data of this study.

In his book "Systems Thinking" Jackson (2005) discussed and applied systems thinking for the diversity and 'mess' from 'simple solutions' to complex real-world problems. Jackson and Keys (1984) developed a framework (System of Systems Methodologies (SOSM)) or *ideal-type grid* (figure 39) for classifying different systems approaches with relation to the range of problems to be solved by organisations.

The vertical axis (Jackson (2005), 18-24) expresses a continuum of systems types conceptualized at one extreme as relatively simple and stable systems with few subsystems that are involved in only a small number of highly structured interactions. At the other end resides the extremely complex systems (the adapting and evolving systems with a large number of subsystems that are involved in many more loosely structured interactions).

The horizontal axis classifies the relation that can exist between participants, those concerned with the problem context: 1) participants being in unitary relationship have similar values, beliefs and interests, 2) participants being in pluralist relationship have compatible basic interests, but they do not share the same values and beliefs. Space for debate, disagreement, even conflict needs to be made available, then accommodations and compromises can be found and participants will agree and act accordingly, at least temporarily. 3) Participants being in coercive relationships have few interests in common. Compromise is not possible and no agreed objectives direct action. "Decisions are taken on the basis of who has most power and various forms of coercion employed to ensure adherence to commands (ibid. 19)."

Jackson combines the systems and participants dimensions and yields six ideal forms of problem contexts as: simple-unitary, simple-pluralist, simple-coercive, complex-unitary, complex-pluralist and complex-coercive. He then discusses the different systems methodologies and their development in the problem context at issue. The conclusion, indicating the assumptions made by different systems approaches about the nature of problem contexts, is summarised in figure 39.

		Participants		
		Unitary	Pluralist	Coercive
Systems	Simple	Hard systems thinking	Soft systems approaches	Emancipatory systems thinking
	Complex	Systems dynamics Organisational cybernetics Complexity theory		Postmodern systems thinking

Figure 39 Systems approaches related to problem contexts in the Systems of Systems Methodologies (SOSM) (Jackson (2005), 24).

Jackson ((2005), 24-28) classifies and describes holistic approaches to management using the system language and offering guideline as to where the main emphasis of an approach lies. According to Jackson (2005), xxii), overall organisational performance depends on the following abilities and consideration must be given to *efficiency, efficacy, effectiveness, elegance, emancipation, empowerment, exception and emotion*.

The first group consists of systems approaches for *improving goal seeking and viability*, for these approaches "the measures of success are 'efficiency' (are the minimum resources used in goal seeking?) and/or 'efficacy' (do the means employed enable us to realize our goals?). This kind of system approaches have assumed that participants are in a unitary relationship so that goals are clear. Their effort has concentrated on problem context where they have sought to optimise the system of concern to achieve its goals or reconfigure it to enable it to deal with internally and externally generated complexity and turbulence" (Jackson (2005). 25).

Hard systems approach (Hard Systems Thinking, Quade and Miser (1985), Checkland (1981) In Jackson 2005) makes an effort to find the best means of getting from the present state of the system to optimum state. Systems Dynamics, The Fifth Discipline (Forrester (1956), Senge (1990)), Organisational Cybernetics (Beer (1972)) and Complexity Theory (Lorentz (1963), Prigogine (1984)), seeks to understand and manipulate the mechanisms, operating at deeper' level that gives rise for systems behaviour (Jackson (2005), 25). The interrelationship between the positive and negative feedback loops, within which system elements are bound, is the key for System Dynamics. Organisational cybernetics tries to manage issues of "complexity" and "turbulence" whereas unpredictability and disorder are concerns of Complexity theory (Jackson (2005), 25).

The second group consists of 'soft systems thinking', Systems approaches for exploring purposes stakeholders want to pursue. The measure of success are

"'*effectiveness*' (are we actually achieving what we want to achieve?) and '*elegance*' (do the stakeholders find what is proposed tasteful?" (Jackson (2005), 26)

These approaches advocate facilitating a learning process in which the importance of subjectivity is respected. They consider important to be able to handle the disagreements and conflicts that occur between stakeholders caused by variation in values and worldviews.

Different assumptions, multiple perspectives and diverse worldviews are concerns of Strategic Assumption Surfacing and Testing (Churchman (1968), Mason and Mitroff (1981)). It articulates a dialectical learning process of "thesis, antithesis and synthesis" whereby conflicts are considered to assist with problem solving. Idealizes design is meant to ensure the maximum creativity to the process of dissolving the disagreement and creating a future they all desire. Other approaches of this group are Interactive Planning, (Ackoff (1974)), and Soft Systems Methodology, (Checkland (1981)). (Jackson, (2005), 26)

Third group consists of the so called '*emancipatory systems thinking*' or systems approaches for ensuring fairness in systems design and in the consequences that follow from it. The measures of success are "'*empowerment*' (are all individuals and groups able to contribute to decision-making and action?) and " '*emancipation*' (are disadvantage groups being assisted to get what they are entitled to?" (Jackson, (2005), 27).

Critical Systems Heuristics (Ulrich (1983) and Team Syntegrity (Beer (1990) are both emancipator. The first stresses the full participation of those who are affected by the systems design and democratic, consensus driven milieu is the concern of the latter. (Jackson, (2005), 27)

The fourth group consists of the *postmodern systems approaches* that seek to promote diversity in problem resolution. Postmodern systems thinkers (Lyotard,

Focault, Topp) are phased by immense complexity and coercion, their interventions can be evaluated by "'*exception*' (what otherwise marginalized viewpoints have we managed to bring to the fore?) and '*emotion*' (does the action that is now being proposed feel appropriate and good in the local circumstances in which we are acting?). (Jackson (2005), 27)

The criteria-model for a self-renewing system. In order to lay ground for the understanding of the different realities where innovation takes place, this section discusses three paradigms (mechanistic, organic and dynamic) of systems thinking based on Ståhle (1998) and (2004), Ståhle and Grönroos (2000), and Ståhle et.al (2003).

In order to study the self-organising, self-reference, and self-renewal in organisations Ståhle ((1998), 117) thoroughly analysed in her thesis system theoretical writing, based on Prigogine, Maturana, and Varela's concepts, as well as Luhmann's applications of autopoiesis on social systems.

She (ibid.) found that, the *self-renewing system must be capable of 1) creating system awareness – self-definition, 2) establishing relationships, 3) exchange of information – crystallizing meanings, and 4) cooperation with time – choosing and acting – connectedness.*

Theories of self-organization and self-reference suggest attributes for the four functions of self-renewal, and provide the criteria for their recognition. In her thesis Ståhle (ibid., 118) presented a matrix of the preliminary criteria for a self renewing system (figure 40). The signs are categorized according to the four main functions of self-renewing systems:

A SELF-DEFINITION - CREATING SYSTEM AWARENESS
A self-renewing system (SRS) is self-reflective
A1 Defining one's own existence: basic ideas for being and doing, mutual values, principles and goals (controlling chaos from within)
A2 Recognizing what is important and meaningful
A3 Prioritizing, continuous self-reference
A4 Everyone participating, personal involvement, responsibility to act
A5 Cooperating with other systems

B CONNECTEDNESS - ESTABLISHING RELATIONSHIPS
Relationships within SRS are double contingent and iterative
B1 Relating: response and resonance, persons react sensitively to each other
B2 Positive and negative feedback: supporting or restricting growth
B3 Balance of power, equality of relationships: each part contributing equally
B4 Mutual trust: attentive listening, sharing, concern for each other
B5 Risk-taking: opening up, courage to disclose personal weakness

C EXCHANGE OF INFORMATION - CRYSTALLIZING MEANINGS
The state of SRS is far-from-equilibrium: the role of entropy is decisive
C1 Redundant exchange of information
C2 Experiential information: feelings, wants and personal views are expressed
C3 Tolerating uncertainty and confusion: accumulation of mutually meaningful information, unhurried decision-making process, no haste in judging what is important
C4 Acting spontaneously, tolerating disorder, confusion and errors
C5 Meanings are processed and clarified in continuous dialogue and mutual interaction

D COOPERATION WITH TIME - CHOOSING AND ACTING
Actions and decisions in SRS adhere to bifurcation
D1 Awareness of circumstances: knowing when to act and when not to act
D2 Choices and actions are based on mutually clarified meanings
D3 Dealing with determinism and freedom: recognizing the realities and possibilities
D4 Letting things happen without control: trusting in the power of the self-renewing process

Figure 40 The criteria-model for a self-renewing system (Preliminary model 1 in Ståhle (1998), 118)

Criteria for self-renewing system will be later discussed in relations to the top-down vs. bottom up way of seeing the innovations systems. Therefore it is necessary to understand what scholars found out about the concept of self-renewing. From literature Ståhle ((1998), 119) deduced the concept and its sub-concepts as following:

1) *Creating System Awareness - Self-definition* In the renewal process of a social system, the significant factor is awareness of the whole and its sub-systems, to create that awareness communication is the decisive factor. "Pertinent knowledge about the system is gained only through interaction" and

everyone belonging to a system is a "systemic actor" influencing the whole system leading it to either increase or decrease its capacity for self-renewal.

2) *Connectedness – Establishing Relationships* means that self-renewing systems are coherent, since they have the ability to relate and establish links. Coherent systems are able to self-organize or strengthen their identity. Networks of relationships and channels of communication are related to personal trust, interdependence and courage to take risks. "Each member of the system is dependent on the other members; that is, the system consists of double contingent relationships."

3) *Exchange of Information – Crystallizing Meanings* refers to systems' need for redundant exchange of information. By interaction, it acquires information regarding itself and the surrounding environment. The interaction always leads also to an accumulation of 'useless' information – wasted resources. "This is necessary because it is difficult to know in advance whether the gained or produced information is useful or not. The process of "becoming" will not occur without redundancy of information, production and dissipation of entropy. Meanings are unveiled, processed and clarified in the self-renewing system […] Collective meanings cannot be discerned without the ability of individuals to refer to themselves; meanings are clarified in the interchange of subjective perspectives. The contributions of all participants are needed for the clarification of meaning; everyone becomes involved in discerning and defining the boundaries of actions. Clarification of meaning always leads to particular choices which are demonstrated in actions."

4) *Cooperation with Time – Choosing and Acting*. Ståhle stated that because the outcomes of the self-renewing process cannot be determined beforehand, then its process cannot be manipulated or controlled in advance. The result is always unpredictable. For that, tolerance is substantial, to let chaos and self-organization occur without interference assuming that the system will react and re-organize. The wisdom of the self-renewal process lies within the system, not

outside it. It is only possible to lend support to a system in its becoming self-renewing and in finding its own path. Everything else is hidden. Furthermore, it is not possible to control time, yet it is possible to learn to identify the basic patterns of self-renewing processes "by becoming conscious and sensitive to situations, reflecting on what has happened and learning about the process that has occurred."

Managerial worldviews and the way to perceive the system and its environment, determines also the way the innovation ecosystems are managed. From the previous, the perception is that the innovation ecosystems' self-renewal process can rather be facilitated than managed. Self-renewal will later be dealt together with the results on systems' negative and positive impact on innovation.

Scholars have also discussed the relationship between the three systemic facets and process of innovation: Idea generation, implementation or actualization of the new idea and commercialization of innovation. "All these phases pose different requirements for the organization and management activities, as well as the pattern of interpersonal relationships (Kanter (1984), Ancona and Caldwell (1992), Pöyhonen (2001), in Ståhle et al (2003), 48). Dynamic facet is crucial for idea generation; the mechanical facet produces efficiency and sustained quality for production phase and organic facet provides successful customer oriented marketing and customer service when commercializing the innovation. In the next section, aspects of mechanistic, organic and dynamic systems are discussed in details due to their usefulness in the innovation process.

Mechanistic, organic and dynamic systems Self-renewal may be an important prerequisite for radical innovations. However the question as to whether the it is sufficient to simultaneously support incremental innovations and the productivity of the mainstream, remains unanswered. As stated earlier, scholars stress the importance of using creatively different systemic viewpoints in different times and situations, that is why in the following section the systemic

paradigms will be delineated in detail, because the practical results of the present study adheres to that frame of reference. More precisely, the focus will be directed on the three systems paradigm which Ståhle (1998) found in her thesis.

Based on a literature review, Ståhle found that different paradigms' starting point and focus are distinctly different and they portray systems in a different way, which was labelled along a continuum of mechanistic, organic and dynamic systems. According to Ståhle et al. ((2003), 32), each of the systems types serves different purposes in the organisation's life.

Moreover, other systems scholars have traced the systems development in an overlapping manners, like mechanic and organic (Burns and Stalker (1962), mechanistic and dynamic (Tetenbaum (1998), Black (2000) in Ståhle et al. (2003)) or open and closed systems, where self-production characterises the latter (Maula(1996)) (Ståhle et al (2003), 34). Ståhle ((2003), 41) together with other researchers introduced these three paradigms in a table 22.

Ståhle et al. (2003), 35) referd to Prigogine and Stengers (1984) and argued that the three-fold division coincides with the historical stages (*steady or equilibrium state, recognition of periodic fluctuation, and state of extreme instability, so-called chaos*) of the development of the science. However, the new emerging systems paradigm was not grounded on open systems theory neither was it based on cybernetics. The diverging new paradigm focused on the chaotic and unpredictable systemic behaviour (instead of stability) and on system's internal dynamics (instead of the feedback cycles) (Ståhle (2004).

Table 22 The paradigms of systemic thought (Ståhle et al (2003), 41)

Paradigm	Mechanistic	Organic	Dynamic
Characteristics			
Theoretical origins	Newton, classical physics	Von Bertalanffy's General Systems Theory	Chaos and complexity research, self-organizing and autopoietic systems
Research focus	Principles, laws, regulations, predictions	Feedback processes, relationships and interactions with environment	Spontaneous organization, continuous self-production and self-inducted change
Operative interest	Predicting, controlling preserving	Steering, sustaining	Opening up for natural evolvement, evolution and innovation
System			
Type	Closed, static, deterministic	Open, equifinal	Uncontrollable, emerging, self-organizing, self-producing
Main function	Efficient, rule-like functioning, linear	Self-regulation, striving for stability and equilibrium, linear or cyclic	Continuous self-renewal and self-production, non-linear
State	Static, permanent, sustaining	Near equilibrium	Far-from equilibrium
Environment			
Role	Non-existent	Casual chain of events that effects the systems	Created by the system's self-reference
Boundary	Closed	Open	Open and/or closed
Relationship	Systems as self-contained wholes	Adaptation to environment; open interchange with environment, inputs and outputs explained by feedback loops, interdependence	System must maintain a distinct identity and be self-productive; Systemic capacity for change is greater than environment's capacity for change
Change			
Role	Catastrophe	Momentary disturbance	Necessity
Source	No change	Environment, adaption to environment	Entropy, fluctuations, continuous process of self-production
Pace	Slow	Moderate continuous	Sudden, bifurcative
Means of knowledge creation	Exploitation of existing knowledge	Information from environment is processed internally into knowledge	Self-referential interpretation of data from environment / within the system, iteration of weak signals

Mechanistic approaches view systems orderly and regularly functioning, systems are considered like machines that operate according to predominated laws and aims to predict and control their functioning. “The organisational hierarchy determines the patterns of the relationships within the organisation, and information flows are typically one-way and top-down” (Ståhle et al (2003), 50).

Crises organisations are examples of highly mechanistic organisations. Applying ideas of standardisation and systematisation to organisational and managerial issues are examples of mechanistic organisational systems. Time and effort will be saved throughout mechanistic and carefully controlled financial administration, logistics, customer services and invoicing (Ståhle et al. (2003), 36, 50).

Within the *Organic Systems Paradigm* “the relationship and interactions of systems within environment are emphasized, and internal regulation and adaptation to both internal and external changes are regarded as crucial” (Ståhle et al (2003), 36). Apart from communicative nature the organic systems paradigm draws attention to information flows into the organisation (input), to the processing of information inside the organisation (throughput and to the information that comes out of the organisation (output). This paradigm stresses the control to maintain the equilibrium. “Quality management programs are a good example on organic functioning” (Ståhle et al (2003), 51).

The Dynamic Systems Paradigm is the most recently emerged paradigm and it reveals the complexity of systems and the significance of a chaotic, non-equilibrium state. “It emphasises the capacity of systems for spontaneous renewal and ability for self-induced change” (Ståhle et al (2003), 37). For Dynamic paradigm systems, systems are depicted as self-organising and self-referential. This third paradigm originates on chaos theory, self-organising systems by Prigogine, complexity research and autopoietic systems by Maturana and Varela (Ståhle 1998, Ståhle et al. (2003), 32-34, 37). *In view of the fact that*

it is throughout the dynamic nature of the systems that the innovation can be best explained, attention will be paid for the dynamic systems paradigm.

Self-organisation and the far-from-equilibrium state. Ståhle (1998) focuses on the dynamic nature of systems. By mobilizing Prigogine's concept of self-organisation, Maturana's and Varela's concept of autopoiesis, and Luhmann's concept of self-referential, Ståhle created the criteria-model for a self-renewing system (figure 41). These concepts are all related to change, but the perspective is however different. Prigogine emphasized *dramatic changes and order out of chaos*, whereas Maturana and Varela highlighted *gradual changes*, which are needed to keep the system maintained. In this way both gradual change and stability are demonstrated in autopoiesis. (Ståhle (2003), 102)

From innovation point of view, and its close association to change, the role of chaos should be emphasised as the Nobel Laureate Ilja Prigogine does. By Prigogine, a pattern or order emerges out of the chaos and is produced by the random behaviour of the elements of the system. "*In a far-from-equilibrium state, the system is forced to explore and experiment new options, and this helps the system to discover and create new patterns of relationships and structures*" (Ståhle (2003), 38).

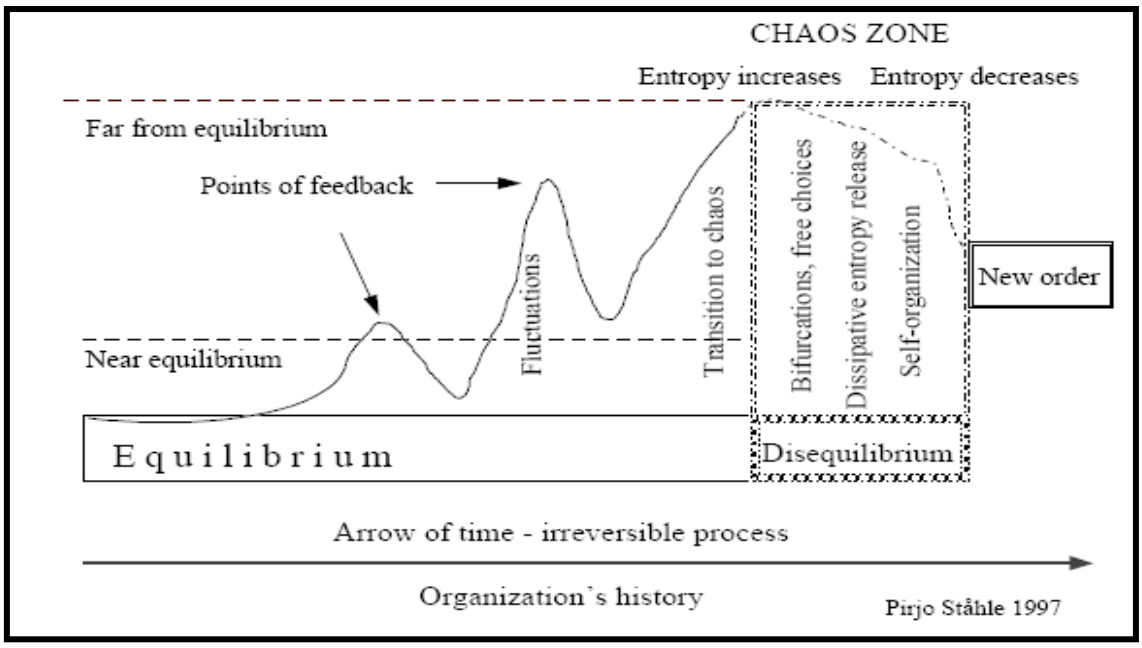


Figure 41 The self-organization process according to Prigogine (Ståhle, (1998), 89)

To understand the importance of chaos and to increase understanding of the self-organization process, as suggested by Prigogine, Ståhle ((1998), 71- 97) discussed Prigogine's five concepts *far-from-equilibrium, entropy, iteration, bifurcation and the arrow of time* by adapting them to pertain to the social systems.

1. The state of a self-organizing system is far-from-equilibrium.

Ståhle ((1998), 91) referred to the fluctuations of diverse interaction processes by writing: "The open system is engaged in abundant exchanges of information with its environment. Concurrently, diverse, opposing forces operate in the system and/or various states of being are manifested" (ibid. 91). Thus, the concept Far-from-equilibrium refers to the system's interior conflict: e.g., in thermo-dynamics concurrent existence of hot and cold or in social systems concurrent existence of reverse interests. These *extremes create tension to the system and activate the inner interaction*. Additionally *external pressure and*

system's inner entropy creates the Far-from-equilibrium state into the system. (Ståhle (2004), 231).

From the interest of this study towards the number of simultaneous realities taking place in the innovation ecosystem, it is important to pay attention to how Ståhle applies the concept of far-from-equilibrium to social systems. "For a social system this may mean an ability to tolerate contradictory interests and conflicts, or sensitive responses to information and events which are issued from outside or within the system. For instance, a group or organization cannot be a self-organizing system if it operates according to rule by consensus or by the norm of unanimous decision." (ibid. 91). It is moreover important to underline that "only a few systems are continuously turbulent and in a chaotic state – the weather or a climatic system, for example (Lorenz's butterfly effect). Some other systems exist within a rhythmic cycle of recurring stable and chaotic periods."

2. The knowledge creation process is based on entropy excess

Abundant exchange of information is essential for self-organization. Entropy refers to energy or information which is produced in the process of exchanging information but which the system cannot use. Entropy is a challenge to the system to tolerate the state of uncertainty and disorder. (Ståhle (2004), 231-232)

A social system needs to be capable of accumulating entropy as well as dissipating it. In order to be able to reach the state of chaos or far-from-equilibrium, the system has to be able to create entropy: it has to be able to acquire and handle knowledge, communicate and deal with contradictory knowledge and reversed interests. However, self-organization cannot occur if the system is unable to dissipate entropy; that is, if the system is incompetent to set priorities and focus, draw value judgments or make decisions and if

needed abandoned old models of thinking and power distribution. (Ståhle (1998), 91-92; Ståhle (2004), 231-232)

3. The feedback mechanism of the system is iterative

Iteration means the continuous, extremely sensitive inner feedback process or activity throughout which the inner information and the models based on that information will be transmitted throughout the system. Thanks for the iteration the system have a capability for self-renewal and for copying its inner models from the micro level to macro level and vice versa. Iteration makes the system spontaneous and respective for change. The butterfly-effect (Lorenz (1993)) is a manifestation of this capability of systems. (Ståhle (2004), 232-233)

"In a group or organization this means that persons react to each other sensitively; they hear and understand the messages that others wish to convey. People's responses are based on what they really hear, not holding fast to old thought patterns and biased opinions. Individuals are able to listen and react sensitively at once; they are receptive to what goes on at a given moment. Thus, they are perceptive and alert, capable of reacting, responding and giving positive and negative feedbacks. This concerns the system as a whole and its internal elements (subsystems) as well. In considering organizations, this means the bottom-up management style in which reciprocal feedback is provided." (Ståhle (1998), 92)

4. Innovative choices occur at bifurcation points

According to Ståhle ((2004), 233-234) bifurcation point, or zone, lies between determinism and free choice. The system cannot choose at any time whatever. Choosing is possible only when the situation is ripe, when there is sufficient entropy and sensitivity within the system. Bifurcation is always the manifestation of new settlement, which is not in linear continuum with the

previous structure. Thus, bifurcation as an incident is always also a source of innovation (Prigogine and Nicolis (1989), 74 in Ståhle (2004), 233).

“Self-organizing ability in the organizational context means that a person or a group must acknowledge the point of bifurcation: when it is time to make a major decision, to choose a new path. When decisions are made without proceeding through the bifurcation zone, the measures might not be mutually acceptable, and the choices unable provide the grounds for a new future (e.g., people are not committed to such decisions, the plans are not fully realized, the declarations are merely scraps of paper without true influence).” Ståhle (1998), 92)

5. Time is a creator

Entropy forces the system to develop and discover new forms uninterruptedly. Self-organization like any other process needs time. This type of evolution has been built-in the system, it is the way of being for the system. With time, all subsystems together will take forward the evolution, which includes both the innovative and deterministic side. The interface of being and becoming is where life occurs. (Ståhle (2004), 234)

“Each system has a history; that is, an irreversible succession of events, its own distinctive path. It can be maintained that every process – along with time – will show its own patterns as the result of repeatedly going through the rhythm of chaos and new order. For self-organizing systems this means that dealing with time is an essential element in any development process. […] Individuals, groups or organizations are challenged to trust in the system’s capacity to organize itself along with time.” (Ståhle (1998), 93)

Maturana and Varela’s notion of autopoietic system highlights continuity and maintenance and it refers to self-production (figure 42). Autopoietic systems construct an identifiable boundary between themselves and the environment

and they produce themselves by self-replication. An autopoietic system can be characterized by two main features "1) By its being, which is demonstrated through interaction. 2) In defining a system, when conceiving something about it, one is already a part of it." (Ståhle (1998), 102)

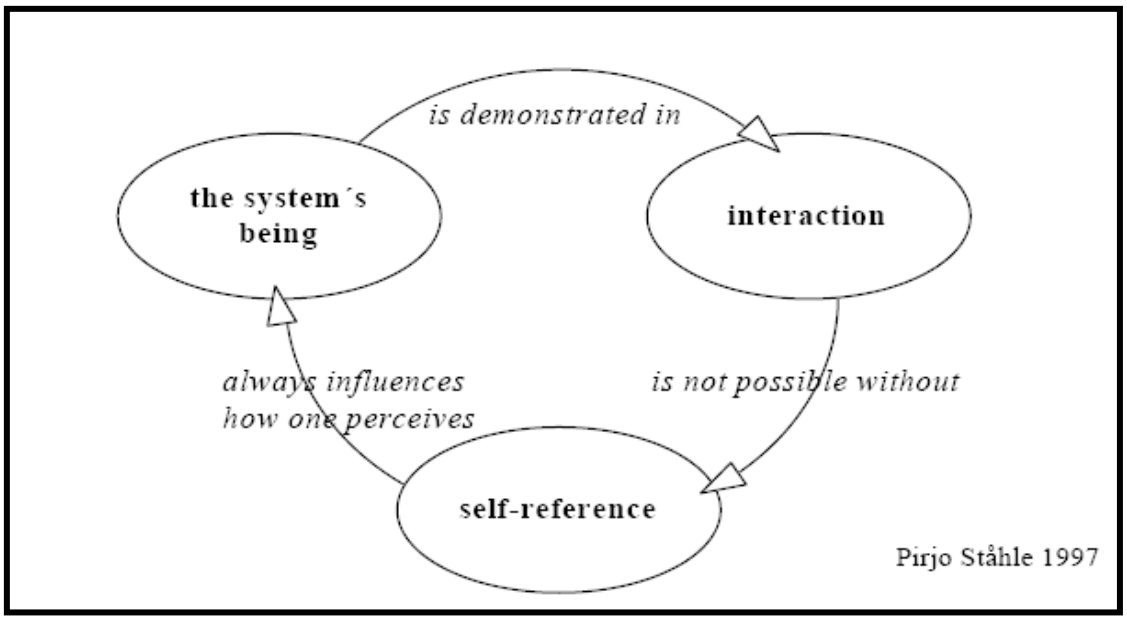


Figure 42 A system's autopoietic nature (Ståhle (1998), 102)

Luhmann's work has been considered as groundbreaking for the development of sociology. Additionally Ståhle ((1998), 109-110) states that for Luhmann self-renewal is a somewhat different concept to that understood by Prigogine. Luhmann stresses system's capacity to continuously renew its identifiable self. He emphasizes the continuity, the process-like development without crises. Prigogine looks into perceivable self-organization, the spontaneous transformation process in the system, which ultimately results in a new order. Prigogine's systems view indicates more abrupt and more dramatic changes.

According to Luhmann (in Ståhle (1998) 110-111), self-renewal can be seen to occur primarily on the basis of three vital criteria, which are double contingency, exchange of information and collectively created meaning. *Double contingency* refers to the fact that quality of social relationships is essential for the system's capacity for self-renewal. That is, the participants must meet each

other at the same level. Mutual inter-dependence must be acknowledged, the risk in establishing a trust-relationship needs to be taken and the participants must operate on that basis. The indispensable grounds for interaction are mutual trust and interdependence.

The second criterion concerns *exchange of information*; communication is the prerequisite for the system's operation because only communication can emanate functioning. Luhmann (in Ståhle 1998) emphasizes the importance of information which becomes the system's "process element" – the kind of information in which the renewing power is attached to experience. Information is dealt with as in the discourse of experience; that is, information pertains to the experience of the one who speaks and provokes an experience in the one who hears. In practice this means that the exchanged information influences the people who make up the system and, in this way, it changes the state of the system.

The third criterion concerns *meaning*. Meanings are created collectively within the system through mutually produced occurrences. "These are never fully developed and as such cannot be transmitted to others. The creation of meanings always requires double contingent relationships, which in turn produce action. Thus, meanings are the basic structural elements of systems. Operations are based on meanings, and, meanings guide functioning." (Ståhle (1998), 110-111).

Drawing from four perspectives (1) personal rapport, (2) mastering a wide range of intervention styles, (3) understanding the criteria for self-renewing system and (4) designing structures that support interaction Ståhle (1998) deduced a model for supporting a self-renewing system. (Figure 33)

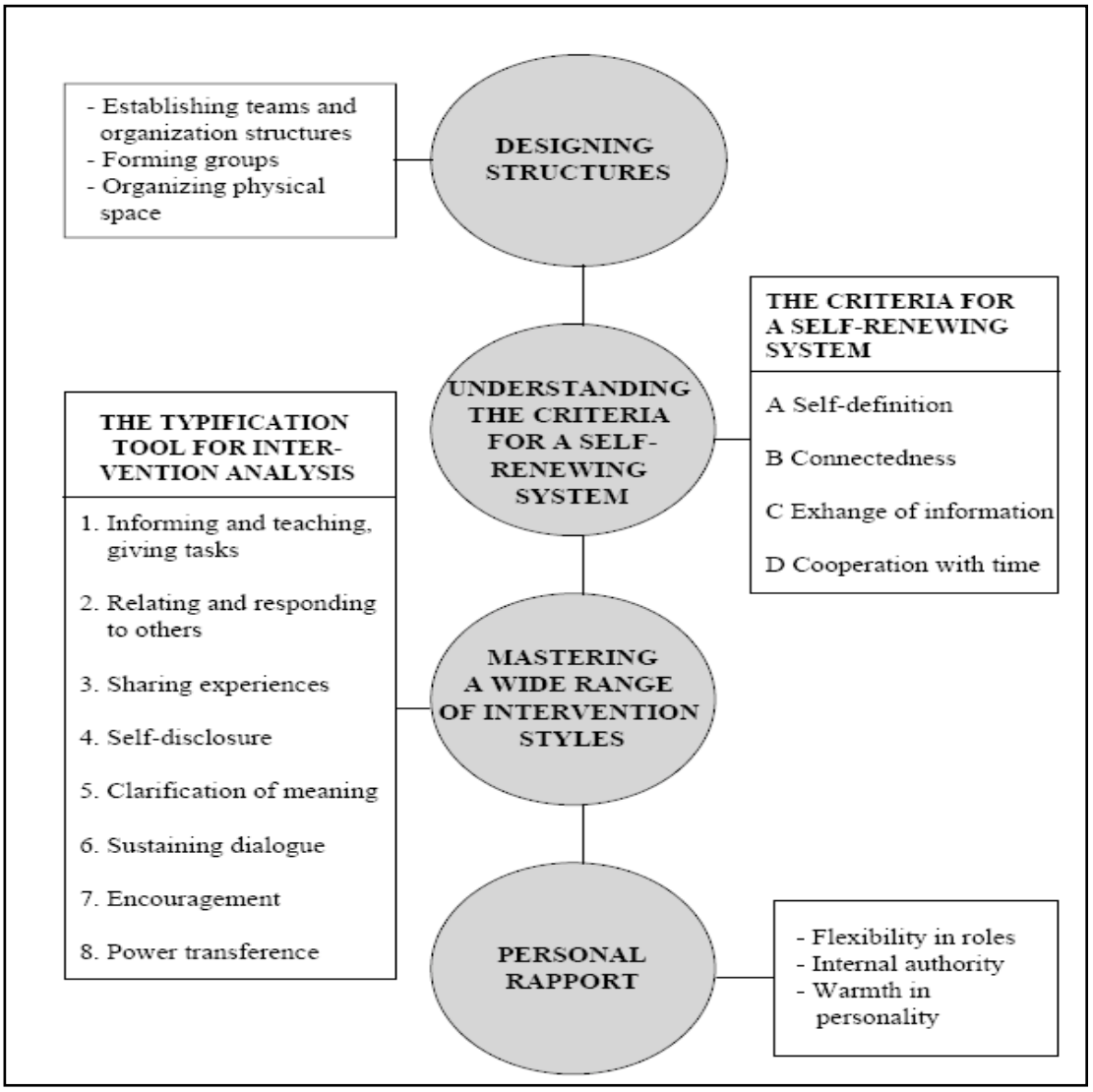


Figure 43 The model for supporting a self-renewing system (Ståhle (1998), 233)

2.4.3 Summarizing discussion on systems theoretical framework for integrating the different perspectives of innovativeness

In order to understand the processes related to radical innovation in social systems (like in organisational context), it is obvious that innovation doesn't happen in vacuum, but the various organisational functions and corporate operations has to be taken into consideration at the same time. These simultaneous functions however have controversial rules or principles, which create tension between the various processes and the radical innovation. It is

evident that in order to survive in long run, any system has to face and tolerate this tension between its basic functions and the future oriented renewal processes.

1. Thus, the *first proposition* states that, *different organisational challenges, like radical innovation and productivity of the mainstream, cannot be managed with one single approach, but a variety of methods and tools are needed.* In addition, the proposal suggests that, considering that not only the management is responsible for any change, the entire social system and all its members are involved in the interaction of the mainstream and radical renewal.

Throughout the increased adoption, of the fact that d*ifferent systems approaches fit with different organisational challenges,* a collective awareness will emerge and promote organisational self-renewal based on the self-organisation.

2. Thus, the *second proposition* states that, *individual and organisational (or systemic) self-renewal is based on capacity for self-organisation and self-production*

Autopoiesis is an example of the metaphoric notions, which has been used to deepen the understanding about systems transition. Stressing the autonomous capacity of systems and their subsystems to renew themselves especially, while in the state of far-from-equilibrium, it is thus apparent that in addition to the notion of "Management <u>of</u> Organisation/system", the notion of "Management <u>in</u> an Organisation/system" should be acknowledged.

The tension related to *chaos generates energy* to be used in the transition of the system. Thus, the *second proposition continues* as following*: in order to adopt autopoiesis and thus, to provide opportunity for the radical innovation based on autopoiesis, the systems have to acknowledge the notion of chaos. Status quo and chaos vary in the lifecycle of a system.*

In order to be able to reach the state of chaos or far-from-equilibrium, the system has to be able to *create entropy*. Allowing the chaos to take place, the system can reach the so-called *point of free choice, or the bifurcation zone* in coping with the fast changes in the complex environment or with the tensions inside the system. In bifurcation point, the system has the true chance to choose from the variety of options. First, through accumulation and then through dissipation of entropy, the system will mature until it is ready for crystallisation of the knowledge for e.g., the radical innovation. Autopoiesis highlights the fact that, wisdom lies within the system and thus system has the capability to take care of itself ("self-organisation" and "management in system"). In social systems, autopoiesis relies on mechanisms like interaction, communication and intuition.

Since the creative individuals are pivotal for the innovations and for the mechanisms of self-organisation, assuring the empowerment of individuals will reinforce their intrinsic motivation, which moreover is a prerequisite for radical innovation.

3. Thus, the *third proposition* states that also soft elements like empowered *individuals should be highlighted in the systems approach, and considered as an important source of "energy" for the throughput (that is the organisational transformation of inputs to outputs) of any social system, aiming at self-renewal and innovation generation. Individual have also a qualification to tolerate inconveniences, which in needed in systems while they are in the far-from equilibrium state*.

The proposition highlighting the individuals, is in accordance with the notion of "Management in System", which carries the idea of distributed managerial power and responsibility.

4. As a pragmatic consequence of the previous, the *fourth proposition* suggests that, *in addition to the already established system-of-innovation notions, like NIS and RIS, the adoption of an additional notion of "innovation ecosystem" (IES), which is based on the content of the propositions one and two, develops both the pragmatic and scientific development of the circumstances reinforcing productive innovation.*

From the practical managerial point of view, the notions of NIS vs. IES can be associated and used as metaphors, which may have a strong steering power to our thinking and behaviour. For example, NIS, based on the definitions discussed earlier, can be associated with the metaphors like a machine or other artificial construction, which very much so refer to the interaction of its elements. However, since the machine metaphor doesn't consider the individual, it also fails to portray the presence or capacity for self-renewal within its elements. Consequently, it loses the energy of the empower individuals.

Contrarily, IES can be associated with metaphor of the ecological ecosystem. A metaphor of nature highlights both the living and nonliving organisms, in not only affecting the lifecycle of other organisms but also in creating the ecosystem itself. Likewise, innovation ecosystem is generated and modified by its various elements. Consequently, the metaphor communicates to the citizens that, even their minor actions matters. – Participation in open innovation, everyday life innovations, generation of positive energy inter alia, can cause the butter fly effect.

Lack of awareness about the role of individuals, may become a blind spots in our (organisational/NIS) thinking, and thus may prevent us from the empowerment of individuals, the prerequisites for innovation. Furthermore, most apparently an incomplete notion of the reality, like missing the role of an individual, leaves a space for confusion and misunderstandings, which generates negative tension and thus deteriorates creativity.

When the notion of IES is fully understood and practiced, it can reinforce autopoiesis, which will again reinforce the capabilities of coping with the fast changing environment. By failing to understand the notion and its implications for the wider perspectives, there may be difficulties in resolving the tension related to the need of common environment for creativity and high productivity. The importance of individuals, in relations to the dynamic interactions and changes among the sub-systems, is stressed in the notion of IES, something that is crucial for the self-organization in a fast changing environment in relations to creativity and innovative actions.

As a concluding remark of the literature review and the propositions based on it, this study defines the *innovation ecosystem as an autopoietic social and economical system where action and interaction among its subsystems and the suprasystem takes place*. Therefore, the innovation ecosystem is initiated, developed and modified throughout the actions and interaction of all of its elements, both internal and external. The idea of innovation ecosystem carries the potential to tolerate simultaneous contradictory elements like cooperation and competition or the cyclic variation between chaos and status quo. Moreover, that potential will be actualised when using contradictions, diversity and chaos as complementary and symbiotic elements for the generation of radical innovations.

The ecosystem is a complex, self-regulating, dynamic system without centralized decision-making. Informal networking, face-to-face or other trust based interaction, and recycling of knowledge, ideas or individuals form the basis of the dynamics of the ecosystem. The innovation ecosystem empowers the individuals in the self-renewal of the ecosystem and creation of innovation in order to create wealth and well-being both in short and in long perspective.

The definition of innovation ecosystem is compatible with the earlier propositions related to innovation, creativity, individuals and the organisational context and wider systems-of-innovations.

3. RESEARCH TASKS

This study is about the innovation-individual-context relation. The purpose of this study was to explore the *sustainable performance of innovation ecosystem where many realities take place simultaneously*.

Multi-perspective approach to the phenomenon was formed throughout the creative and entrepreneurial forerunners of various professions, the informants of the study. Special research interest was related to times and situations *when facing significant transformations or challenges in the innovation ecosystem or in the innovation process*.

The study consists of conceptual analysis and an empirical Grounded Theory analysis of the data. The conceptual analysis encompasses notions related to innovation, innovative person and innovation context. The results of the literature has been deduced into propositions, which have then been used in two different ways. First, propositions widened inspector's awareness and sensitivity towards the intangible elements of the system. Secondly, together with empirical results they generated the *middle-ranged theory*.

The empirical study was focused on the experiences of professionals who are profoundly involved either with a demanding innovation process or with the development of different types of innovative environments. Participants are very experienced professionals, some of which have gone through revolutionary changes during their long carriers, and most of them have created important radical or incremental innovations. Most of the informants had the experience and capacity to look at the innovation both from the innovators and managers viewpoint.

This study aimed at obtaining information on the way creative and entrepreneurial professionals perceive and experience the innovation context, the different levels (micro, meso and macro) and aspects of the innovation

ecosystem. The focus was to *detect the concepts describing that experience and how the concepts are related.* Finally the study intended *to clarify the core process of innovation in sustained performance of the innovation ecosystem where many controversial realities take place at the same time.*

Hence, the purpose of this study was to construct a Grounded Theory about creative and entrepreneurial professionals' relationship with innovation and innovation ecosystem by clarifying the following research tasks:

1. What are the *innovations, individuals and context in concern like*?
2. How does a creative and entrepreneurial *professional perceive and experience innovation and creative individuals*, which are the *concepts* describing that experience?
3. How does a creative and entrepreneurial *professional perceive and experience innovation ecosystems* and which are the *concepts* describing that experience?
   - What are the experiences related to different *levels* of innovation ecosystems (from the micro and meso levels, to the most macro level)?
   - What are the experiences related to different *aspects and dimensions* of innovation ecosystems?
4. How are these *concepts related to each other*?
5. What is the *core process* of innovation and its *relationship to the context* of innovation ecosystem where many realities take place simultaneously?
6. What are the innovation *reinforcing and deteriorating factors* ?
   - Which factors are rel*ated to the individual?*
   - *Which factors* are related *to the innovation*?
   - Which factors are related to *the innovation ecosystem*?

As starting point of the study all the innovation elements and levels of the innovation ecosystem are considered as equal in value. The inter-relation among these elements, perceived as the preliminary scope of the study, has been illustrated in figure 44.

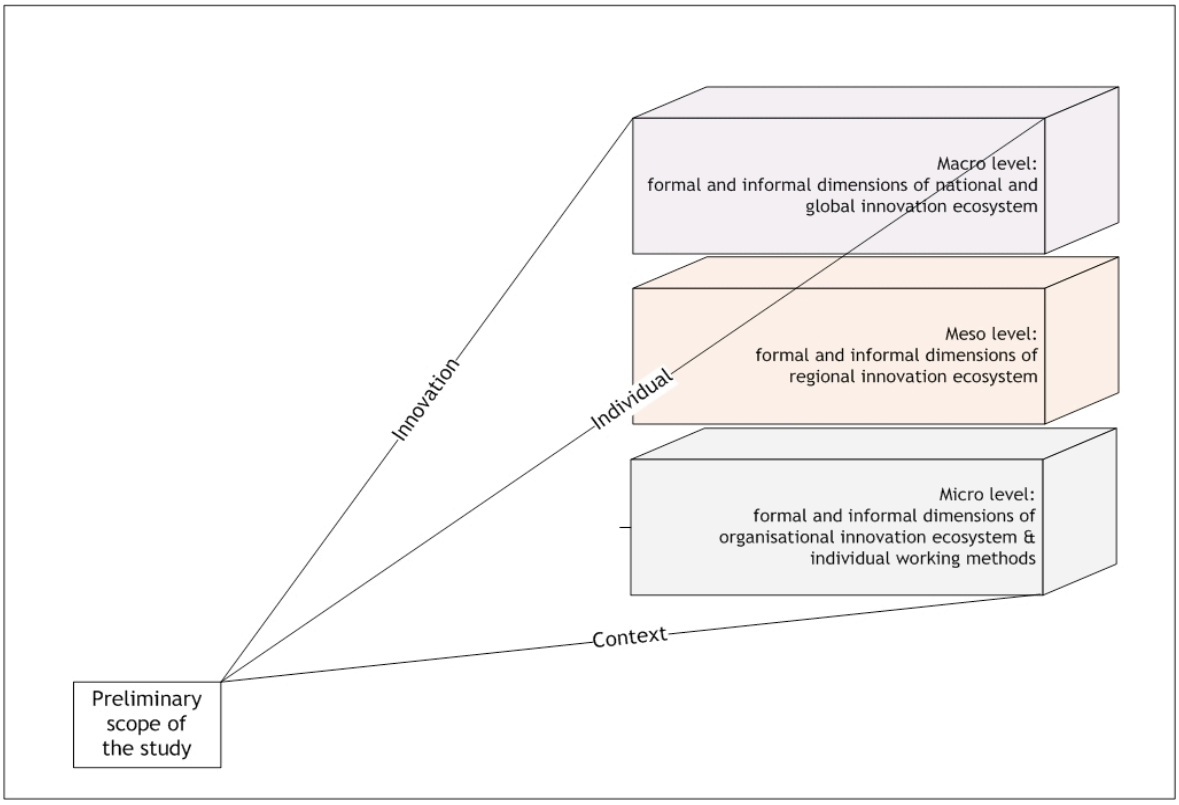


Figure 44 Preliminary scope of the study: Balansed relationship among the innovation elements and levels of innovation ecosystem

Grounded Theory is not resulting into a *theory* in sever meaning of philosophy of science, rather the aimed theory is a *conceptual model*, which may later achieve the status of *theory*, if verified by other studies.

4. RESEARCH MATERIAL AND METHODS

4.1 Methodology and methodological starting points

4.1.1 Introduction to the topic and method of the research

Innovation and innovation ecosystems are complex phenomena; they evince both change and permanence. In order to create a truly innovation friendly environment in global, societal, or organisational level, we should have a better understanding of the challenging and systemic nature of innovation. Innovation faces simultaneously the challenges of the past, present and future. Whilst the radical innovation of yesterday (e.g. a mobile phone) may become the mainstream of today, the routine of today may turn to a problem of tomorrow (e.g., fossil fuel turned to pollution). Innovations are needed to solve today's problems and at the same time, today's routines may become tomorrow's innovation when applied in other fields or due to creative usage.

Innovation ecosystems are also about the *diversity of human beings*. This diversity is the fuel for creative thinking when finding and solving problems. The diversity among the people provides furthermore a source and means for the division of labour whenever the system claims for balance between change and permanence. At the same time, for individuals, their lives and work are unique, and the individuals are entitled to enjoy their lives throughout meaningful work and creative thinking.

The knowledge era depends not only on skills and knowledge but in addition, on the creativeness of every individual. Sometimes, as a result of creative professional's lives, a change of a paradigm has emerged. Transformation in societies is about innovation, and innovation is about creativity embedded in individuals. Therefore, there is a full reason to assume that the experience of

today's innovators and creative leaders could help us to complete our understandings about the sustainable performance of innovation ecosystems.

Finding the best possible means and methods to arrive at the insight and understanding about what is crucial in innovation ecosystems, was a difficult endeavour for a novice researcher. Knowing, that creating and leading a well performing innovation ecosystem at whatsoever level, as well as the work of creative professionals, are both ambiguous challenges, did not make the researcher's task easier. Considering, that successful innovation makes difference for not only individuals and organisations involved but also for all of us, and for the future generations, brings humble and modest.

Based on intuition and thirty years working experience from the field of higher education, the qualitative Grounded Theory (GT) method (Glaser and Strauss 1967) was finally chosen for the attempt to understand and explain the issue in hands. The decision to use GT, led to a myriad of studies of empirical incidences and theoretical notions. Long afterwards, and after many hesitations, the decision to use GT got confirmation from the following compatible description of Corbin and Strauss ((2008), 8):

> "[…] The methodological implications of the above can be summarized as follows. The world is complex. There are no simple explanations for things. Rather, events are the result of multiple factors coming together and interacting in the complex and often unanticipated ways. *Therefore any methodology that attempts to understand experience and explain situations will have to be complex. We believe that it is important to capture as much of this complexity in our research as possible, at the same time knowing that capturing it all is virtually impossible.* We try to obtain multiple perspectives on events and build variation into our analytic schemes. We realize that, to understand experience, that experience must be located within and can't be divorced from the larger events in a social,

> political, cultural, racial, gender related, informational, and technological framework and therefore these are essential aspects of our analyses.
>
> Process is integral to our studies because we know that experience, and therefore any action/interaction that follows, is likely to be formed and transformed as a response to consequence and contingency. We don't necessarily want to reduce understanding of action/interaction/emotion to one explanation or theoretical scheme; however, *we do believe that concepts of various levels of abstraction form the basis of analysis. Concepts provide ways of talking about and arriving at shared understandings among professionals.* If you don't have a language, you can't talk – and if you can't talk, you can't do, and the basis of many professions is still doing."

However, the methodological problem was not yet fully solved. There was still the mythological dilemma of the split in the theory between Glaserian and Straussian paradigms. After having studied the differences of the methods and their philosophical approaches (see a detailed comparison in Siitonen (1999), or Tunkkarinen-Eskelinen (2005)), the final decision was taken, and it was purely a practical one.

Since this study is also an academic thesis and it has prove not only the capability to apply methodologies correctly but also to prove sufficient knowledge of the literature from the field, the decision was rely on the *Straussian paradigm*. The Straussian paradigm of GT allows the *combination of both inductive and deductive approaches*, in contrast with Glaser's puritan inductive method. Another practical reason was the fact that the researcher has lived for such a long time with the phenomenon, both in discussion at working and in private life that the "tabula rasa" approach, claimed by Glaser, was simply not possible anymore.

To be able to follow the advice of listening to the data without too strong presumptions, the theme of the research was finally disentangled from the more familiar to less familiar. Namely, from the societal function of higher education to the role of the leading lights of the society, the innovative and entrepreneurial individuals and their innovations in various different sectors and fields. The effect of the researchers own background on the analysis of the data can be assessed based on the figure 46.

4.1.2 A deeper look at why the Grounded Theory Method (GT)

The following reasons lead to the use of GT method in this study. The most important reason is based on what Corbin and Straus (2008) 8) stated above about making sense of the complex world. As, there are no simple explanations for things in the complex world and "any methodology that attempts to understand experience and explain situations will have to be complex." Based on that, it can be claimed that the *complex nature of innovation and the insufficient understanding of its relationship to innovation ecosystem might be better approached and understood with GT method.*

The second reason is practical, the confidential and sensitive nature of part of the data. Informants' experiences and organisations' information were sometimes content (e.g., economical success or creative flow), and sometimes painful (e.g., bankruptcies or bullying). Extreme experiences, both positive and negative, are difficult to study with any method. They may be considered too private to be shared with the researcher. Moreover, the issues related to company confidentiality may restrict the research. GT provides an opportunity for trust building, especially when the informants can reflect anonymously. Hence, a deeper perceptions on what is considered relevant by the respondents becomes more probable.

The conceptual GT method analysis of the data provided an ethical and methodological tool to analyse the gathered confidential experiences. In the research report, the subjects have been dealt *discreetly and confidentially*; namely reporting the results in a less descriptive and a more abstract level of concepts. Protecting the anonymity of the informants led to the usage of publicly well-known examples and wide literature review to epitomise the findings. This solution was not whatsoever problem-free. It generated additional (and from the scientific point of view unnecessary) work (and additional pages) to build up a coherent story round the theory without directly mentioning the organisations or the innovations which obviously had uncovered the informants. Secondly, and more importantly the solution fights against the principles of the transparency of scientific work.

The third reason to use GT is related to the previous one. The continuous GT based comparison of the positive and negative experiences *made the tensions between the different aspects of realities visible* and thus served as a *fruitful source of the analysis of the facilitators and inhibitors* of the sustainable performance of innovation ecosystems. Obviously, those tensions cannot be studied with quantitative methods as long as there is uncertainty about their existence and quality.

The fifth reason is the researcher's curiosity for everything new and the irresistible attraction and desire for creative insights and even failures, which always have provided an opportunity to learn and prepare oneself for the future challenges. The GT method has been all of that, taking it sometimes to the extremity.

Complex networking, long lasting efforts, setbacks and obstacles as well as great victories are all related to the phenomenon of innovation, especially in the case of radical innovations. In one word, contradictions and paradoxes go with the subject. Hence, it may be assumed that the qualitative Grounded Theory approach is the most fitting for attaining new knowledge on controversial

innovation ecosystems and on how the creative professionals have experienced the innovation ecosystems' multidimensional aspects. Better understanding of how creative professionals, in their different roles, perceive and feel about circumstances enables the development of a more sophisticated approach for the understanding and future development of innovation management.

Grounded Theory method has been hailed as an appropriate approach to use in studying complex phenomena. In the early stages of discovery, it also provides an opportunity to create theory in subject areas that are difficult to access with traditional research methods. Grounded Theory method also helps to understand processes from the individual's point of view. (Glaser and Strauss 1967, Glaser 1978, Rennie et al. 1988, 140, O'Connor et al 2003, 355)

To sum up, one can argue that research phenomena, such as creative professionals' experiences related to the innovation, are difficult to define with traditional methods. Particularly, since the attempt of this research is to understand the sensitive phenomenon of tensions and contradictions which puzzle in the everyday organisational life and management of innovations.

What is Grounded Theory then? It is a method based on qualitative analysis, and its emphasis is on the generation of theory through the inductive examination of information. In GT new concepts and conceptual and theoretical structures are derived directly from the empirical data. Sociologists Barney G. Glaser and Anselm L. Strauss developed the Grounded Theory method, "the discovery of theory from data", particularly for this purpose. (Glaser and Strauss 1967, Glaser 1978 and 1992, Strauss 1987, Strauss and Corbin 1990, Corbin and Strauss 2008)

Before discussing more thoroughly the methodological issues, and how to conduct the GT research, a glance at GT in management and innovation studies will be offered, to provide a general synchronized introduction both to the innovation and the method used in this study.

4.1.3 About GT in management and innovation studies

In spite of its origin in social sciences, Grounded Theory has been applied also in the field of Management and Innovation by different authors. The aim of this chapter is to introduce the general outline and aims of some GT studies about innovation to lay ground and provide a context for the deeper introduction about how the method has been used in this study.

Concerning the studies on innovation and regional development, or "learning regions" as they term it, Mackinnon et al. ((2002), 305) criticize this stream of research for not being adequately empirically substantiated and for being overly based on secondary data sources. They state that "there is a need to employ a range of research methods - including corporate interviews, surveys and ethnographic approaches – that involve direct contact with the individuals, firms, and organizations engaged in processes of learning and innovation within various regional and industry contexts".

From the point of view of the conundrum incremental - radical innovation in understanding of innovation ecosystem the work of O'Conner and Rice is crucial for this study. O'Connor et al. (2003, 353-354) have extended Grounded Theory building methodologies with the focus on the processes used to conduct the research that were affected by the need for a longitudinal *interdisciplinary team-based research in the domain of organizational studies*. They discuss the merit of longitudinal interdisciplinary research on highly complex phenomena with increasing sophistication in the conduct of research, such as innovation creation and adoption, organizational change initiatives, or organizational growth and decline.

Colarelli O'Connor et al., based on comparison of research programs, make suggestions on development the methodology and management of grounded

theory as a team-based research. They stressed, “Multidisciplinary longitudinal research presents a host challenges that appear in some context to be insurmountable”. They strive for variation in methodological requirements based on given set of desired objectives; namely, theoretical perspectives’ richness in diversity vs. a common theoretical perspective or wideness vs. narrowness of the range of issues to be examined.

One can postulate, that managing an innovation ecosystem, with many simultaneous incremental and radical innovation processes developing in their different phases and affected by the richness of established mainstream processes, is facing similar challenges as the management of a multidisciplinary research team exploring new knowledge.

O’connors’ et al. (ibid) research is partly based on their own experiences during 1995 - 1999 as members of the *Radical Innovation Research Program* in Lally School of Management and Technology, New York. In next paragraphs their studies on GT will be discussed.

O’Connor, Hendricks and Rice (2002) continue to concentrate on the radical innovation and their implications on the organizations. These researchers aimed at examining the *transition readiness* as a part of the organizational success in ten big companies, where they have been observing for eight years the performance of 12 projects ((2002), 51) which had different status of development. They tried to assess the projects readiness capabilities for transition, since they believed that managing radical innovation is a possible practice only if the understanding of what the companies are doing to manage it now is taken into account, and the mechanisms for improvement will be fostered ((2002), 50)

The necessity of *knowledge sharing through team formation* was stressed to foster the clear transition through diagnosing and the remaining works towards project maturity. Moreover, team members’ responsibility towards a successful

accomplishment have to be declared (ibid., 51). *Uncertainties on the organizational future of the innovation* were stressed as one of the problematic tool during transition (ibid., 52).

The research process in this reason had been through a long-term observation, something that is proving positive findings for proper analysis and development. O'Connor et al (2002) developed a tool for the transition assessment that included different important aspects (p.53-56), which were evaluated as useful by the users.

Using the same sample, O'Connor and Rice (2001) opted to investigate the *firms recognition of opportunities associated with breakthrough innovation*. In this context, they applied in depth interviews, surveys and reviews of different project documents to enable them to get the understanding of the projects. In this study (ibid.) the authors emphasized the importance of the *multiple case study methodology* in allowing the greater robustness in the development of the insights.

In relation to innovation, the authors have clearly mentioned the importance of the i*ndividual initiative and capabilities* (ibid., 106), l*eadership role as protectors* (ibid.,108) and the role of *informal networks in propagating opportunity recognition* (ibid., 106) as some of the key points of consideration. Since, there is interdependence upon each other to reach the success.

In the same juncture of the opportunity recognition, Kelley and Peters joined O'Connor and Rice (2001) in triggering the *initiation of opportunity recognition and evaluation*. The sample consisted of eight radical innovation projects in six large, multi-national, research and development intensive firms.

The authors generated their framework from the research study on management processes associated with radical innovation, a study that comprised a team of researchers from management and technical disciplines. *They explain the use of*

different professionals as a major to provide wider insights through the perspectives given by the assorted sample. Furthermore, the utilization of *multiple cases* to give the researchers a wider context while relating the cases with their research question.

Various technical and managerial staff had taken part in the multiple interview sessions and shared their personal views as well as historical and current information regarding the research question. Apart from the interviews, the authors attended different workshops and meetings for a wider clarification of their data collected. They pointed out factors like *idea generation, decision-making, recognition and assessment* as required in initiation.

In collaboration with Morone and Peters, Rice and O'Connor (1998) continued to focus in the *Management role* in favour of managing discontinuous innovation. Through the in depth interviews with key team members of 11 projects situated in nine companies, and the data collected from the survey of 16 addition companies, the authors realized that the *variation in the results depends to the project in question*.

According to Morene et al (ibid), *continuous learning*, *stakeholders and government position* in the development have been seen as some of the things that may favour the innovation. The authors found *long-term process, high level of uncertainty, non-linear development, sporadic and the extended front end* to the success as some of the elements that are associated in the lifecycle of the discontinuous innovation.

Saatcioglu (2002) has used Grounded Theory for exploring management of Innovation. Alternatively, using his words: "*idea management,* the process of searching for, generating, and implementing ideas, which determines innovativeness or lack of it in organisations" (Saatcioglu (2002), 4, RM: C1). Saatcioglu explored innovation as a part of the idea management process by means of grounded theory method. He utilized three anchors - contextual,

cognitive and social dimensions - to explore the idea management, because according to him, “no concept can be explored from the blank perspective” (Saatcioglu (2002), 4, RM: C1). He furthermore underlines the nature of the whole approach by writing “both Glaser and Straus (1967) and Strauss and Corbin (1990) strongly argue that what is distinct about grounded theory is not the method of data collection and analysis involved, but rather the explorative, iterative, and accumulative nature” (Saatcioglu (2002), 4, RM: C2).

Grounded theory has been used by Carrero, Peiro and Salanova (2000) during their study on the social processes occurring on the implementation of *radical organisational innovation*. Their aim was add understanding on the nature of radical organisational innovation’s development by identifying the dynamic social processes of creating new meaning between key actors and in a continuous stream of Innovation (Carrero et al. (2000) 489, 493). The authors explained the grounded theory that allows deeper understanding of the organizational innovation from the *holistic perspective* affording the exploration of the organizational innovation *in relation to other wider and complex social processes* (Carrero et al. (2000), 510).

The work of Glaser (1978, 1992, 1995, 1998) has been supported on the grounded theory notion of providing new insight into an understanding of the basic social processes that emerge from the contact were they occur without forcing or adjusting the data to previous theoretical frameworks (Carrero et al. (2000), 491). Carrero et al (ibid) have specifically mentioned the qualities of the Grounded theory in their work as a method that allows a researcher in accomplishing an inductive analysis which facilitates the theoretical propositions, generating a descriptive theoretical model of radical innovation (ibid., 493). Furthermore, the authors argued on the influence of grounded theory in avoiding the problem of achieving consistency in the research process through applying theoretical sampling and theoretical saturation criteria in category creation (ibid., 511)

Furthermore, Day (2007) has presented her findings on the development a comprehensive and holistic understanding of *working relationship between the in-house IT department and other parts of the related business* in the United Kingdom (UK). This author has used grounded theory in order to develop a framework from the empirical study. The author clarified the idea of Strauss (1995) and Urquhart (2001) of the importance of the grounded theory in developing research theory, since it provides a good influence for the research investigation (Day (2007), 10). The research was organized from the identification of the theory perspective, scope selection and research strategy. Later, the researcher associated the narrative, individual category definitions, memos and a set of conditional matrices in integrating categories of the research findings.

Day (ibid.) used the IT professionals and internal customers in five, medium to large, UK based companies. A total of 24 in depth interviews were transcribed from the individuals fulfilling the role of owner (managing director), Manager (IT director), corporate staff, deliverer (system designer or consultant) and supporter (technical administrator). The data was collected across four Insurance companies with a slightly fewer at an airline company (ibid., 9-12) Despite the notion of grounded theory as a method, the author concentrated more on the innovation and organizational behaviour, stressing more the importance of *Interaction* and *collaboration* within the organisation, *to foster innovativeness and value added capabilities*.

Autio et al. (2003) utilized grounded theory in their study, which aimed at framework construction describing the *distinctive mechanisms by which big science centres generate industrial knowledge spillovers in the economy*. The grounded theory was selected by the authors due to its implication in the building of theoretical framework. In this research, which focused on big science centres (ibid., 109) doing fundamental physics research (ibid., 108), three in depth case studies were implemented to reach results. The case specific interviews and discussions were carried out alongside a close personal

observation by persons permanently based at the international large science centre, CERN. The recording of insight and observation was taken into an account by the researchers to realize the new emerging theories, since the main focus was in the theory building rather than theory testing (ibid., 113).

In this regard, grounded theory had been said to be an accurate basis for their investigation. The method enabled the researchers to take a *closer look at the process* rather than identification of the results of other researchers (ibid., 123). The relationship with the existing theories of social networks, organizational learning and innovation were taken into account when choosing the cases for their research.

Another study of the Grounded theory in innovation has been given by Simpson, Siguaw and Enz, (2006), whereby the use of grounded theory to determine the framework of *potential outcomes that result from an innovation orientation* has been carried out (ibid., 1133). The study on innovation orientation is said to be less executed and especially in the perspective of positive and negative effects. Therefore, grounded theory was thought as a basis that could assist the authors to come up with the grounded empirical findings for the study (ibid., 1134).

The authors (Simpson et al (2006)) complemented the work of Carson et al. (2001) on the notion of grounded theory appropriativeness when little prior research or theory exist, as this can act as a guidance towards the researchers' Hypothesis development (ibid., 1134). In their research analysis, each author had to do different task, and the final agreement across all authors resulted from a panel discussion. The main ideas had to be gathered according to the need of the research. Therefore, positive and negative implications of the research findings in relation to innovation orientation had to be taken in to an account.

The study (Simpson et al (2006)) that carried out a total of 54 in-depth interviews has been achieved with *respondents from different levels in the*

organization, as well as from diverse organizational specializations. Importantly, authors have made clear the significance of their framework as a tool for the future research agenda and the justification of the Innovation orientation (ibid., 1140). Moreover, they have realized the need for more study in innovation orientation in relation to financial performances.

In previous paragraphs the general outline of grounded theory on eleven different innovation studies has been introduced. None of the studies is about the innovators' experiences on innovation ecosystems, but they all discuss important issues related to the topic of the present study and the way the GT method has been applied. The usage of the GT method will be deepened in next chapter.

4.1.4 How the GT method worked?

In this research, the grounded theory is generated by induction and deduction throughout the analysis of data obtained by the in-depth interviews and related observations of the creative professionals. The concept finding and theory generation has been stimulated by rich supplementary material such as literature, statistics, public strategies, reports, or organisation's correspondence, memos and web pages. In other words, both "nontechnical and technical literature" has been used in order to compare, enhance sensitivity, provide questions, stimulate questions, suggest areas for theoretical sampling and to confirm findings, or to "illustrate where the literature is incorrect, simplistic, or partially explains a phenomenon" (Corbin and Strauss (2008), 37).

This method by Corbin and Strauss diverges from the traditional method of applying data for testing and proving a theory and it furthermore diverges from the Glaserian paradigm, which is strictly based only on nontechnical literature, the data itself. The grounded theory introduced in this study, describing sustaining performance in innovation ecosystem, may be the object of testing

and verification by future studies and, thus, it might have potential to become a theory in the strict science philosophical meaning.

The GT is *based on constantly comparing conceptualized data* on different levels of abstraction, and these comparisons contain deductive steps, which, for Glaser, refer to deductions inside the data, but for Strauss and Corbin, can also refer to technical literature as described above. Comparison, however, should not be mixed with comparative study in which entire sets of data are mutually compared. Crucial in both GT paradigms is that the method forces the investigator to stay close and to be sensitive to their data, hence the reactive impact that investigators have upon their data bears more on the scope than on the credibility of an emerging theory.

Erjanti (1999), in her breakthrough grounded theory of grief, referred to Glaser and Strauss ((1967), (1978)) who analysed the development and more resent nature of the GT method.

> "Glaser and Strauss (1967) maintain that there are three approaches to qualitative research. In the first approach, investigators code data and crudely quantify the codes in the attempt to prove a theoretical proposition. In the second approach, researchers are interested only in creating theories. They inspect data to detect new properties of theoretical categories. In the third approach, which entails Glaser's and Strauss', constant comparative method, the first two approaches are combined. Investigators systematically categorize data and limit theorizing until patterns in the data emerge from the categorizing operation. This method requires data collection, open categorizing, memoing, moving towards parsimony through the determination of the core category, recycling of earlier steps in terms of the core categories, sorting of memos, and the write up of the theory in terms of the picture arrived at through the last step (Glaser (1978)."

In the study in hands, GT enabled the collection of data on innovators awareness of their own working strategies, the organisations they lead, and the innovation ecosystems. Information on how did they perceive them and what did they feel and think about them, was furthermore collected. Glaser and Strauss (1967) maintained that with GT a substantive theory could be generated from this type of knowledge and understanding. Formal theory can be generalized to apply to several areas, whereas substantive theory is seen as limited to specific area.

The grounded theory method is based on symbolic interactionism with focus on the interactive processes and their development between individuals. *Symbolic interactionism places particular emphasis on the person's relationship to the surrounding reality and on the symbolic meaning one creates of that reality.* (Ashworth (1979), Blumer (1969), Charton (1985)) It may be assumed that the relationship of the creative professional to the surrounding reality, namely innovation ecosystems and its various meanings gain particular significance during the phases of ideation, development, commercialisation and diffusion of innovation.

Corbin and Strauss ((2008), 91) described how, "as analysts we are interested in the interplay between micro and macro condition, the nature of their influence on each other and subsequent interaction, and the full scope of consequences, then how those consequences feed back into conditions that become part of the situation and subsequent interaction or emotional responses." They also reminded (ibid., 92) that "the full range of possible interrelationships between micro/macro conditions are not always visible to individual research participants […] it takes listening to many voices to gain understanding of the whole." After having, in the next paragraphs, explained the interplay of macro, meso and micro conditions and other concepts used in GT, the way, how the many voices has been listened in the present study, will be described more in detail.

Corbin and Strauss ((2008), 93-94) explained how, with a conceptual guide or an analytical tool, called conditional/consequential matrix (figure 45) one can

visualise the potential scope of research and the interaction of the concepts. Namely, the intersection of conditions/consequences and the resulting chain of events (the arrow in figure 45). They (ibid. 93) wrote, “Conditions move towards and surround the interaction to create a conditional context. The other arrows move away from interaction to change or add to conditions in often diverse and unanticipated ways.”

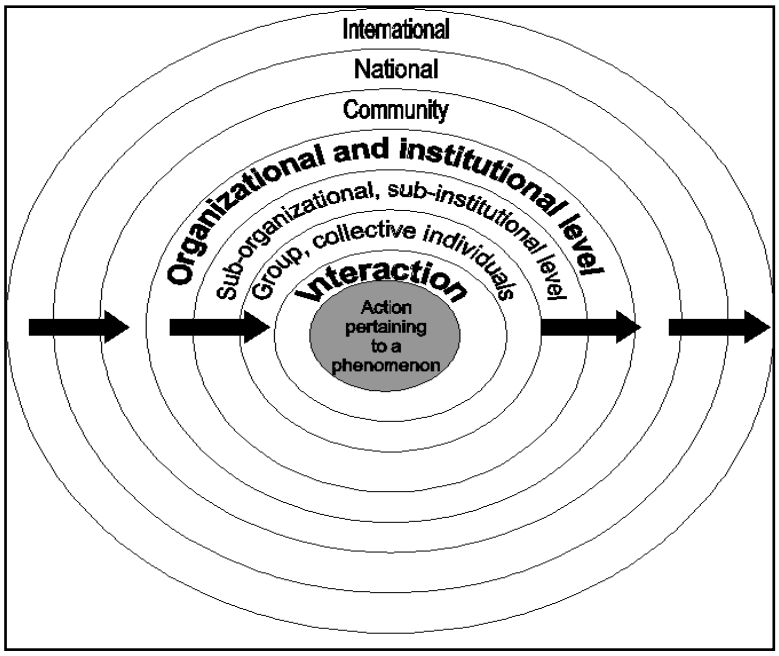


Figure 45 The Conditional/Consequential Matrix (Corbin and Strauss (2008), 94)

According to Corbin (ibid.) theoretical writing, the aim in GT, requires *in-depth interpretation and more abstract conceptualisation* than description. Revealing connections between the concepts is elementary in conceptualization. *Theoretical sensitivity*, that is, capability to see what is crucial in the data and give a meaning for it, is important in theory building. Theoretical sensitivity provides help in creative employment of literature and work or life experience.

As mentioned earlier, the choice of grounded theory for this study is warranted, since the clarification of the chosen research task challenges methods, which have to have the capacity to approach the true heart of creativeness. According to Turner ((1981), 225), “The use of the grounded theory approach enables

researchers to develop their own theories related to the substantive area that they were studying, and encourages them to use their creative intelligence to the full in doing so."

GT method progresses from simultaneous *theoretical sampling* and the analysis of the data and concepts towards analysing the data for context and bringing process to the analysis and finally "integrating categories to the core category and refining and trimming the resulting theoretical construction (Corbin and Strauss (2008), 263)." Checking for gaps in logics and searching for the negative case continues while integrating categories. Those processes and the question of how to evaluate the quality (credibility and plausibility) of grounded theory will be discussed in chapter 6.1.

4.2 Research material and the flow of the research

Informants. In 2001-2005, 55 business unit leaders, managers from public sector and scholars were interviewed concerning innovation and innovation ecosystem. Informants came from Finland, Japan, Ireland, Portugal, Sweden, UK, and US.

In 2005-2007, the *theoretical sampling* encompassed another 35 in-depth interviews, which settled on focusing on creative and entrepreneurial individual's experiences on innovation and innovation ecosystems. The informants either hold the patent, or had, in a significant way, influenced the development of the innovation or the innovation ecosystem. The in-depth interviews formed the data together with the related innovation and company material, for the actual grounded theory analyses.

The first set of the interviews (55 interviews) guided theoretical sampling. They were furthermore used to fill the gaps in information concerning the context and to test the evolving guidelines of the thoughts.

The additional innovation and company related material was utilized in order to familiarize to the innovations and discussed deteriorating and reinforcing aspects of the context. Additional material was collected before, during and after the interviews.

The flow of the research process. In a qualitative study the researcher is the interpreter of the data. The sensitivity to pick up subtle nuances and cues in the data that infer or point to meaning can be affected by the background of the researcher. For that reason, a rough description of the phases of the research process and the type of material that might have influences the interpretation of the data has been described in figure 46. Since most of the GT data has been collected from Finland, a more detailed background analysis of the Finnish society took place (chapter 2.3.2.3), specifically from the point of view of the third task of the higher education institution.

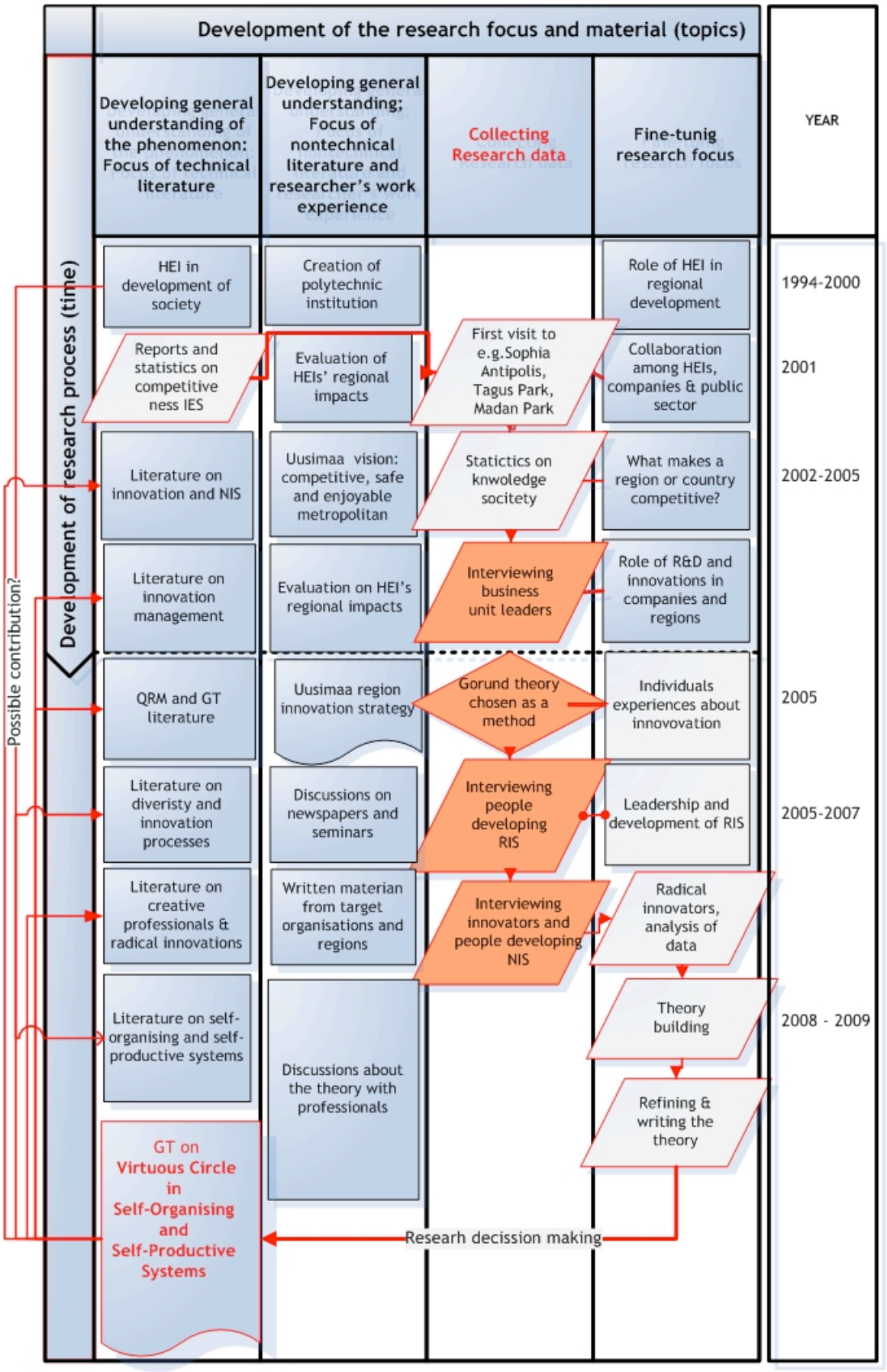

Development of the research focus and material (topics)
Developing general understanding of the phenomenon: Focus of technical literature
Developing general understanding; Focus of nontechnical literature and researcher's work experience
Collecting Research data
Fine-tunig research focus
YEAR
Development of research process (time)
Possible contribution?
HEI in development of society
Creation of polytechnic institution
Role of HEI in regional development
1994-2000
Reports and statistics on competitive ness IES
Evaluation of HEIs' regional impacts
First visit to e.g.Sophia Antipolis, Tagus Park, Madan Park
Collaboration among HEIs, companies & public sector
2001
Literature on innovation and NIS
Uusimaa vision: competitive, safe and enjoyable metropolitan
Statictics on knwoledge socitety
What makes a region or country competitive?
2002-2005
Literature on innovation management
Evaluation on HEI's regional impacts
Interviewing business unit leaders
Role of R&D and innovations in companies and regions
QRM and GT literature
Uusimaa region innovation strategy
Gorund theory chosen as a method
Individuals experiences about innovovation
2005
Literature on diveristy and innovation processes
Discussions on newspapers and seminars
Interviewing people developing RIS
Leadership and development of RIS
2005-2007
Literature on creative professionals & radical innovations
Written materian from target organisations and regions
Interviewing innovators and people developing NIS
Radical innovators, analysis of data
Literature on self-organising and self-productive systems
Discussions about the theory with professionals
Theory building
2008 - 2009
Refining & writing the theory
GT on Virtuous Circle in Self-Organising and Self-Productive Systems
Researh decission making

Figure 46 Evolving research process and focus of the technical and nontechnical research material

The study was created in connection with the daily development work in Laurea, University of Applied Sciences. Laurea is a leading Finnish higher education institution, which has generated an educational innovation involving students to the R&D&I processes. Moreover, the development of the HEI takes place in close collaboration with public and private organisations, all of them building up wealth and social wellbeing, that is to say, the crucial actors of the innovation ecosystem. Hence, the idea of the role of knowledge and innovation creation in society has been put forward in a two-way praxis-poiesis process.

The year 2001 was the starting point of this study, when a study journey to the European Science Parks in Sophia Antipolis, Tagus Park, and Madan Park took place. Interviews started with the representatives of the management and other interest groups focusing on the collaboration among companies, public sector and HEIs. The frame of the discussions was regional competitiveness and the rise of the regions and organisations. Later (in 2002 to 2008), interviews took place concerning the innovation ecosystems in UK, US, Japan, Ireland, Sweden and Finland. Most of actual GT data was collected in Finland. Steaming from that, the language of the interviews travelled back and forth, from Finnish to English.

In 2002 Laurea started an Innovation Development Project together with its interest groups. Collaboration to underpin the regional innovation system was established with the Committee for the Future of the Parliament of Finland, companies and regional bodies. Statistics of the factors related to the innovation potential of the greater Helsinki metropolitan region was collected and analysed together with Laurea staff and students. Altogether 32 business unit leaders and managers of public organisation were interviewed about the role of innovations and R&D in knowledge creation and product development. The role of HEIs and other interest groups was mapped. That data enlightened company's and municipalities growth related aims and the business unit leaders' point of view of the bottlenecks and backup related to the regional innovation ecosystem. The

material was used as supplement to the primary data of the GT as explained earlier.

In the years 2006 and 2007, the Council of Uusimaa Region asked Laurea to run a process to organise an innovation strategy process for the southern part of Finland (Uudenmaan Innovaatiostrategia). A large number of people and institutions were integrated into the strategy process. The process enlightened the interrelation among the key players of the Helsinki metropolitan region.

Due to an innovative pedagogical method (Learning by Development (Lbd)) and its results, the National Evaluation Council of Higher Education has appointed Laurea as a Quality Unit of Education and Unit of Excellence of Regional Development. Lbd integrates students and working life to the proactive development of companies, region and the higher education institution itself. Even this study has served as a learning environment for the business students.

All previously mentioned served as a springboard for the development of the research theme. Furthermore, the general socio-economical situation related to the globalisation and to the financial crises in 1990s (in Finland) and in 2008, had an effect on the direction of this research. Both the discontinuation in 1990s and 2008 have also served as an authentic environment to compare the findings of this study with the public debate in the world's leading newspapers.

As was illustrated more in detail in chapter 2.3.2.3, the economy of Finland, after having recovered from the deep depression in the beginning of 1990's and following a radical structural change in the entire society, started to grow quickly. Year after year, Finland held the leading position in most of the statistics scoring the competitiveness, innovativeness and growth in European and OECD countries. Helsinki Metropolitan region progressed well among the leading metropolitan regions. However international evaluators (like Sabel and Saxenian (2008)) underlined that one shouldn't rest on one's laurels, but to keep on striving to develop new ways of renewal. The country had went through rapid

economical changes during the previous 20 years and it was unclear whether the strategy which had for time being proved its power would furthermore backup the future success.

At that point, the creative and entrepreneurial persons (the innovators, managers and the lead users and of the innovation ecosystem) were invited to join the study. With their help the question how the innovation ecosystem actually works, specifically during the major transformations has been studied. The final research task to explore the individuals' experiences of innovation and innovation ecosystems (in micro, meso and macro levels) was then established and the grounded theory was chosen as the research method.

Since, much was already known about formal innovation systems and especially about the linear innovation model, the *theoretical sampling* was directed to the individuals who have had a major role in some radical or incremental but important innovation. The informants were found throughout the formal and informal professional networks. In the beginning, it took a time to find proper participants, but then the situation turned and created a flood of data. A few people refused form the interview, for them it was a matter of principle due to the restrictions from their companies.

Theoretical sampling was hence redirected to individuals who are known from their long carries as inventors or innovators. Learning from "innovation experience" was extended from conventional product and/or technological innovation to innovations in small and big companies, in public sector as well as in higher education and research institutions. A general description about the set of innovations in concern has been described in chapter 5.2.1. Since the personal and also sensitive experiences were the core of interviews, and due to the fact that the innovations were in most cases also company confidential, the innovations formed primarily a contextual element for the study.

After having learned about the severe difficulties related to radical innovation, the idea of the paradoxical nature of innovation and the discovery concerning the parallel controversial realities started to direct the study. The theoretical sampling was then directed to serial entrepreneurs and investors, to learn about economical aspects related to innovations. Finally, to get the full picture, visionary managers and politicians were invited to participate into the research. They all were experienced leaders of creative organisations, institutions or innovation processes. Some of them had participated in the development of the European level, national (Finland, Portugal, France) level or regional level (Helsinki, Cambridge, Nice, Lisbon, Austin) innovation ecosystems.

To sum up, the innovation perspective varied from the inventors and innovators to the managers, politicians, financiers, investors, researchers and educators. All of them had been considered as creative and innovative in their own fields. Some of them furthermore shed light on how does it come up to function as an "innovation protector" or "opinion leader" (see chapter 2.1.).

The age distribution of the informants varied from 35 to 79, and most of them spoke post ante about their experiences of the previous innovations, expressing, however, their feelings and thoughts about innovation ecosystems, often by reflecting their past experiences with the probable future.

4.3 Collection of data

The research data used for grounded theory was obtained in-depth interviews and observations during the interviews. The interviews were recorded and then transcript. Informants provided additional material concerning the innovations, person and organisation; it was furthermore obtained from public sources (like patent registers or annual reports).

According to Glaser (1978) and Lowe (1996), the GT approach is most apparent in the data collection and analysis technique, which occur simultaneously, as

these analytic interpretations shape the ongoing data collection. Because of the slowness of the transcription procedures, the analytic interpretations while the interviews continued were mainly based on the mind maps, field notes and continuous listening of the recordings.

The aim was to assure the variety in arising categories and their possible subcategories. That however finally led to the situation, where there was a clear overflow of material. This made the actual coding process very hard, and furthermore, forced to leave interesting details out of the deeper analysis. Specifically, the richness of innovation related metaphors used by the informants is worth for further research in the future.

The informants received in advance a short description of the purpose and themes by emailed (see appendix 1). Discussions lasted an average of three hours and 25 minutes, the shortest being one hour and the longest almost nine hours. Descriptively, the intensity of the discussions was high, and during most of the discussion, the informants told about their innovations, with little or no need for further questions from the interviewer. Even a flow sensation was experienced during some of the interviews.

A long list of detailed questions was prepared to keep the discussions consistent at the starting point. Later, the discussions evolved based on the phase of the research.

4.4 Analysis of data

4.4.1 Continuing comparative analysis

The goal in using the GT was to discover the creative and entrepreneurial professionals' experiences; namely their main concern when innovating or supporting the innovators, how did they proceed, what were their experiences on innovation ecosystems while working and in their life in general.

"What's going on?" and "What is the main problem of the participants and how are they trying to solve it?" are the questions which were asked while listening to the informants and the additional data. In GT, the core variable and its subcores and properties will answer these questions. Thus, as Glaser & Strauss (1967) stressed, by using empirical data and with the help of the core variable and subcores the aim is to conceptualize the present situation.

There were two basic levels of GT coding, *open and axial coding*, which will be described more in detail in the following section. "Open codes are low level descriptive codes and selective codes are conceptual codes" in following the Glaserian principles (Lowe (1996), 8). "The classification is discovered when concepts are compared one against another and appear to pertain to a similar phenomenon. Thus, the concepts are grouped together under a higher order, and more abstract concepts are called a category." (Strauss & Corbin (1991), 61) Hence, the GT has the goal of generating concepts that explain people's actions and emotions regardless of time and place. The descriptive parts of a GT are there mainly to illustrate the concepts.

In her study Erjanti ((1999), 76) refered to Glaser and Strauss (1967), and wrote "[researchers] place particular emphasis on the systematic and careful analysis of the obtained data. The aim is to obtain an abstract level in describing the investigated phenomenon. The essential method of the grounded theory is the continuing and comparative analysis during which categories are formed through substantive and theoretical coding, relationship between categories defined and finally the core category detected. During this stage is essential that the formed categories are closely connected with the data (Glaser and Strauss (1967))"

In this study, the transcripts comprising the recorded interviews were analysed with the support of listening the recorded tapes and analysing the mind map notes. Listening to the recorded interviews again and again, kept the memory of

the situation, the person and even the unspoken message fresh while doing the actual coding work.

Categories were formed from the empirical data through logical induction and with the help of theoretical memos. Technical and nontechnical literature, related to the phenomenon, was found useful in itemizing of the properties and dimension of the codes. Either with substantive or open coding, the data was marked with concepts defending the elements of the investigated phenomenon. The material was hence analysed line by line, paragraph by paragraph.

Coding took place by marking the codes on the paper and by using the NVivo software program. NVivo, MindJet MindManger, and techniques based on visualisation were pivotal to manage the process of perceiving and visualising the complex connections of concepts. During intervals, continuous listening to the tapes, gave both depth and creative ideas about the possible categories and the possible interfaces with the previous literature, which was found useful for the process. Listening to the tapes was both eye friendly and made the process with the computer faster, because the transcribed spoken language was from time to time difficult to follow. That is how, the stories and the literature become part of the inspector's daily life, and gave depth to the analysis and kept the process joyously and thus motivating.

In the following sections, the stages of analysis will be presented, showing how the data was coded; i.e. conceptualised and organised into categories, and how the relations between categories were defined and finally the core category was detected.

4.4.2 Open and Axial coding

The challenge in this study has been to understand how the individual accommodate him- or herself to the environment when innovating, and how is it

possible to innovate in an institutional context, where there are constrains related to the institutions, organisations, technology, economy or socio-cultural elements.

In order to gain new understanding, analysis has been allocated to the oscillation between the individual, innovation and context. Individual progressively differentiate her/his inner sphere (like attitudes, values, background, working strategies and techniques as well as the view of life or world view) in and from the innovation (variation in the attitude towards creativity and innovation, different type and phase of innovation). The environment and circumstance refer to context where the life, work and the innovation took place (the questions like whether the context affected the innovator, or innovator effected the environment, or whether the innovation and innovator had no relationship with the context).

The "open coding" refers to the analysis of the text, in order to get the first idea about what the data is telling. Alternatively, as Corbin and Strauss ((2008) 195) put it, open coding refers to "breaking data apart and delineating concepts to stand for blocks of raw data. At the same time, one is qualifying those concepts in terms of their properties and dimensions to account for variation."

Since the language used by the interviews was often very rich, many metaphors were coded in-vivo. The questions what is going on, what is the problem were repeated within every section and paragraph of the transcribed text, as both Glaser (1978) and Strauss (in Strauss & Corbin (1991) and Corbin and Straus (2008)) pointed out in their procedures. Afterwards, the question of action and the nuances of the happening or incident were asked.

In the coding process the key notions or tools of GT are the *"concepts", "properties", and "dimensions",* which have been described by Corbin and Strauss ((2008), 45-46) as following: "*Concepts*: words that stand for groups or classes of objects, events and actions that share some major common

property(ies), though the property(ies) can vary dimensionally. [..] *Dimensions*: variations of a property along a range. [..] *Properties*: Characteristics or components of an object, event or action. The characteristics give specificity to and define an object, event, and/or action." Strauss and Corbin ((1991), 69) wrote, "Properties are the characteristics or attributes of a category", and "dimensions represent locations of a property along a continuum." (See also Glaser (1978))

"Axial Coding" (Corbin and Strauss (2008), 195) refers to "crosscutting and relating concepts to each other." Linking categories together, and thus elaborating them, occurs at every level of pyramid of the concepts. In the 2008 edition Corbin and Strauss explain the distinction of open and axial coding as artificial and for explanatory purpose, "to indicate for the readers that though we break data apart, and indentify concepts to stand for the data, we also have to put is back together again by relating those concepts." (ibid., 198)

In 1991 Strauss & Corbin defined axial coding as "a set of procedures whereby data are put back together in new ways after open coding, by making connections between categories. This is done by utilising a coding paradigm involving conditions, context, action/interactional strategies and consequences." (ibid., 96)

Erjanti ((1999), 76) discussed various methodological sources and defined the role and method of axial coding as following: "In axial (Strauss and Corbin 1990) or theoretical coding (Glaser and Strauss 1967, Glaser 1978) the analysis is confirmed by clustering the concepts generated through substantive coding further in to categories. The categories are then compared to each other by their properties or by detecting relationship between them. Theoretical memos help the investigator to make assumptions concerning the relations between categories as the process proceeds. The aim is to detect the core category. In the final phase of the analysis, the categories are combined in to one or several core categories through selective coding. (Glaser and Strauss 1967, Schatzman

and Strauss 1973, Glaser 1978, Turner 1981, Chenitz and Swanson 1986, Hutchinson1986, Rennie et al. 1988, Leino Kilpi 1990 b, Thorne 1991, vehviläinen-Julkunen 1992, Becker 1993 penoliel 1996, Morse and Field 1996, Isola 1997, Paunonen and Vehviläainen-Julkunen 1997)."

"Comparative analysis" (Corbin and Strauss (2008)) takes place continuously and refers to "comparing incident against incident for similarities and differences. Incidents that are found to be conceptually similar to previously coded incidents are given the same conceptual label and put under the same code. Each new incident that is coded under a code adds to the general properties and dimensions of that code, elaborating it and bringing variation."

"Conceptual saturation" refers to the process of acquiring sufficient data to develop each category/theme in terms of its properties and dimensions and to account for variation.

4.4.3 Exploring the context and process

Furthermore, innovators' and visionaries' life and work context was coded and explored in order to reveal the circumstances or factors that presented the deteriorating and reinforcing factors for the innovation.

By *"context"* Corbin and Strauss ((2008), 87) mean "s[S]tructural conditions that shape the nature of situations, circumstances, or problems to which individuals respond by means of action/interaction/emotions. Contextual conditions range from the most macro to the micro."

Furthermore, *"process"* refers to "the flow of action/interaction/emotions that occurs and responses to events, situations, or problems. A change in structural conditions may call for adjustments in activities, interactions, and emotional

responses. Actions/interactions/emotions may be strategic, routine, random, novel, automatic, and/or thoughtful."(ibid., 87)

In the present study two analytic GT tools were used, both provided cues about how to find the contextual factors and their relationship with the process. One of the tools is *"paradigm"* and the other is "*matrix"*, (as described earlier in this section). They were used to obtain and enrich the understanding about of circumstances.

According to Corbin and Strauss (2008), 89), "Paradigm is a perspective, a set of questions that can be applied to data to help the analyst draw out the contextual factors and indentify relationships between context and process." (Corbin and Strauss (2008), 89) The basic components of the paradigm are as follows; the "*conditions*" (conceptual way of grouping answers to the question about why, where, how and what happens), the "*inter/actions and emotions", [...]* "referring to the responses made by individuals or groups to situations, problems, happening, and events", and the "*consequences*" which answer to the question what happened as a result of those inter/actions or emotional responses."

The conditional/consequential matrix was used in order to distinguish and separate the elements of the various levels of innovation ecosystems. Table 23 illustrates the ideas contained in the matrix as Corbin and Strauss ((2008), 91) described them. It furthermore (in the right hand side column of the table), exemplifies how the elements appeared and were interpreted in the analysis of the present research.

Table 23 The elements of the conditional/contextual Matrix

Elements described by Corbin and Strauss ((2008), 91-92)	Examples of how did the elements appear in this study
"*Conditions/consequences do not exist in vacuum*. They are always connected throughout action/interaction/ emotional responses. [...]	The historical and present events of the national innovation system proved to be complex and difficult to sort out. The political decisions (e.g. the many innovation strategies) and the global economical situation fluctuated (e.g. after regression in early 1990's Finland was able to reach a well developing economical phase which due to the global financial crises in autumn 2008 finished). In macro level, the virtuous circle turned into vicious circle in 2008.
[...] *The distinction between micro and macro is artificial one*. [..] we are interested in the interplay between micro and macro conditions, the nature of their influence on each other and subsequent inter/action, and the full scope of consequences that result, then how those consequences feed back into conditions that become part of the situations and subsequent inter/action or emotional responses.	Informants from incumbent enterprises, EU and national level referred to the continuous process in balancing between the global environment setting the rules of business and the enterprise/EU/nation trying to effect those rules. Likewise, national and regional levels of the innovation system were so overlapping and intertwined that it was difficult to distinguish them when talking to the business people. The distinction between them appeared more obviously when discussing with the local politicians and the representatives of the technology and science parks.
[...] The full ranges of possible interrelationsip between micro/macro conditions are not always visible to individual research participants. […] it takes listening to many voices to gain understanding of the whole.	Innovation and innovation system/ecosystem proved to be very complex and multidimensional notions which varied based on from whose point of view they were perceived. The standpoints towards innovation system varied even among the MPs, to say nothing of the perceptions of the inventors and innovators from SMEs. Obviously, in order to understand the dimensions of complex phenomena, the multi-perspective approach is pivotal.
[...] Conditions and consequences usually exist in clusters and can associate of covary in many different ways, both to each other and to the related inter/action.	The Finnish banking sector reacted heavily with a set of innovations first to the deregulation in 1970s and then to the adoption of ICT in 1990s. These innovations created change reactions, forcing actors, like other banks, unions, clients, to react with other innovations.

Bearing in mind, that the deteriorating and facilitating factors of innovation, have their foundation in historical, political, international and national socio-cultural conditions, it is not possible to analyse all conditions. Hence, a sufficient background was explored only concerning the Finnish innovation

ecosystem (chapter 2.3.2.3). The organisational conditions were explored with the help of additional material only to a limited extent.

Because of the broadness of the present research task, it is obvious that the items (sources of conditions/consequences) which appeared in the research were many and included all the areas and layers of the matrix in figure 45. Starting from the most macro level, the international or global issues were discussed, that is to say e.g., economical and environmental questions or European Union policy concerning taxation, innovation funding or the role of HEIs. The analyses included moreover the most micro level, the journey to the individual's mind, to the deepest thoughts about creativity and the methods to deal with the problem solving.

The participants perceived and evaluated innovation from the various levels of the operative environment throughout their work, membership or collaboration with the following institutions:

1. *The European Union (EU)*
2. *International associations or networks, such as:*

- Technopolicy Network (TPN),
- Creative Problem Solving Institute (CPSI),
- European Network of Living Labs (ENoLL),
- Center for Knowledge and Innovation Research (CKIR), (Finland).

3. *Science and Technology Parks, such as;*

- St John's Innovation Centre, Cambridge (UK),
- Sophia Antipolis (France),
- Tagus Park (Portugal),
- Madan Park (Portugal)
- Otaniemi Innovation and Business Community and Technology Center (Finland),
- TechVilla Ltd (Finland)
- Hong Kong Science and Technology Parks Corporation

4. *Universities and research Centers, e.g.*
   - The University of Texas at Austin (United States of America),
   - George Mason University (United States of America),
   - University of Oulu (Finland),
   - Helsinki University of Technology (TKK), (Finland),
   - University of Art and Design Helsinki (TAIK), (Finland),
   - Åbo Akademi University, Turku (Finland),
   - Laurea University of Applied Sciences (Finland),
   - Royal Institute of Technology KTH (Sweden),
   - VTT Technical Research Centre of Finland,
   - Technical University of Lisbon (UTL) (Portugal),
   - University of Nice Sophia Antipolis (France),
   - University of Aveiro (UA) (Portugal),
   - University of Cambridge (United Kingdom),
   - University of Oxford (United Kingdom),
   - Katholieke Universiteit Leuven (Belgium),
   - Trinity College and University of Dublin, (Ireland),
   - Tohoku Fukushi University at Sendai (Japan).
5. *Innovation and business service and administration bodies, such as;*
   - The Committee for the Future - Parliament of Finland,
   - Foundation for Finnish Inventions (Finland)
   - Finnish Funding Agency for Technology and Innovation (Tekes) (Finland)
   - Finpro (registered association) (Finland, Japan),
   - Finnvera Plc (Finland),
   - Ministry of Employment and the Economy (Finland),
   - Ministry of Education (Finland),
   - Regional Council of Uusimaa (Finland),
   - Science and Technology Policy Council (Finland),
   - Sitra, the Finnish Innovation Fund (Finland),
   - Technopolis Ventures Ltd. (Finland),
   - VINNOVA, Research and Innovations for Sustainable Growth (Sweden).

The Companies and Cities have not been mentioned in order to respect and protect participants' intellectual property rights and privacy.

4.4.4 Theoretical integration

Corbin and Strauss ((2008), 55) claim that "theory denotes a set of well-developed categories (themes, concepts) that are systematically interrelated through statements of relationship to form a theoretical framework that explains some phenomena (Hage (1972), p.32). The cohesiveness of the theory occurs through the use of an overarching explanatory concept, one that stands above the rest. And that, taken together with the other concepts, explains the what, how, when, where and why something." Moreover, theories may be substantive, middle range, or formal (Glaser and Strauss (1967), 32-34).

The main theme, or a central category (*reconciliation of the simultaneous controversial realities*) of this study was found (based on the "selective coding") as the first step of the theoretical integration, and the major categories were then "related to the core category through explanatory statements of relationship." The use of theoretical memos, mind maps, other visualisations, and constant comparisons were used in order to reach the core category. (See also Glaser (1978), Strauss (1987))

Previous research and management literature ("technical literature") was used throughout the entire process of the research. However, the usage of literature was not similar as in quantitative research. Following the GT rules (Corbin and Straus (2009), 39) and in spite of conceptual analysis of the first part of the study, no predefined theoretical frameworks were used in the present study. As described earlier literature was used to compare the findings and to formulate the continuous questions for the analyses. Literature helped in directing the theoretical sampling and deduced propositions were used to discover the propositions and dimensions of the categories. Furthermore, literature (see

chapter 2.3.2.3) was used in order to describe the socio-economical and cultural macro context of innovation. Most importantly, the psychological literature concerning creativity and the soft elements of organisations made the analyst sensitive for the emotional messages embedded in the data, and thus helped to detect the human side of the innovation ecosystem. That is, reading the empirical data and previous literature side by side helped in turning the invisible side of the system visible.

During the theory generation, previous theoretical frameworks (specifically systems thinking concerning autopoiesis and chaos, in chapters 2.4 and 5.4.2.2 and the notion of paradox, in chapters 2.1. and 5.2.) were found useful in order to complement and focus the theory, and then to verify the discoveries (e.g., the existence of self-organising phenomenon or the paradoxical nature of innovation).

Furthermore, refining the theory (validating the theoretical scheme) took place in two ways: firstly by comparing the theory to the raw data, and secondly by comparing the theory to the technical material (e.g. the articles in newspapers and magazines concerning innovations and innovators).

4.4.5 Continuous questioning

This section illustrates how the continuous questioning took place during the formation of the category pyramid, and the exploration of the context and process. According to various GT manuals (like Glaser (1978), Strauss & Corbin (1991) and Corbin and Strauss (2008)) constantly asking questions has been highlighted as characteristic for a GT approach throughout all phases. The coding process and the search of the categories of the present study's data were based on thinking around the following sensitizing and theoretical questions. Altogether, kept in mind, the purpose of coding was not to summarise but to conceptualise.

Starting the analysis, as Corbin and Strauss (2008) guidelines, with the following question: "What is happening here; that is, issues, situations, problems, concerns as defined by the participants?", and then continuing, in the various different layers of the category pyramid, with questions driven by the researcher's own sensitivity, "technical and nontechnical literature" or most importantly, the data itself. The used questions were as following:

1. Questions driven by the data and the intuition of the analyst:

What kind of innovation/creativity is this all about? What does this innovation/creativity consist of? What is its meaning to these people? Are the different actors' definitions and meanings the same or different? Who are these people and what are they like? What is the true nature of the innovation/creativity for this person? Does the variation in their innovations/creativity affect the perceived reinforcing and deteriorating factors? What are the perceived obstacles and facilitators related to the innovation/creativity itself.

What is crucial about the relationship between the innovation/creativity and the person him/herself? How are the various individuals involved and what are their own roles and actions in innovating? Are the various actors responding in the same way or in a different way? With what consequences are they acting for various situations? What kind of individual characteristics/actions have been found useful or inhibitory on innovating, How does he/she portray the effects of his/her earlier life upon innovating?, Why?,

What is crucial about context of innovating that is, the environment and circumstance where innovating? What are the structural conditions that gave rise for the situations related to innovation? How do the different actors define the situation? What are most important deteriorates and facilitators of the context?

Have they changed over the time? Why does these elements of the innovation ecosystem affect the interviewee's experiences of innovating?

2. Furthermore following type of "Technical and nontechnical literature driven questions", as Corbin and Strauss (2008), 38) advise, were used and found useful:

What is going on? Am I overlooking something important? Are conditions different in this study? If so, how, and how does this affect what am I seeing. These questions helped to be convinced about the discoveries (e.g. the paradoxes or the permissive management), which first seemed not have any sense. The contrast between the conventional management literature and the tendency to provide a harmonious and fluently ascending image of innovation and the present discoveries full of paradoxes and tensions epitomise the most insecure moments during the analysis. Acquiring more data (theoretical sampling) and literature concerning paradoxes convinced however the investigator about the existence of the less easy aspects of innovations.

3. Following Corbin and Strauss (2008), 72) the following theoretical questions was put forward in order to see the process, variation in the concepts, and to make connections between concepts:

What is the relationship of one concept to another; that is, how do they compare and relate at the property and dimensional level? What would happen if…? How do events and actions change over time? What are the large structural issues here and how do these events play into or affect what I am seeing or hearing?

5 RESULTS AND DISCUSSION

In this section, the results of the empirical data will be introduced in the form of inductively discovered categories and their relations. Propositions and dimensions of the found categories are discussed as they emerged in the data, utilising however at the same time the earlier research in order to distinguish and explore all the relevant aspects of the categories. Due to the richness of the innovation phenomenon and related earlier research, only the part of literature, which has been found most relevant for the theory formation, has been repeated in this section. Hence, the foremost role of literature, in this section, is to deepen and enrich the inductive analysis, to facilitate a more conceptual and abstract level of the theory generation.

5.1 Categories of the innovation-individual-context related experiences, and the relations between the categories and concepts

It was the research task of this study to examine the real-life phenomenon of innovation and related circumstances, based on the experiences and views of different innovation pioneers. Interviewees had perceived innovation and innovation ecosystems from various different perspectives. That is to say, from the different levels of innovation ecosystem (IES), like the global, national, regional or organisational IES, and from the most micro level, namely, from the Individuals' perspective. The research task of examining the real-life phenomenon in concern took place inductively, in accordance to the Grounded Theory method, without any theoretical hypothesis or research problems and questions.

A myriad of concepts emerged from the continuous comparisons of the research data (the discussions with the proactive innovation intellects and the observations from the related 'technical literature'). Throughout the examination of the resonance among the concepts, the *core category* emerged

focal and had a natural relationship with the other categories. A large number of used memos and mind maps made it possible for the core category to emerge in an early phase of the continuous comparative analysis of the categories; however, the name was finalized only during the ultimate phase of analysis of the relations of the main categories.

Consequently, management and reconciliation of the many controversial realities at the same time emerged as the central theme during the analysis of the innovation-individual-context related experiences and views. The core category of *"reconciliation of the many controversial realities at the same time"* emerged in each of main categories, in all subcategories, as well as in the relations of the main categories.

The first interviews, which took place among the more traditional innovators, in the field of high technology unwrapped the textbook image of a smooth and well-defined innovation. Later, it become evident that, to the more macro level the innovation is taken, the more complex the innovation-context relationship will turn and no definite truth of the features reinforcing or deteriorating innovation will be found. It was these early paradoxes and contradictions, that directed the theoretical sampling of the Grounded Theory towards the different types of innovations and innovative individuals.

In the following sections the substance of "innovation-individual-context related experiences" has been broken apart into its various components, in order to examine them, and then to identify their properties and dimensions. In comparing one incident against the others for similarities and differences, incidents were given conceptual labels (called 'codes'), according to the grounded theory methodology. This knowledge has been furthermore used in order to make the inferences concerning the innovation related experiences.

In practice, results from the coding process are presented in the form of concepts, which have been interpreted by the inspector and followed by direct

quotations from the respondents. The concepts that have been chosen to formulate the category are those, which had been considered as best in illustrating the content of the data. Always, when a suitable notion, metaphor or a connotation (like "innovation as a chameleon") appeared in the data, it was used as the name of the concept describing any subcategory.

Theory development took place throughout crosscutting or relating the concepts to each other ('axial coding') and conceptualising the process, and then putting it together with a structure. As a result, figure 47 pulls together the research threads. As Corbin and Strauss (2008) suggested, the substantively derived theory was furthermore expanded to the more abstract level of middle-range theory, linking both the earlier discussed system theoretical approach (specifically the autopoietic theory and the self-organising process according to Prigogine), and the substantively derived theory. In order to construct a coherent explanatory story about innovation-individual-context related experiences, the figure was developed further to a theory called *The Virtuous Innovation Circle in Self-organising and Self-productive Systems,* and it will be introduced in words later, in chapter 5.5.

However, at first, in the (open) coding process thousands of innovation-individual-context related experiences or 'properties' were identified and coded from the data. Sub-categories were then formulated and they were furthermore related to the *three main categories*, namely to the

- "*innovation and creativity*" illustrating the core essence of innovation,
- "*proactive innovation intellect*" illustrating the person involved with innovations, and then finally,
- the context, where innovation takes place, that is, the "*innovation ecosystems*" in the organisational and wider societal contexts.

The main categories are analysed in chapters 5.2, 5.3 and 5.4. To use a metaphor, as if a goldsmith analyzes gold, by rubbing, cutting and melting it, the Ground Theory analyst sorts out the empirical data. Hence, the following

chapters explore thoroughly the ‘properties’ and ‘dimensions’ of innovation-individual-context and continuously return to the incidences from various different perspective. The tables, figures and the conclusions after every subchapter serve those readers who want quickly to progress towards the final theory. Chapter 5.5 examines how the main categories are related to each other as well as how and why the virtuous innovation circle emerges as a consequence of the interaction among the context and process.

When reading and coding the data, special attention has been paid to the aspects related to innovations, individuals and conditions, which were found to have had a positive or negative impact on innovation. The context of the core category (reconciliation of the many controversial realities) has been explored both in macro and micro levels. The more macro conditions referred to the economical-, political-, legislative-, historical- and socio-cultural aspects, that furthermore led to the more immediate conditions, whereas micro conditions referred to the various day-to-day situations, in the immediate life of the person.

On other words, it was explored how the different issues that deteriorated or facilitated innovations had their foundation in the historical, political, and social conditions that how they had set the tone for the creative work. In this exploration, a wide range of research literature (see chapter 2) and other ‘non-technical literature’ have been studied in order to learn about the innovation systems in individual, organizational, national, regional and global levels. The comparison of the categories and the previous research assisted not only depicting the similarities and dissimilarities, but it also revealed the contribution of newly erupted aspects, that assisted in the theory development.

Finally, the process, (actions, interactions and emotions) through which the systems, persons and groups responded to the innovation conditions has been explored. The chapter has looked at the patterns of the ongoing strategic action/interaction/emotion, in order to discover how systems and people

managed to overcome the obstacles and paradoxes related to the innovation generation and diffusion. Patterns have moreover, been used to conceptualize and put the process together with structure.

Relations between the categories were constructed by comparing the categories according to their characteristics. As a result of the axial comparison, relations between the categories and the core category can be presented as in figure 47. Based on the Grounded Theory methodology, the "reconciliation of many controversial realties at the same time" emerged as the core process associated to the innovation-individual-context related experiences in the rapidly changing and complex environments. Furthermore, the found actions/ interactions/ emotions related to the management of many controversial realties where finally reduce to four elements, which formed the bases for the theory upon *The virtuous circle in self-organising and self-productive systems*. These elements are as following:

- *holistic approach,*
- *complementary interaction,*
- *tolerance of inconveniences, and*
- *generation of emotional energy.*

These elements were all considered to embed in human beings and thus *the immanence of human aspect* in innovation can be considered as a prerequisite of innovation. These crucial points are discussed in the light of the empirical data and expanded upon with some views from the literature on systems theory and innovation related change.

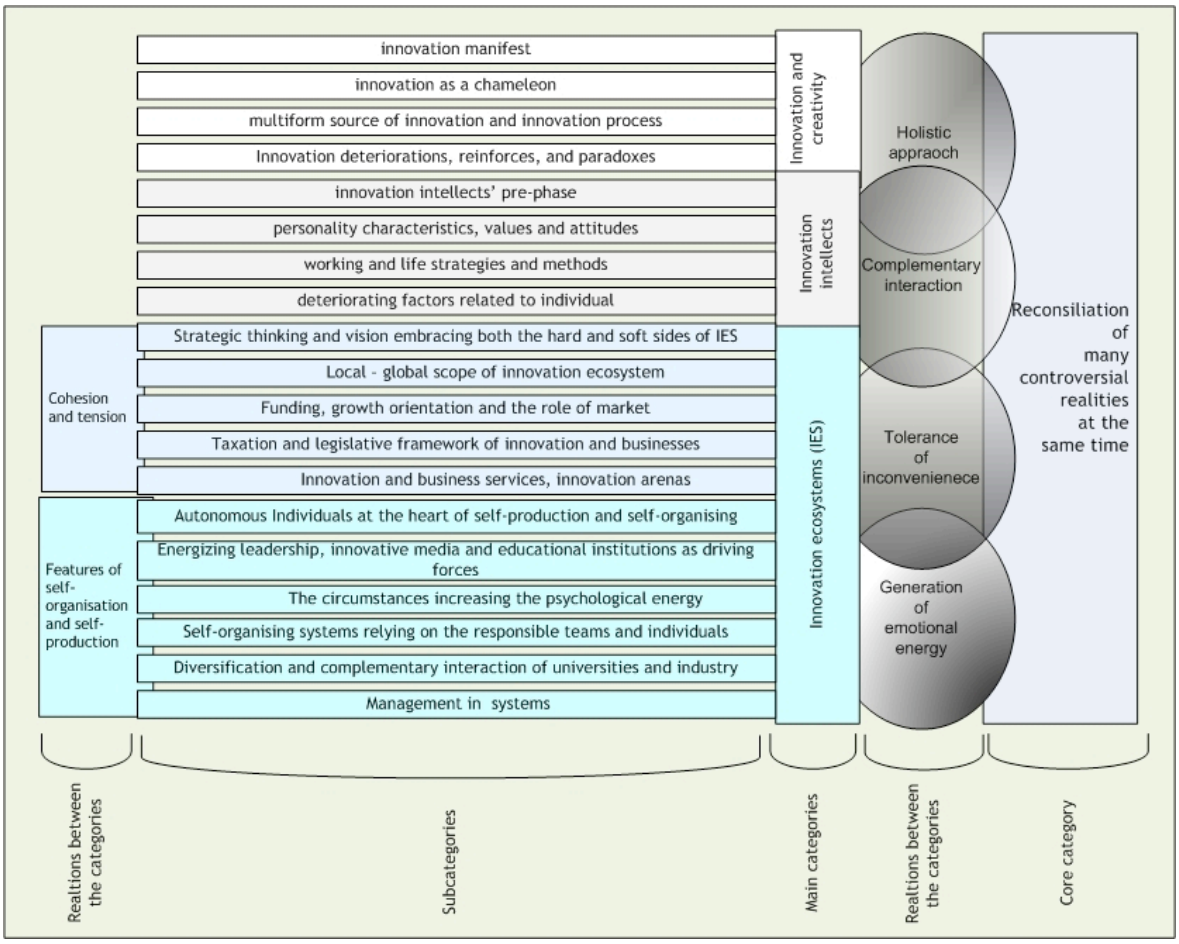


Figure 47 Relations among the main categories and the core category describing the innovation and creativity experiences and views

5.2 The main category of innovation and creativity

The main category of "innovation and creativity" is based on questions relating to what kind of phenomenon people are referring to, when they work with innovations and creativity, as well as, how do they perceive innovation, when talking about it. The main category of "innovation and creativity" comprises five subcategories as presented in table 5.2.1.

Table 24 The main category of "innovation and creativity" and its sub-categories

The main category	Subcategories
Innovation and creativity	- innovation manifestation, - innovation as a chameleon, - multiform source of innovation and innovation process, - stages of innovation - Innovation deteriorations, reinforces and paradoxes.

In this section the subcategories will be introduced, giving most attention and space for the "innovation manifest", since it provides the idea about the general frame of the innovation. For the evaluation of the results and conclusions of the study, the wide introduction of the found innovations has been considered important. Nevertheless, due to richness of the data, only the most important 'tip of the innovation iceberg' was possible to be included.

Analysing the myriad of innovations and the related background material was laborious. What's more, it called for an open and humble mind, and an open heart from the analyst. The process reminded of the approach described in Scharmer's (2007) U-theory.

The analyst was furthermore challenged with the fact that, often the innovations appeared differently from what was expected. Background information of the informant and the innovation in concern was obtained beforehand, because, it found important to familiarize with the forthcoming interviews. However, when the informants started to their stories, it was important to let the preconceptions to go and to concentrate just on the story.

It also happened that, persons who had received many national and international awards, based on their innovations or successful business operations, scarcely mentioned or spoke about the their famous innovations. These people were

more eager to share their experiences related to the more recent innovations, which often were still in their early developmental phases.

The interviews could also turn to co-creation session of new potential innovations, with a shared sensation of flow between the researcher and the informant. Since during a discussion, the interview could turn to creative ideation and as a result, many more ideas emerged. That is to say, the actual result of the study is, apart from being an analysis of what the informant brought forward, is an interpretation made by the inspector, including her stimulus for the informants during the interviews.

Some of the explored innovations were based on hundreds of international and national patents, some of which were related to conventional technology or science based inventions whilst others were based on the more common everyday life solutions and appliances. In one extreme, the competitive advantage of one of business ventures was told to based on aggressive patenting, whereas one of the informants was awarded with a few-hundred international patents. The eldest patent, still in an important role in the original field, was approved in 1960s.

Keeping in mind, that conventional inventions and technological innovations were not unaccompanied in the centre of this study, it is highlighted, that many of the participants hold neither patens nor any other types of intellectual property rights.

Moreover, some of the informants are more well-known in their professional fields, than the others. Some of the informants, their innovations or businesses, had become famous because they have been awarded nationally and/or internationally. The following recognitions were discovered in relation to the informants:

- The Frost & Sullivan Award for Product Innovation, British Telecom Award for Product innovation, INPEX, the Invention & New Product Exposition Award; the New York Intl. Innovation & Patent Fair "Award of Merit",
- VWR Partner Award from VWR International in Europe,
- The Economist's Seventh Annual Innovation Awards and Summit (Computing and Telecommunications),
- Some have been awarded with academic or wider international and societal honours,
- Finnish national awards for innovation, Entrepreneurship and Internationalization.

5.2.1 Innovation manifestation, the properties and dimensions of innovation

Due to the theoretical sampling, the subcategory of “innovation manifestation” represents a multi-stakeholder approach and classification of innovations. As could be expected in the multi-plural world, creative professionals’ experiences concerning innovation were tremendously rich and multiple. Innovation manifest illustrates the ‘properties’ (i.e., characteristics expressed as the found types of innovations) and ‘dimensions’ (i.e., variation of the found properties) of innovation experienced and described by the participants. Previous literature has been utilized when organising the found innovation properties and dimensions. In this section, the rationale behind the discussion includes the following aspects:

- Introduction of the framework for the found innovation properties and the development of the notions used in this study
- Introduction of the framework for the found innovation dimensions, including the construction of innovation maturity and revolutionary indexes
- Introduction of the found innovations, encompassing an estimation of the innovations’ maturity and a comparison of the radicalism between the explored and some well-known innovations

That is to say, an introduction of the *innovation manifestation* -category and its properties and dimensions takes place in this section and it has been illustrated in figure 48.

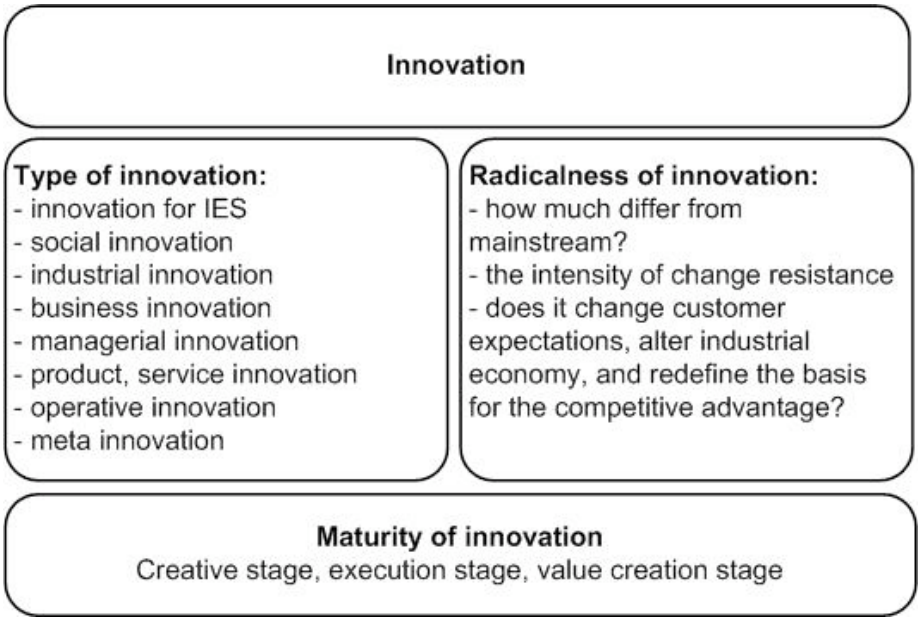


Figure 48 Properties and dimensions of innovation; type of innovation, radicalism of innovation and maturity of innovation

The framework for the found innovation properties and the progress of the innovation notions used in this study. The multi-stakeholder approach to innovation illustrates the way that innovation penetrates the various dimensions of organisational, societal and individual lives. The multiple nature of innovation manifested in its various forms, from the predictable technological and profit oriented innovations, to the more intangible social, non-profit solutions. Some of the innovations had turned to an economical success or had fully diffused to the market (like the SMS). Many of discussed innovations had however failed or where still in the execution phase.

Moreover, it was found that, innovation was not a sporadic phenomenon, but innovations were *systemic* and *appeared in clusters* of inventions and innovations, or that, they emerged, during decades, in various different adaptations, in different fields and in different business ventures. Especially,

innovations discussed by the more experienced and elder innovators consisted from clusters of associated innovations and inventions. These innovations were found to appear in various different forms, and their broadness varied as well (compare Hamel (2002)). For instance, it was introduced by one informant (PC1), how since 1969, a cluster of research based inventions and patents related to the pharmaceutical industry, had been developed and then integrated with service innovations. The rationale behind the development of the innovations of the cluster had been to generate a systemic combination of technological and service innovations, based on which a radical pharmacological business innovation could emerge.

It was furthermore found how invention and innovation *moves form an incumbent or small and medium sized enterprise into new business ventures* alongside the innovator and while doing so increases value. E.g., an emeritus CEO (MI1) explained how his technological innovations had moved and adapted, during the last 40 years, from the forest industry to the mining industry, and furthermore, from the high-capacity machines to the small scale devices. Moreover, how new successful businesses had emerged based on those changes.

Many of the explored stories of innovation were non-intentionally overlapping, explaining the same innovation from different perspective. Hence, the data often illustrated the same phenomenon from different viewpoints, diverse interests and worldviews.

Defining the essence of innovation was found complicated, due to the *innovation's tendency for transformation* from one type of innovation to another, or from incremental to radical innovation, or vice versa. This was found for example in a multinational corporation, as described by an informant (HT1A), in a leading position. He defined innovation from the corporation's point of view and stressed that the relationship between product and business innovation is crucial. He pointed out how,

> "For the user, innovation is a visible novelty, in which the old things are organized in a new way. Innovation does not necessarily include any new technological insights, nor does it necessarily include any inventions. Innovation is about how the things have been organised, so that during a certain moment the visible value for the end-user is maximal. The more visible the link between the novelty and the basic needs of the end-user, the bigger the innovation, the closer connection between the value of the product and the end-user's basic needs, such as, fellowship, freedom, health, security, quality of life, or convenience, the better. Timing is a crucial added value, which means that at the right time the right technology will become a product providing the biggest value for the end user."

This type of definition of innovation was furthermore explained to have led to the understanding about how incremental product innovations lead to radical effects on businesses. As the informant continued,

> "[…] this is seldom understood properly. Even in our corporation, we have learned the hard way, that is to say, the new and actual businesses are not necessarily born throughout the radical innovations. [For me] radical innovation refers to an improvement, service, or change that consists of incremental ideas, which has been seen radically by the end-user." (A0048)

The found innovation experiences were delineated under the following properties introduced in table 25. The left column of the table portrays the different innovation definitions used in the analysis of the empirical data. It should be kept in minds that, the classification is exclusively suggestive; hence, many of the individual innovations could have been classified in various different ways. The aim of the table in first hand is to illustrate, how the innovations were related to each others, and at the same time to demonstrate a tool constructed for the comparison of innovations.

Table 25 Innovation manifestation, found innovation properties and respective notions related (The development of this table has been based on figure 7)

Innovation manifestation – the property of innovation	Respective notion used in this study
• Innovations increasing the innovation ecosystem's potential to produce innovations.	• *Innovation for innovation ecosystem*
• Innovations related generally to the society. Novel solution to social problem that is more effective, efficient, or sustainable than existing solutions and for which the value created accrues primarily to the society as a whole, rather than sporadic individuals or organisations.	• *Social innovation*
• Innovation which effect an entire industry or field and its logic	• *Innovation for industry*
• Strategic innovations based on new business concepts or models to unlock new sources of revenue or drive down costs or to sift the wealth-creation potential in favour of the innovator	• *Business innovation*
• Innovation improving management, (organisation or administration in favour of innovation); innovation in management principles and processes that ultimately changes the practice of what managers do, and how they do it	• *Managerial innovation*
• Innovations related to technology, process, service and/or product	• *Product or process innovation*
• Innovations improving everyday corporate operations, or everyday life situations; how the work of transforming inputs into outputs actually gets done	• *Operational innovation*
• Innovations providing tools and methods contributing the development of innovation	• *Meta-innovation*

Based on the previous table, the properties and dimensions comprised by the subcategory of *innovation manifestation* will be discussed more in detail in this section. Examples of the clusters of overlapping innovations are put forward to illustrate the found properties and their dimensions, as experienced by the participants.

How mature were the found innovations? In order to answer this question, the innovations will be compared with the phases of innovation funnel (based on Davila et al. (2006)). A suggestive "*maturity indicator*" (estimations based on

the available data) has been developed in order to illustrate or to provide an estimation of how mature the innovations were at the time of the analysis of the data. The ballpark estimation (table 27) for the innovation maturity is imitating the innovation funnel, and hence comprises the following categories:

- the innovation has passed its way to a value *creation (VC) stage*, as to whether it has been partly or completely diffused,
- the innovation is still under construction, in the *execution stage (ES)*, after the ideas had been selected or the innovation failed at this stage, and
- the innovation is still in the *creative stage* (CG), at the fuzzy front end of the innovation process.

How radical were the found innovations? In the same way, another indicator, namely the suggestive "*revolutionary index*" was created in order to illustrate another dimension, namely, how radical the innovations were. For that purpose, the discussed innovations were contrasted to comparable and some well-known radical innovation, if possible, from the same field or sector. The well-known radical innovation was provided the index value 100 and based on the data a ballpark estimation index was then presented for the overall impression of the innovation under discussion.

As Scharmer ((2007), 68) pointed out, while referring to the rise and fall of Enron Corporation revolutionary strategies and innovations "are not values in themselves but must be embedded and grounded in a shared sense and real connection with the larger social context or whole". The reader will thus be mightily reminded that the here introduced indexes and indicators have only one purpose, which is to shrink the enormous amount of data in an illustrative way. Both of the indexes are based on researcher's interpretation of innovation based on three types of resources, firstly, the publicly available information of the innovations, secondly, the informants' subjective descriptions of their innovations and thirdly confidential material received from the informants.

Consequently, it was found, that the innovation radicalness was interpreted in different ways by the informants. For some, radicalness referred to (1) the actualized advantage of the innovation, and for the others, to (2) the potential competitive advantage, while some referred to (3) the change resistance against a revolutionary idea or innovation departing from conventional mainstream. The radicalness vs. maturity in table 26 illustrates the found ways, as to how the revolutionary stage of the innovation had been understood, together with the maturity phase of the innovation. All of these approaches were found fruitful in order to lay ground for the understanding of 1) the innovation-individual-context relationship, and 2) the dynamics related to the deterioration and reinforcement of innovation in a firm way.

Table 26 Radicalness vs. maturity of innovations

Maturity of innovation	**Radicalness of innovation**
Creative stage CS	How radical is the idea, or how much does the innovation differ from the existing mainstream? Potential competitive advantage of a radical idea of innovation.
Execution stage ES	The intensity of the change resistance towards the innovation by mainstream during the execution of innovation.
Value creation VC	Does the innovation change customer expectations, or does it alter industry economies and redefine the basis for the competitive advantage?

Consequently, in order to illuminate the explored innovations, it was however, chosen to use Hamel's (2002) value creation oriented definition of "how radical the innovation is". According to Hamel ((2002), 62), "*[R]radical innovation is innovation that has the power to change customer expectations, alter industry economies and redefine the basis for the competitive advantage*. […] By definition, a bona fine competitive advantage is both unique and difficult to

duplicate. A central goal for radical innovation is the invention of new sources of competitive advantage."

Hamel (ibid.) furthermore highlights the extensiveness of innovation together with its radicalness, "Every new idea can be judged in terms of these two criteria: To what degree does the idea depart from industry norms (how radical is it)? And to what extent does the idea stretch beyond the product to encompass other elements of the business concept (how extensive is it)?" (Hamel (2002), 63)

Based on previous, in table 27, the radicalness of the innovation has been estimated (and marked with an x in the corresponding column) based on the actualized value creation of a matured innovation. Additionally, a few innovations' possible future value has been assessed (and marked with an x inside brackets).

In this study the above definition of radicalness has been applied also for social innovations in relations to what concerns profit organisations. However, in this study, the revolutionary index of the social innovation in non-profit organisations is a modification based on Hamel's ((2002), 62-63) definition on radical innovations and Zak's (2008) definition on social innovation. It states that, *a social innovation is a novel solution to a social problem that has the power to change stakeholders (i.e. users, members, and partners) expectations, alter attitudes, values and behaviour towards the society as a whole, and redefine the basis for the social development and wellbeing.*

Based on Hamel, "every new social innovation can be judged in terms of these two criteria: To what degree does the social innovation depart from conventional industry norms (how radical is it)? And to what extent does the social innovation stretch beyond the product or subsystems to encompass other elements of the system (how extensive is it)?" (Hamel (2002), 63)

In this study, a decision has been made, to separate (1) innovations related to the innovation context (innovation ecosystem) from the (2) more general social innovations. When applying the previous definitions (radical innovation is innovation that has the power to change customer expectations, alter industry economies and redefine the basis for the competitive advantage) to global, national and organisational innovation ecosystems, the "customer" refers to the different stakeholders, like corporations, universities, science parks and similar organisations, public organisations, citizens or consumers, nations, etc.

Consequently, the *innovations for the wider innovation ecosystem* have, been considered from the point of view of national and global economies, cities, regions and other similar institutions and organisations in focus. As with the other innovations, the competitive advantage concerning the innovation ecosystem has also been compared with globally well-known radical innovation, even though the innovation in concern might be competitive only in a local or national environment. Consequently, in the table, those innovations which have more competitive advantage and impacts in international level, score higher in radical index than those, which compete in the regional or national levels.

Consequently, the subcategory of *innovation manifestation* comprises the following properties (notions) and dimensions (maturity and radicalness) as described in the following table.

The table is modified based on Hamel's ((2002), 64) two-dimensional model between the broadness and radicalness of innovation (see figure 6. in 2.1.2). In contrast to Hamel's (2002) model the notions of IES innovation, social innovation and meta-innovation were found and classified as independently. Maturity estimations of the (1) creative stage, (2) execution stage, and (3) value creation are based on the innovation funnel by Davila et al ((2006))

Table 27 The properties and dimensions of "Innovation manifestation" based on the "maturity estimation" and "revolutionary index" (dimensions) of the exemplification clusters (properties) of innovations.

Notions of innovation and their broadness	Overall maturity as an innovation					Revolutionary index of innovation How radical?			
	creative stage		execution stage		value creation	Index: Incremental	Index: Semi-radical	Index: radical	Point of comparison (Index = 100)
A. Innovation for innovation ecosystem									
EU's eco-innovation ecosystem, reinforcing ecological industrial revolution		x	x			-	-	-	Platon's Athens Electricity in early 1900s as the driver of the Second Industrial Revolution (year 1879)
Finnish innovation ecosystem (1995-2005)					x		x		Silicon Valley since 1900
Sophia Antipolis IES Cambridge region IES Tagus Park IES				x	x x	x	x -	x -	Silicon Valley
World wide laboratory for wellbeing innovations, Finland	x					-	-	-	Finland, as a laboratory for telecommunication 1990s
Television and film industry, Finland				x		x			
Unban plan, built infrastructure and townscape, attracting citizens, Finland					x	x			Tokyo, San Francisco, New York, Florence in Renaissance Italy
B. Social innovation									
Making innovators visible to society and corporations, Europe		x				-	-	-	Grameen Bank, the pioneers of microfinance. Finnish maternity and child healthcare clinic system in 1920s and the law on free of charge school catering in 1948
Giving voice for the citizens Marginalized youngster as football journalists in, GB					x		x		
Assisting low-income children to gain computer skills un, US					x		x		
Exchange programme in a developing country									
C. Innovation for industry									
Financial and bank sector innovations reacting to the deregulation and adoption of ICT (1970-2005), FIN					x			x	Financial innovations caused the depression 2008 (value is negative)
Scientific innovation creating a new approach to the field, cases: - health care, - business sciences, - ICT			x		x x		x x -		Penicillin in 1928, Alexander Fleming; Transistor in 1925, Bell Labs, US
Integration of telecommunication into pharmaceutical chemistry			x			-	-	()	
D. Business innovation									
Radical business innovation based on incremental technological product innovations					x			x	
Radical business innovation based on radical technological product					x			x	
Radical business innovation based on radical technological product and service innovations (SMS/GMS)					x			x	

Business concept based on the Interface of technology, individual, and artificial intelligence		x						(x)	
Private welfare service concept vs. public monopoly					x			x	
Municipality providing Innovative services for consumers speaking a foreign language					x	x			
SME product development with the clients and partners					x		x		Linus –open source operating system, in 1991 Thorvalds
E. Managerial innovation									
Outsourcing the production of pharmaceutical equipments to countries with cheep knowledge capital and markets					x		x		Toyota Nokia orchestration
Supportive management innovation in turbulent business environment					x			x	leadership innovation Bill L. Core, Google,
F. Product or process innovation									
Patented pharmacological research equipment since 1960s					x		x		
Technological innovations and machinery related to the telecommunication, lifting and moving, forest and mining industries					x			x	Bell telephone in 1876, Alexander Graham Bell;
Solution for finance process automation, in 2000 and anticipatory accountancy in the 1970s					x			X	Single-use camera, pioneered by Kodak; ATM card in 1930s US - 1960s UK, Dydson' bagless vacuum cleaner
Safty devices related to minor electrical gadgets					x		x		
Device monitoring personal wellness					x		x		
Services reinforcing Creative thinking and learning					x	x			
G. Operational innovation									
Operational innovations related to nursing, salesman's and politicians' work, teaching.					x	x			Wal-Mart's cross-docking practice
Everyday innovations and use of innovation - utilizing the rainbow family as a litmus test for the use of innovation					x	x			
*H. Meta-innovation***									
Pushing the scientific boundaries of business sciences throughout exploring innovation as an analytical category and perceiving innovation in odd contexts.					x		x		The development of incubator movement in Brazil

** tools making the actual innovating easier

5.2.1.1 A deeper look at the innovation of the data

In order to provide a better idea of the quality of the data and the innovation phenomenon under exploration, some of above mentioned innovations will be

introduces more in detail in the following section. Letters in front of the line refer into the letter in above table, whereas letters and numbers inside the brackets refer to the various informants and codes.

A. Innovation for innovation ecosystem

In this study innovations related to the wider innovation ecosystems are called "innovation for innovation ecosystem" (IIES), in order to distinguish them from social innovations, and to stress their special characteristics compared to the more general social innovation. Given that, authors have not explicitly referred with any specific notion to the innovations covering wide system-of-innovation, these innovations are here referred as *innovation for innovation ecosystem*.

Innovations for innovation ecosystems (IIES) were related to *innovative solutions or ideas concerning legislation, national and local politics or administration, financing, urban planning, networking, culture, or human centric development*. They encompassed and illustrated both Wessner's (2005) entrepreneurial idea of innovation ecosystem and the soft human side of innovation ecosystem, as discussed by Katz (2004) or by the system intelligence approach (Saarinen, Hämäläinen et al. (2007)).

Consequently, and diverging from the conventional concept of innovation system, the reported innovations encompassed both tangible and intangible side of system. Intangible side refers to the dynamic human side of innovation system. Due to the solutions aiming at increasing the attractiveness of the living and working environments, this finding had been considered consistent with Florida's (2005) previous findings highlighting the importance of the human aspects.

Taking into consideration the active participation of the companies, organisations, and citizens to the development of the environments, the metaphor of ecosystem has been used here. *Innovation ecosystem* includes the

connotation of the conventional notion of innovation system, but highlights the system's complex, self-regulating and dynamic nature based on individuals.

Innovation for innovation ecosystem through some examples as they appeared in the data:

A1 The ongoing development of the EU -wide innovation ecosystem, reinforcing the future ecological industrial revolution

An example of a rising international and systemic innovation was introduced in the form of the EU -wide endeavour to reinforce the market for eco-innovations and hence to both induce a negative impact on global warming and to react on the change.

Experiences and views were reported concerning managerial, political, and legislative innovations in European Union/nation states/regions, in reinforcing a fruitful European market and source for eco-innovations to emerge and to become economically profitable. Public acquisitions, means of financial control and directives, product regulations and standards were mentioned as the methods behind this systemic innovation.

The human oriented innovations encouraged the companies and municipalities to involved the users to the product development or concerned the "the last mile" of the innovation in society, encouraging the citizens to find innovative solutions to degrease their carbon footprint

The rise of the "ecological industrial revolution" was stated to appear as a system-wide transformation and the following was put forward:"Ecological industrial revolution means huge societal and economic changes in how we manufacture, produce and consume goods. We believe that the next technological revolution will be driven by the global drivers of the environment and sustainable development. It grounds on the common awareness of ecological

issues and the explicit formal decisions made in corporations, nation-states or in European Union" (EI1, B02).

In the envisaged ecological revolution, the attention was paid to the innovation's multidisciplinary and cross-systemic interdependences. The following sporadic innovations (and innovators, in bracket) have been encompassed under this umbrella:

- EU; managerial and legislative innovations to encourage product development and foster diffusion of eco-innovations (EI1)
- Associations encouraging social and technological innovations, deteriorating the pollution of Mediterranean and Baltic Sea (EI1, EI2, EI3)
- Local authorities political decision to use a certain percentage of an investment budget for new technologies or other product innovations (IES4)
- Awarded technological innovation for saving energy in electrical devices, see 6 (HT2),
- Innovation reducing the use of chemicals in laboratories, ongoing development of a science based technological and service innovation based on micro total analysis systems in chemistry. (See also (PC1)
- Educational program educating first the school children to save energy and using then them to educate their parents (LL1)

Informants often referred to various signs of discontinuities and to the symptoms of current paradigm's breakdown. Especially, the possible economical discontinuation related to the ecological crises were often discusses. That discovery goes in the vein with Perez' (2005) comprehensive illustration of industrial revolutions in various faces of the mankind. Furthermore, the finding supported Hamel (2002), who stressed the capacities and competences required in corporations when the industry is to be reinvented. Scholars like Scharmer (2007), Hamel ((2002), (2007)) and Davila et al. (2006) have furthermore highlighted the overarching effects of industrial revolutions.

A2 A series of political, managerial, (media-) technological and educational innovations reinforcing the Finnish national innovation ecosystem

Finnish informants often referred to an innovation trajectory, which has its roots in the country's history (explained in chapter 2.3.2) but has changed during the past decades. The trajectory was argued to have comprised a new sift to a more caring and value driven human-centric knowledge society. It was furthermore said to be developing towards a future economy based on knowledge intensive "nano-corporations" (standing for the networked micro-businesses) which will in future generate the wealth and jobs. (L1, HT1B, FM2, S2)

Most of the stories confirmed the development of the Finnish innovation ecosystem, as described in chapter 2.3.2.3. Based on the data, the development of the Finnish innovation ecosystem was earlier driven by decisions aiming at technological innovations based on well educated labour force. Recently, the emphasis seemed to have been shifted towards the less-tangible functions of society and social innovations building up social skills and common societal values. This change was assumed to have taken place as a response to the changing circumstances were not only skilful but furthermore creative labour force is needed. Moreover, the wish to pay attention to the wellbeing of the staff and citizens was mentioned as an important reason. (HE1, MP1, S1, S2)

It was explained e.g., how the informal networking, since 1970s had played an increasing role in the Finnish innovation ecosystem (MP1, HT3,). "In early 1970s, the networking started among the opinion leaders who come from the University of Oulu, Helsinki University of Technology and technology corporations, such as Nokia and Sonera, the Committee for the Future - the Parliament of Finland, or from the municipalities and organisations in Helsinki and Oulu regions". (MP1) These individuals generated a collective movement, which was explained to have evoked a transformation in the country's administrative culture.

The actions behind the previous transformation from technology to human driven innovation ecosystem have been considered as a managerial innovation. In table 27 it was considered as a semi-radical innovation based on the excellent improvement of Finland's ranking in international comparisons during the past and present times, and the minor improvement in its capability to attract international investments and creative workforce

The combination of the informal and formal networking was explained to have formed the basis for the Finnish Triple Helix model. Simultaneous managerial actions in various organisations created *an intersection for collaboration* among the Finnish corporations, research and educational institutions, and other public actors, something that encouraged the co-creation of knowledge and innovations. Collaboration was experienced productive and was explained to have generated internationally unique scientific and practical technological knowledge, which was reported to be pivotal in opening up the opportunity for product development and scientific collaboration with the western countries during the Finno-Soviet treaty (1948-1991).

In 1990s the new Universities of Applied Sciences had widely adopted the idea of triple helix to the core of their functions and practices. Since then, they have educated tens of thousands of professionals with the potential know-how concerning the exploratory approaches how to accomplish work and to generate innovations. (MP1, DM2, HE1, HE2)

As the society become wealthier and the working life turned busier, the locus of values and innovations shifted as well. As discussed in chapter 2.3, the Committee for the Future – Parliament of Finland has enlarged upon a proposal for a more caring Finland based on enriching communities and an innovation strategy, which highlights the role of individuals and communities.

Similarly, the data supported surprisingly strongly the importance of the less tangible or the soft side of innovation ecosystem, as well as the urgent need of

social innovations. The discussed innovations were often appraised based on their contribution for the values like humanity and common good. Moreover, “innovation ecosystem was considered to be seeded over and over again in the creative pedagogical solutions, reinforcing the pupils’ eagerness to learn and develop their creativeness and self-esteem in the highly respected and internationally valued Finnish public primary school system” (MP22) in the frame of the egalitarian educational system. The school system prized by OECD Pisa evaluations was also referred as a strong mainstream where the forerunning innovations explored by lecturers, leaders, politicians or the high rank civil servants were however, concerned to have faced many setbacks. (MP1, HT1, HT3, MP2, S2, BA1)

A3 A country considered as a living laboratory for health and wellbeing related innovation

A systemic innovation was experienced to take place in Finland, where there is an ongoing development of the nationwide welfare and social wellbeing system. That is because Finland, together with Japan, faces the problem of the aging society earlier than most of the other OECD countries.

The idea in the systemic innovation is then, to mobilize all the elements of the Finnish health- and social care systems in order to create a nationwide living laboratory for wellbeing innovations. Due to the rapid increase of health care costs, apart from medical and technological innovations also systemic, social and managerial innovations are fundamental and urgent for the aging society.

That is to say, new product and process innovations related to the health and social sector are urgent. However, they are not sufficient, and hence, we need broader systemic innovations, penetrating various societal and knowledge sectors. There resides a need for new type of systemic and managerial innovations, based on crowdsourcing and open innovation.

The main goal is to collectively achieve rapid solutions to given health promoting and economical challenges e.g., the promotion of wellbeing, community, democracy and financial system in collaboration among citizens, administration and private sector. Finally, “if the living lab is successful, the forerunning country might later export the related innovations and knowledge for those nations, who will only later face the aging problem” (MK1).

Some of the informants continuously claimed for the importance of the innovations for innovation ecosystem. (IF1, M1, WB1) For example, the public-private-partnership concerning the childminding was explained to have turned easier ever since the legislative and administrative innovations. However, jurisprudence concerning the competitive tenders for private companies was both acknowledged and criticized; the lack of managerial innovations was a common target of criticism.

“The problem is that the public management culture dates back to the time of the public monopoly in services. That is why the new legislation doesn’t work in practice. […] if we want to construct an internationally competitive wellbeing sector, we need meta-innovations. Like, why not to integrate the best parts of the public system with those of the private companies? By integrating the best parts of both sectors, there would be enough critical mass in day-care businesses to develop a true commercial business innovation for the international market. Just like it happened in the mobile phone businesses in the 1990s.” (MIKC0091)

Following material and immaterial (see also table 27) innovations related to this category: (1) Science driven pharmaceutical equipment and service innovations (PC1) and related (2) business and management innovations (PC2, CEO), (3) safety and wellness device innovations (HT2, CEO; S3), (4) day-care (WB1) and (5) elderly-care service and related business innovations (WB1, MP3), (6) pedagogical innovations in health and social care (ANE1 and 2), (7) Finnish-Japanese research and product development concerning aging societies (S1, S4,

IF2), and (8) operational innovations in daily day-care work (LP1, M1, I1, MP3, WB1) .

A4 International innovation hubs based on co-creation of knowledge, innovation, entrepreneurship, physical proximity and brain circulation

Respondents referred to their experiences on following innovation hubs: Cambridge Cluster, Otaniemi Community, Tagus Park, and Sophia Antipolis. Based on the interviews and related publicly available data, it was evident that all the discussed innovation hubs were somehow different and the innovative idea or driver behind the hub varied.

Consequently, this study suggests, that the innovation hubs themselves could be seen as different type of innovations, and that they could be classified into three different categories based on the hubs' main difference in their innovation characteristics. Table 28 provides an overview on the discussed hubs and their drivers. The categories are:

1. Innovation hubs based on the *butterfly effect* – Rapidly evolved innovation hubs based on innovative political thinking and entrepreneurial actions
2. *Triple helix community* which integrates the top down and bottom up models
3. *Evolutionary hub*, with long history and a spirit of modern innovation and growth culture, *driven by high-tech entrepreneurship and heroes*

Table 28 Innovation hubs and their evolving innovative drivers as they appeared in the data (IES1AB, IESABC, IES3, IES4)

Innovation hub	Evolving innovative drivers
1. Innovation hubs based on butterfly effect -rapidly evolved innovation hubs based on innovative political thinking and entrepreneurial actions	
Sophia Antipolis, a value and innovation policy driven science park in Southern France.	SA originates in Senator Pierre Laffite's managerial, political and financial ideas. Knowledge creation has been driven by multinational corporations and brain circulation among other international hubs, like Silicon Valley. University has moved only later to the Park, but was told to be well integrated to the development of new SMEs, which is of high

	priority for the region. “Networked sub-hubs are now scattered across the region, where people live.” The “future of humanity” was highlighted. The following quotations exemplify the value driven management: “We stress informal activities in order to share tacit knowledge”. “Quality of life and services are focal in the region Côte d’Azur and the diffusion of the culture of science to the rest of the society”. “Democratisation of knowledge and development of the Côte d'Azur region and the quality of our brothers’ life in the other parts of the Mediterranean area and in the African continent effects also to the quality of our own life”.
Tagus Park, Lisbon’s science park, in Oeiras	National and municipality level managerial and political innovations and initiative individuals are the drivers to the innovation hub. Financial innovations together with the urban planning created a basis for the development of the companies. Series of Managerial innovations, continuously adapting to the changing business environment have generated fast economical growth and increase of working places outside the capital of Portugal.
2. Triple helix community - integrating the top down and bottom up models	
Otaniemi community in the capital region of Finland	The hub locates in the southern Finland, which is one of the world’s most research intensive countries. In the innovation hub technology clusters form their own virtual ecosystems comprising research units, growth companies and educational institutions. Nokia Corporation attracts ICT companies to the neighbourhood. Government and the municipality boost the interaction among the actors of the innovation ecosystem, including the professionals living in the area. In 2004 one of corporations was awarded with the Excellence in Technology Transfer by EU.
3. Evolutionary hub, with a spirit of modern innovation and growth culture, drivenby high-tech entrepreneurship and heroes	
Heroes and spirit of Cambridge region	Today, the economical growth in Cambridge region is one of the fastest in EU. The region has a long tradition with a nine-hundred-years old University, which has an annual budget of £ 940 000 000 and a history with altogether 83 Nobel laureates. Cambridge cluster was stressed however, to be a modern phenomenon, driven by high-tech entrepreneurship and a culture, which is strongly affected by the local serial entrepreneurs. It evolved from the University driven regional development to a modern growth model in which the serial entrepreneurs are the heroes of the networked community. Sprit of Cambridge was highlighted as the core of the modern Cambridge cluster.

A5 An awarded innovative urban plan, built infrastructure and townscape attracting citizens and corporations

Creative and entrepreneurial professionals generated series of innovations, which formed a solid basis for the development of an urban environment. The

high quality of the built city infrastructure was nationally awarded. Moreover, the decades lasting urban development had turned to a business innovation, since the municipality has learned to utilize their urban environment and infrastructure as a strategic competitive advantage when attracting citizens and boosting economical activities on its territory. (UP, M2, LP2)

B. Social innovations

By definition, there resides conceptual grounds for arguing that social innovations equate to the *innovations for innovation ecosystems*, since social innovations often promote favourable innovation circumstances. However, in this study, they have been classified as an independent category, to facilitate the discussion on the richness of nuances of innovations.

Social innovations may have a role in the overall development of the innovation ecosystem but that role is not necessary intentional. For example, the *Finnish maternity and child healthcare clinic system* has been considered as a social innovation. It was established as early as in 1920s, and during the past decades, it has increased considerably the health and quality of life of children and pregnant women, and hence, decreased the infant mortality to the minimum. During the last century, the maternity and child health care clinic system, together with the Finnish public schools, turned out to be the core stones of the Finnish human centric innovation ecosystem.

The following examples illustrate the propositions and dimensions of the found social innovation, as appeared in the data.

B1 Social innovations fostering innovation and making innovators visible in societies and corporations

The following questions were uninterrupted topics during the discussions. How to make creativity, innovations, and innovators visible and noticeable to the society? How to promote innovators' interaction with other innovators, all over

the world? How to encourage ordinary people to develop their creativity ability, and to realize their ideas? Sarcastically, it was said, “In spite of the publicly announced creativity policy, it is difficult in practice to attract the educational institutions, media, or other actors and organisation to use their resources and time to promote creativity in the society or in corporations”. (TAIN2)

Moreover, many social innovations were provided as answers to the questions. As examples of such social innovations, which were furthermore considered as successful, it was mentioned such as:

- *Innovation fellows:* Corporations, have appointed “industrial fellows”, independent professionals, who if needed, can “act as official heretics”, and who are in charge of innovations for the entire organisation. They subordinate for the CEO and actively promote, vary and develop different radical innovations and creative thinking methods among the entire population of the organisation. Innovation fellows were said to have similar proactive role as the court jesters in the past. (I2, HT1A)
- In societal level innovations like *creative patrols*, *public creativity occasions and festivities* have been experienced as useful. Internet and television promoting innovations were, moreover, seen as the main medium for boosting innovation among the citizens. (I1, M2, MP2, MP3)
- Female *inventors’ associations* were found effective in linking innovators and their ideas internationally. (I1, I3)
- Schools’ *creativity curators* and various other residential solutions, inspiring young people to foster their creative skills, were claimed for. (I2)
- An experienced manager had developed a social innovation of integrating the civic education of the developed world with the governmental aid to support the economic, social and political development of developing countries. A new type of international exchange programme would be executed as an option for the military service. Exchange period in the developing countries would hence provide for the young professionals of the developed world a variety of useful skills and knowledge needed in the management of any complex operative environment. It was said that, providing people an

> opportunity to learn from the circumstances in developing countries, would increase the art of creative problem solving and develop related values and attitudes. Consequently, the exchange programme was planned to offer better contribution to the developing countries than the traditional foreign aid. (NIL23)

C. Innovations transforming a field or industry

Some of the innovations have the power to affect an entire field or to generate, no fewer than, an industrial transformation. Those innovations can be considered as radical, based on the earlier discussed definition. Here, they have been classified as a property of innovation.

It was found that some of the discussed innovations had a capacity for industrial transformation or change in a domain. Furthermore, some of the innovations originated in industrial transformation, but they, additionally, carried a potential for further major transformation in the field. Innovations related to the transformation of the industry or field in concern were such as:

C1 Financial and bank sector innovations. Some of the reported innovations, from the past decades of Finnish banking sector, had originally been reactions to the deregulation, later they had started a sector wide transformation. An innovation complex, which firstly generated and then solved the financial crises and deep regression in Finland in early 1990s, was discussed. Furthermore, it was stressed, how the adoption of the ICT had boosted the bank sectors' service innovations all the way since 1970, and had moreover demanded both managerial and organisational innovations from the sector. (BS, MP2, PC2)

C2 Scientific innovations creating a new approach or transforming a field Based on the experiences concerning scientific work, the following cases we found. They had affected both the scientific and pragmatic understanding in respective fields.

- A multidisciplinary theoretical model, which had diffused among scientific, healthcare, and business professionals who developed methods or provided help and services for people in personal mental crises (S1)

- Exploring businesses in new contexts (e.g., gift economy, providing free services and goods) had expanded the scientific framework on business studies. (S5)

- Development of new user centric product development method had uncovered some the hidden needs in the market. It carried a potential for the change of open innovation methodology. (S3)

- Integration of telecommunication, pharmaceutical chemistry ("micro-fluidics", manipulating small and precise amounts of liquids) and business innovations carried a potential to revolutionize the conventional laboratory standards. If fully developed and diffused, these innovations have a capacity to change the logic and principles of value creation in public and private healthcare services. This set of innovations can be compared to the notion of radical innovation by Davila et al. (2006), stressing the innovation's capacity to force the field to reply with series of new innovations. (PC)

D. Business innovation

Following innovations have been coded to this category:

D1 Radical business innovations based on incremental product innovation. A leading multinational corporation's strategy based on business innovations proves that there are many origins for business innovations. Referring to the earlier explanation and citation (A0048) from a multinational corporation, a product innovation may result to business innovation. Concisely speaking, "when incremental product innovation has been applied fulfilling the customers'

expectations in a new way, there will be a radical business innovation as a result".

D2 A radical telecom business innovation which replaced the traditional landline telephone system in 1990s by services relying on GMS-standards and related service innovations. Data services, which appeared on mobile phones starting with person-to-person SMS text messaging in Finland in 1993 created turned to a business innovation. (See more in detail subsection 5.2.4. about the multifaceted origin and stages of SMS) (HT3, HT4, HT1)

D3 Providing **private healthcare services** in a country with a long tradition of public monopoly turned into an awarded business innovation. (WB)

D4 Providing public services in a foreign language was categorised as business innovation from the point of view of a municipality, due to the fact, that those services were considered as part of their competitive strategy and as a competitive factor when creating an international profile for the region. (DM)

D5 User centric open innovation turned to a business innovation in 1980s in businesses related to the production of electronic devices (MP1, HT1) and in wellbeing and educational services (S1, HE1)

D6 Outsourcing of financial administration in 1980s was introduced as a business innovation of the time (FM1)

D7 Off-shoring production and development of pharmaceutical equipments to countries with essential knowledge and growing markets was considered as a business innovation in 1980s. (PC2)

E. Managerial innovation

Examples of managerial innovations were reported from various types of management and leadership situations in public and private organisations and in political contexts

E1 Empowering personnel intellectually, emotionally, or with tangible support.

Informant explained, “Based on our definition on radical innovation, supportive leadership was considered as a source of radical service innovation, which could change the clients’ expectations concerning the transportation services.”

The manger in concern was young, only 32 years old, when she was requested to run an international transportation company. Since she had neither education nor experience of the core substance of the field, which at the time went through a turbulent developmental phase, she explained her managerial innovation as following:

> “They [personnel] knew that, I trusted them, and gave all needed space for their professional know-how. They also knew that my support was always available, whenever they would need it. However, my support was seldom needed. Knowing that the support is available is usually enough for people [...] if they can count on it.
>
> Hence, people felt safe in the chaotic and turbulent business environment. I believe, it was the empowering leadership that provided the needed energy to our homing corporation, it also gave the needed means to adapt to the chaotic development of the field.
>
> […] It is important to remember, that it is in the chaos where all the new is “tingling”, and all the interesting ideas are developing. That is what has always attracted me, and that was the reason, why I accepted the CEO’s

> post in spite of my lacking experience and competence from the field" (A0090)

Another found dimension of managerial innovation emphasises the *recruitment of new professionals* into the banking sector and the importance of *cross-sectional leadership*.

> "[…] in order to generate new ideas for new type of innovations and services to the banking sector, we need to mix people from various fields. It was important to recruit people who had not internalized economists and lawyers' conventional thinking models throughout their studies. For example, I have found my decision to recruit a person who had studied theology very successful for our bank.
>
> […] What matters, is that people have good basic education and a wish to continuously develop, the actual degree is not important." (B0049)

E2 Organisational innovation

"The entire organization right from A to Z is based on innovations (A0049 ref.1)" was mentioned as an example of managerial innovation by one informant. Furthermore, a serial entrepreneur highlighted the difference in thinking between the conventional restricted and narrow idea of innovation and the idea of wide, holistic concept of innovation, that is to say, *applying innovation to the entire organization is a managerial innovation*. He pointed out:

> "I have tried to teach the professionals all the way to the Governmental level, as well as to the University professors that, the old management textbooks' knowledge on innovation from the 1980s does not work anymore in our present world. Since, nowadays, all of the business operations should consist of innovations, and to start with the international marketing.

> […] yes, there are some regularities and logics, that has to be taken into consideration, everything should not be re-invented, however, the point is that regularities and logics should be applied to the businesses in an innovative way. It is extremely important that all the decisions and choices are based on innovative thinking and their connection to the rest of organization are well thought-out.
>
> […] that is to say, companies will not develop, if relying in old theories, instead one has to be very agile and quick-moving.
>
> […] I would take the innovation as a comprehensive holistic notion." (A0049 ref. 1).

F. Product and process innovation category

Category comprises the following dimensional examples

F1 Patented pharmacological research equipments since 1960s. Awarded laboratory technology patents (PC1 and 2) and equipments used in pharmacological research and analyses were discussed as an example of product and process innovation in two corporations. An informant explained his long professional background as a scientist, inventor and entrepreneur:

> "Since this technology was created in 1960s, my patents have been dominating a chunk of the world markets, up to 90%. Packard Instruments Company utilizes the sample oxidizers, which measure radioactive stamps in pharmacological research. This gadget has been the (-) standard for the preparation of many biological samples, for pharmacological research. A product like that has been the leading product of its field since 1969 and that is just the bottom layer of my technology." (D0057)

F2 Technological and service innovations related to telecommunication, lifting and moving, as well as forest and mining industries were the most numerous categories of innovations. (HT3, HT1ABC, MI1, S3, MI2, HT4, HT2, HT5, HT6, HT7, BA1)

F3 A solution for **finance process automation**, since the year 2000, called electric financial administration (FM2), and the **anticipatory accountancy** in the 1970s (FM1) included systemic development of the legislative, financial and administrative framework for the corporate operations.

F4 An awarded device improving the safety of minor electrical gadgets The President of the Republic has awarded a national prize to a Finnish company, which through its technical expertise has answered the needs of ordinary people, and promoted competitiveness of businesses in Finland in an inventive way. (HT2A)

F4 An awarded personal wellness monitoring device, an automatic and wireless personal security system, monitoring and analysing users´ activity levels. (HT2B)

F4 Various consultant and management services based on innovative methods reinforcing innovation and creative thinking and learning in organisations. The explored experiences concerning Creative thinking methods and consultant services (C1, C2, C3, HE_1) were consistent with the earlier discussed Schemers' U-learning theory.

G. Operational innovation

Various found operational innovations were related to professional life and work such as management, engineering, consultancy, financing, nursing, childcare, marketing and selling, design, media and art, research and teaching, or making politics.

For example a former engineering salesperson (C2), had developed operational innovations related to the sales processes. He had been successful in 1970s at his sales operations due to his methods based on *specific client oriented services and utilizing intuition* in the sales negations.

Furthermore a former nurse in psychiatric (C1) stressed the importance of *innovativeness in the nurse's daily work*, she stated that, "when coping with the different type of patients in the fast changing situation, where quick, independent decision making is needed, creativity is pivotal (D0071)".

Likewise, a manager of a media company, referred to the innovations when speaking about *journalists' attitude towards editing news*. "I have seen during the past decades how, for some journalists, it is difficult to make any news out of a given material, while for another, the same material, after having generated an interesting piece of primary news, provides a further source for three more news. – Some journalist use their energy for inventing reason for why things are not possible, as the others are empowered by *asking what if or why not*?" (D00045)

Often operative innovations were described in relation to the ordinary life, e.g., the family life and education of children, and they were referred as everyday life innovations. For example, a member of parliament, who himself had a remarkable public role in the development of national and regional circumstances for innovations, explained how, due to the fact that it is difficult for the young people to gain work experience during the summer holidays the family had solved the problem through a "family entrepreneurial camp" for their children. Hence, during the summer holidays the children who took the responsibility for some of the household and farm businesses learned to plan, distribute and manage their own work. They received salary based on the acquired results. (MP2)

Some of the discussions were critical in opening up the awareness of the need to widen the notion of innovation. It was said (S5), that:

> "For me innovativeness and creativity go beyond the definition of the conventional business studies. For example an innovation, which once upon a time was defined as innovative [novel] in intellectual meaning, is no longer, by definition, an innovation of today. However, the use of that innovation can continue to be innovative.
>
> […] In that moment, in intellectual meaning, the innovation comes to an end as an innovation, but it can still be used in an innovative way, that is to say, it is still an innovation
>
> […] When exploring the use of innovation, we start to see a lot more interesting innovations, and we become aware of innovation's energy
>
> […] That is why, it is extremely important [for business studies] to utilize philosophy and anthropology, in order to approach and understand the importance of the use of innovation. I believe we should now look at innovation, when it is no longer at the hands of a top engineer, but at the hands of ordinary people [those who are the users of the innovation].
>
> However, the mistake is to explore the average consumer, since there is no such [as an average user]. Nevertheless, we can broaden our understanding of innovation by using the litmus test. For example, if you understand the rainbow family as a user of an innovation, you will be able to see beyond the boarder of the conventional notion of innovation. That is how we can learn to find new ways to do things, think about Nintendo Wii - bringing tennis to the living room." (D0092)

H Meta-innovations

Meta-innovations are the methods or tangible innovations, which facilitate innovation; they help the creative thinking or make innovating easier. Informants often referred to meta-innovations.

A researcher, for example, used meta-innovations for expanding the scientific boundaries in business sciences throughout "exploring innovation as an analytical category, and perceiving innovation in odd contexts, like in jails, or by using the rainbow family as a litmus test." (D0092B) This type of meta-innovations had proved to be important in avoidance of "the trap of success" which goes alongside with the existing paradigm in business sciences.

In molecular biological product development, another researcher's meta-innovation was a mental method to convert him into innovation. "It often happens that problem solving based on the conventional knowledge and methods do not help me. Then I try to imagine of being a molecule, asking, what I would like be done next, if it was I who was the molecule." (D0057)

5.2.2 Innovation as a chameleon

In the multifaceted data, innovation was found to have a chameleon like characteristic. The chameleon nature of innovation was illustrated throughout perceiving the data from different perceptive, by answering the questions of what, who, whose, how, where, when, why, or what kind of innovation. Among the professionals, emotions related to the confusion concerning the essence of the notion of innovation were recorded.

"Innovation as a chameleon" is consequently deduced form the deepest and 'slippery' essence of innovation which appears all over and which continuously transforms during its journey throughout different times and places. - All this

makes the innovation policy quite a challenge since in the societal level there resides countless different and controversial type of innovation at the same time.

Innovation as a chameleon, as a category, is based on the discovery of the chameleon like features and construction of the analysed innovations. It furthermore refers to the transformation of the philosophical idea of innovation. Likewise, the chameleon like nature of innovation was found in the processes of simultaneous ideation and implementation of various types and phases of innovations as well as in the continuously varying nature and sifting roles of innovation (see "innovation manifestation").

In the data, which was collected from many different actors of the innovation system, innovation was explored in a broad sense. In the analysis, the discussed innovations transformed back and forth through research, development, prototyping, market testing, start up, commercialisation, ethical, and social cycles. In the hands of researchers, inventors, brokers, entrepreneurs, intermediary people, and users, innovation finally actualized.

Consequently, throughout the notion of innovation as a chameleon, the innovation expands its conventional horizon towards the more philosophical and psychological questions, those behind the essence of the practical problems of innovation management. This furthermore, opens up the question about the consequences of the conventional, narrow and stable interpretation of the notion of "innovation" to the various discussions in science and in real life. It can be assumed that the stabile notion may have restricted the dynamic discussion and development of both theoretical and pragmatic use of innovation.

Moreover, some of the found dimensions of the "innovation as a chameleon" contrasted sharply with the earlier provided literature and the intellectual concept of innovation. Some of the interviewed great minds even warned about the risk of being trapped with the business researchers and politicians' definition

of innovation. As, one of the informants said, “We will remain inside the [narrow and conventional] concept. Without the deconstruction of the notion we will be stocked”. (D0092)

It was highlighted that apart from the politicians and business researchers’ definitions of innovation, innovation can be seen more clearly from the perspective of history of creativity; hence, innovation, which has not been sponsored, supported, or financed with the system, can lead us to the deeper essence of the innovation. As a respondent put it:

> “We’ve learned from history that innovations which have really changed things have not been among the best funded. […] The origin of innovation can be opened up, for example, by learning from the history or from phenomena like prisoners innovations […] Observing innovations taking place in peculiar arenas and in odd ways, is a way one can learn to understand innovation’s energy and dynamics” (D0092).

It can be argued that this way of approaching innovation outside the formal domain and field is however, contesting Csikszentmihalyi’s (1997) definition of creativity with a capital C, since possessing the domain and counting on the acceptance of field are embedded as prerequisites in Csikszentmihalyi’s definition. It is hence suggested that this difference should be taken seriously when exploring innovation.

“Innovation as a chameleon” comprises many complex and paradoxical dimensions of the deeper essence of innovation, which will be discussed in the following paragraphs.

Systemic, hybrid and complex nature of innovation

The “undertow” of innovation and creativity turned to be a lot more complex than what appeared on the face of innovation. The stories of the innovations

evolved from one aspect to another, and often a myriad of different types of radical and incremental innovations appeared under one story line. Most stories were like pealing an onion, layer after layer additional innovations and elements of innovation appeared. The analysed innovation stories well illustrated the hybrid, systemic and complex nature of innovation.

Innovation as a notion was found as slippery, or something that is difficult to crab without spoiling or breaking it, this appeared in comments like,

- “Make sure we are reading the same book, it is pivotal before sharing our ideas about innovation.” (D00101)
- “Defining what is creative about my idea, or even to talk about it too early, scares the creative idea or the innovation away, it just disappears or it doesn’t feel original anymore.” (A0099)
- “I don’t know how to define innovation, but I will definitely distinguish it when I see one.” (A0012)
- “Innovation is not a thing or an end, but a process or something that is alive, embedded in our work and everyday life practices that evolve in a spiral movement in the different phases of the innovation tunnel.” (A0015)
- “The perception of the use of innovation differs from the phenomenon itself, as a matter of fact, I am not sure if innovation can be defined at all, creativity stops being creative when defined.” (D0092)

To sum up the chameleon like nature of complex innovation phenomenon: “The attempt to define innovation and creativity is like a tautology, it is not possible to attain its true deeper essence, due to the fact that always when you are almost there, you realize that there are new scopes and dimensions appearing. While defining what innovation is, you recognize that it has already evolved from one form to another.” (D0096) “Innovation is like a piece of soap, when you try to grab it, it breaks free. (A0048)”

It is evident, due to the rapid increase of health care costs that different types of innovations, including systemic, social and managerial innovations are fundamental and urgent for the aging European society. That is to say, product and process innovations related to the health and social sector are urgent, however they are not sufficient, and hence, we need broader systemic innovations, penetrating various societal and knowledge sectors. Hence, we need new type of *systemic and managerial innovations, based on crowdsourcing and open innovation*. The main goal of which is collectively achieve rapid solutions to given questions and challenges, e.g., promotion of wellbeing, community, democracy and financial system in collaboration among citizens, administration and private sector.

From whose point of view should we perceive the innovation?

With reference to the more resent idea of the broad sense of innovation, namely innovation in organisational, societal, global or in everyday life contexts, this question emerged as an important one.

One of the interviewed great minds discussed the innovation in an unconventional way, and he referred to the attitudes of the funding authorities by saying, “They were angry, since their holy notion of innovation was smeared. – But I am asking, do they have the right to decide what the correct way to define the innovation is?” (A0092)

Related to the innovation definitions, also ethical problems were often stressed, like the common good versus getting rich, or promoting the wellbeing of our generation versus the future generations. It was common to put innovations side by side, in order to compare the desired future to emerge versus the cash flow innovations of today. “Innovation is my tool and engine to accomplish my future dreams [...] it is not just about making money with gadgets and stuff” (A0061).

The often mentioned common good, as well as the various types of global and ecological issues can be summed up with a citation: “In western societies we created an artificial bubble, where work and money are the big issues, and which enabled us to ignore the problems of the rest of the world. […] There are already millions of unnecessary goods and gadgets, instead of innovating more of them; we should concentrate on the systemic innovations, which have real power of affecting the life of people, and to make the world a better place.” (B0099)

Furthermore, in the opposite extreme, it was stressed, “the problem is that, there are too few actors who can turn an innovation into a global cash flow.” (A0048) This statement got verification from the fact that, as it was told often the inventor or innovator got none or only minor economical benefits from their patents and innovations. (C1, C2, HT2, HT3)

Ethical problems and value conflicts attained within the value oriented innovation operations

It was found, concerning welfare innovation in a Nordic welfare system, that “there is a conflict between the private and public logics, for the private companies better services means better revenues, whereas for the public sector it means a reduced amount of costs” (IF1).

Furthermore, it was discovered, how sometimes innovation had turned against its original purpose. The following example refers to an innovator, who regretted the pain his innovations concerning the automation of working processes had caused for the accountancy people. As he said, as a consequence of his innovation the work of those using his innovation not only became busier but also a lot more monotonous and thus more boring. “People, like me, tending to do well are the villains of the piece. Doing good often damage, like my innovation did for the professionals of the accountancy. […] I compare this paradox with Chaplin’s movie Modern Times.” (B0099)

The time related nature of innovation refers to the fact that, when innovation is diffused, today's radical innovation will transform to tomorrow's mainstream, until it finally will be replaced by other innovations. Moreover, innovation appearing "too early, or in a wrong environment" was in addition discussed as a common phenomenon. For example, it had taken more than ten years for the innovations like SMS or the Reverse mortgage to diffuse to the market. (HT1, HT3, BS1)

Furthermore, it was explained how, "the service innovation of outsourcing accountancy, at the time when the service was launched, was not approved by the field of professionals, but as we today have learned, the market has fully approved it and later also the field (business economics) accepted it." (FM1)

As an example of incompatibleness between innovation and innovation ecosystem, a bitter experience was put forward about how a professor, who had supervised a young PhD student at the 1960s, had considered the Ph.D. students' pharmaceutical innovation too significant and demanding for their university. Supervising professor had then handed out that innovation for another better known researcher in a larger university with more resources. That researcher was later awarded by Nobel price, but the original creator of the idea was not mentioned. (PC1)

By definition, novelty is a characteristic of innovation; however changing the perspective from whose point of view the innovation is perceived can turn the old to a novelty or the innovation to a mainstream. The significant role of old as a part of innovation, was illustrated with an example: "In spite of the development of the war technology, the idea of using the horses was however critical for winning of the WWII." (A0092) A more recent example, from the television and media field was put forward, it exemplifies how the distributive innovation of using subtitles turned to a radical educational innovation and affected the Finnish youngsters' good learning results (Pisa evaluation). It was

said that "the poor man's solution of using the old technology of subtitles instead of the modern and expensive dubbing or looping [the process of recording or replacing voices for a motion picture] turned to an innovation in another field, it facilitated children to learn to read and people to learn foreign languages." (D0045)

Similarly, it was found how, due to the butterfly effect, ***an incremental innovation could transform into a radical innovation*** in two different ways. Firstly, as discussed earlier in the innovation manifest section, incremental product innovation may turn to radical business innovation. Secondly, an incremental processes or evolution can lead to radical outcomes in long term, if accurate decisions are made timely. Concisely, in the bifurcation zone, if the needed decisions are taken and then implemented, the minor innovation can create a radical innovation. The second type of evolving radical innovation will be illustrated with the following citations. A manger from a multinational corporation had put it forward,

> "[…] nothing appears from vacuum, which means, everything is grounded in existing knowledge and incremental evolution. If we can perceive, let say the potential of radical innovation, with it we can accelerate or decelerate, or we can target the evolution to the right issues. […] It is always inevitably an incremental process during which the radical thought starts to turn to businesses." (A0048, ref 4&5).

An informant from a high tech corporation (A0048, ref 6) provided another analysis of radical innovation. He highlighted that decision-making based on the understanding of the essence of human beings' true and hidden needs may lead to a situation where the technology innovation may serve the true human centric innovation of the society. The informant portrayed that,

> "[…] we have a tendency to overestimate radicalness, or to perceive that radical changes take place faster than they do in reality - hence we easily make disinvestment by hyping up matters like the virtual reality or the automated traffic control and vehicle's steering. […] For me radicalism

means that, we provide people more time and opportunity to be physically together in the same place.

[…] Throughout correctly leading the evolution, the technological evolution and the virtual development, we can simplify our routines and develop the environment for an easier handling of everyday routines and thus, we can provide more time for ourselves to do the things collectively. Radicalness might refer to the freedom of doing things collectively. This is due to the fact that people are, at first place, always human beings, and they want themselves to control matters […] and the human need to have a physical contact with those whom we care about steers our behaviour."

The relative nature of innovation was discussed in the form of ***innovation cannibalism, a phenomenon when innovations prevent other innovations***. It was for example explained how an ecological hybrid car, consuming less fuel, however increased the pollution due to its larger ecological footprint. Thus, that type of ecological innovation is an obstacle for the more important ecological systemic innovation, or the ecological industrial revolution. (EI1).

Apart from the purposeful innovation competition among corporations, also unintentional competition or innovation cannibalism takes place while developing in-house innovations in corporations or in wider innovation ecosystems. Altogether, the informants discussed the following dimensions of unintentional innovation cannibalism:

- The earlier example of the hybrid car as an innovation prohibiting the more systemic innovation from progressing (EI1).

- Consequences of outsourcing and redundancy can be both negative and positive. For example as Finnish pharmaceutical company publically informed (Orion, Helsingin Sanomat 30.11.08) about a radical managerial innovation of moving over from the in-house research and development to

the joint, collaborative r&d with other corporations. Firstly, the managerial innovation leading to redundancy was said to disconnect hundreds of researchers' knowledge from the innovations under construction and hence it was said to cannibalise the corporations own innovations. At the same time, it was however commented how time will show whether the choice of the collaborative r&d will lead to even more radical and successful innovations in the future. Innovation could benefit the corporation in concern, or they could form of completely new cluster of innovation and knowledge driven businesses, established by those who now lost their jobs. (M3, MP2, HT6)

- Furthermore, the different phases of innovations were reported to corrupt each other and thus to deteriorate the economical success based on the innovation in hands. As discussed based on the earlier research, the principles, rules and procedures of different innovation phases are different, and thus, they harm each others. In this study, the ideation phase of a radical innovation turned to be most vulnerable, due to the fact that, "those responsible for the stocks value only killer applicants [commercial application of the innovation] to make the quick money" (C0098, 593)

- Fear and risk of success traps in the form of the earlier successful innovation preventing the new innovation from emerging was elicited. Among the Finnish informants the risk of success trap in the national strategy level was commonly discussed, Sabel and Saxenian (2008) have confirmed the existence of this risk. (MP1, WB1, HT1 and 4, PC2)

Moreover, the origin of innovation can also be like a chameleon. Often innovation came when there was an intersection of different things, which seemed not at first glance to fit together. "Rather than asking what innovation and creativity are, I believe we should ask where they can be found. For me,

innovation refers to the circumstances where the weird energy field appears." (A0093)

It was explained how the collision of technology, design and leadership created the eureka-experience of finding the right problems. Interestingly, often, for those with an open mind (compare Scharmer (2008)) a problem turned to an opportunity throughout innovation.

A member of a parliament stated, "during discontinuities, being a small country, is an advantage in the scope of economics. That is due to the fact that, a small country is more collaborative and thus more agile and faster than the larger economies" (A00103), and another one continued "we are among the first ones to face the aging problem, and it is our advantage if we manage to tackle the health care and related questions." (A0015)

5.2.3 Multiform source of innovation and innovation process

Where is innovation coming from, is answered by the category of "Multiform source of innovation and innovation process." It represents the dimensions of the origin and phases of innovation as expressed by the informants. It is related to the previous subcategory of meta-innovation and the category of working strategies. The difference however is that in this section the source of innovation refers to the more general matters behind the innovation, or to the reasons why the innovation at the first place was developed. Working strategies discusses the personal drivers of innovation and ways of finding problems to be solved or targets for innovation.

The sources of innovation were multiform and multifaceted. The dimensions of their origins extended from the curiosity of scientists and inventors to ethical dilemmas all the way to the purely profit oriented reasons based on the needs of markets. The identified dimensions for the origin of innovation were cross-tabulated (table 29) with the type of an organisation be it profit or non profit

organisation. As the typologies in general, this is neither a problem free table, because the innovations should often be classified simultaneously to various categories. Stefik and Stefik's (2004) typology of innovation's origin based on knowledge and curiosity, referring to what is possible as well as to what is needed, has been used as the starting point. However, also other elements arising from the data have been integrated into the table 29.

Table 29 Origin of innovation (dimension) cross-tabulated with the type of organisation (profit/non profit). (Letters refer to the table 27 and explanations in corresponding chapter)

Origin of innovation, dimensions		Type of Organisation	
		Profit organisations (Radical and semi-radical innovations)	Non-profit organisations
Innovation based on own wish/ strategy	Driven by knowledge and curiosity (what is possible)	Integration of telecommunication and pharmaceutical chemistry (C)	Using anthropology and philosophy to widen the notions of innovation in business studies
	Driven by need and desire (what is needed)	A private welfare service business concept (D)	Giving voice for the citizens (B)
	Driven by ethical reasons, or common good	Finance process automation (F) Computer skills for low income children (B)	Built infrastructure (A)
Innovation as an imperative	Driven by the coercion based on the circumstances	Financial and bank sector reacting to the deregulation and economical depression (C)	EU reinforcing eco-innovations and ecological industrial revolution (A)

In the following paragraphs, the found dimensions for the origin of innovation in relation to the type of organisation will be discussed more in detail.

Concerning most of the *profit driven innovations* it was impossible to specify one accurate origin for the innovations in concern due to the fact that many of the innovations where based on continuous incremental development in conventional product development. They often originated at the same time on the work done at the companies' research and development units and at the business units or at client's problems. The imperative of innovation was based

on the need to be productive in the competition. These innovations were mostly discussed in the spirit of conventional business management textbooks and in the context of cash flow and short term productivity. The origin of the incremental profit driven innovations was thus mainly a mixture of the two dimensions, curiosity and need. Ethical issues were not elicited in these discussions.

In profit organisations, the origin of *radical and semi-radical innovations*, were furthermore often based on the work, done both in the r&d and business units. In this study, there were cases in which, both the need and knowledge were elicited as the origins of the innovation. However, unlike the incremental innovations, the radical or semi-radical innovations more clearly originated either on curiosity or on the needs of the market. Not the scientific knowledge and curiosity alone, but additionally, the individuals and their radical thoughts or ideas were elicited as the origin of the radical innovation for innovation ecosystem, conventional product innovations, and business innovations. “Wired questions, questions asked by nobody else. They are the core source of radical innovation.” (A 0099, 680).

Additionally, collaboration was reported as the origin of innovation, but it had not always been doing well. Paradoxically serious problems had occurred in corporations, when for example, a large corporation’s r&d and marketing units had disturbed the development of a radical innovation. (C0098, 594).

Interestingly, it was found that often the radical- and semi-radical innovations in profit-organisations were discussed in an ethical context. Finance process automation (C) for example was obviously driven by an idea of improving the working conditions of those in concern than making profit with those peoples’ difficulties. Another example of the need driven non-profit innovation comes from US where companies provided facilities and equipment for the low income children to learn computer skills (B). (FM2, SI1)

In most of the cases, the informants referred to the *coercion of innovation*, by using expressions like “change or die”, referring to the hard competition in the market. However, what concerned the radical innovations in banking sector, the imperative of innovation was different. They were grounded on the colossal transformations in the operative environment, caused by the deregulation in the financial sector, and then the economical depressions. In those conditions the market surveys where useless and hence, abandoned as foundation for radical innovations. As one manger explained,

> “[…] look at Walt Disney, if it had been for the market surveys; he had never been able to develop the story about Donald Duck. Or, do you think anybody had expressed a wish to read the story about a wired duck without trousers? […] Clients seldom have any idea about what is possible in the future, or what are their own hidden needs and desires” (A0087, 303)

What concerns incremental and radical innovations systemic innovation tools, like the Triangulation method, where also reported as source of innovation.

In non-profit organisations, *knowledge and curiosity driven research* on innovation in business studies was driven beyond the existing notions and frames. Using anthropology and philosophy to widen the notions of innovation in business studies was confusing, and actually heretic, from the point of view of established framework, but they were unquestionably utilized in order to increase the awareness of the hidden aspects of innovation. (S5)

A municipality, struggling with unemployment, social marginalisation and other problems deteriorating the region, gave voice, through the social media, radio and TV, for its citizens, in order to empower them. This social innovation was grounded on the recognition of the needs of the people. (B) (M4)

Decade lasting development of the built infrastructure was originally driven by the common good and quality of life, of all of those living and visiting in the

city. It was only later, when the innovation turned to a business innovation or competitive factor for the region attracting the “best taxpayers”. (A) (UP, M2)

EU’s measures for reinforcing eco-innovations and ecological industrial revolution have been classified as an example of coercion due to the ecological reasons however, these innovations could be classified as a need driven innovation (member states and companies need for competitive advantage). (A) (EI1, EI2, IES4)

Furthermore, another dimension, namely, positive and negative emotions related to desires, passion, crises was found as a crucial source of innovation, specifically luxury goods and services. It was even assumed that desires and passion seem to be a symptom of ongoing change towards the era of experiences and emotions and they seem to have replaced the tangible need as a driver of innovation.

5.2.4 Stages of innovation

The category “stages of innovation” embraces the process of various types of innovations introduced in table 27. This section provides an overview on the properties and dimensions of the category. Stages of innovation varied based on the type of innovation and the form of context (e.g. SME, multinational, public organisation). Firstly, it was discovered that the informants’ descriptions, related to the product innovations, appeared in accordance to the innovation funnel’s phases (creative stage, execution and value creation) as discussed in the literature review (Davila et al. (2006)). Nevertheless, managerial innovations were continuous without separable phases.

Innovative measures of orchestrating a company appeared evidently in all of the discussed business innovations. For example, what comes to the business innovation of a multinational corporation, the importance of the vision and

orchestration was stressed in the innovation process which included both linear and nonlinear phases. One of the managers of the corporation explained it in the following way:

> "It can be described as a process that goes with time, first, the vision will be created, then the strategy. After that, you develop or acquire the needed technology, and then that will turn to the production in the linear phase, which is in accordance with the agreed processes. In the vision phase, we need all the knowledge areas, that is to say, the technological knowledge, product development knowledge, understanding of logistics, product assembly and factory work, as well as marketing. You create the common vision about what will be done, and then you try to find the strategy, the innovation on how the things will be done and with what kind of an organization. It is crucial that all areas of the knowledge and know-how are in as close interaction as possible with the corporation's highest level of management. Management's support, sponsorship, and authorization are clear for the teams in the lower levels. Teams have to be empowered with authority, because innovations are born in the lower levels, in the horizontal, multidisciplinary teams, neither in the management nor in the disconnected parts of the organizations." (A0048 ref1)

Importing innovation to a SME One of explored SME cases illustrated how innovation was imported from a multinational corporation, and how successful innovation and businesses were created around it. A serial entrepreneur explained how he resigned from the multinational corporation, since he had not been able to continue the development of his invention there, because, "nobody in that corporation had an insight on what to use the innovation for". The inventor explained how "insights into the real life problems and to the way how innovation could solve problems is my way, it was that insight which was missing in that corporation." Hence, he had left the corporation, and bought the IP rights for the invention. After having created his company around that

innovation, the innovation had become a financial success. Later, the company was sold with a considerable profit. (B0061 ref. 1)

According to him, “the difference between innovation processes in multinational corporations and small and medium sized enterprises is as big as the difference between the day and night.” Form the point of view of innovation there resided strengths and weaknesses in both type of organisation, as he explains:

> “In large corporations, it was difficult to exploit your ideas, however, their support organization made the innovation process easier. When I stepped into my own world [SME], I had to solve all the problems [e.g. technological and legislative issues] by myself. In a SME, you are alone, but, what is most important is, that you are the master of yourself in so many different ways. I would not give away any of the twenty years as an entrepreneur, because as an entrepreneur I have been able to do things and to create innovations which otherwise had been impossible, that is because, I have had the courage to take risks, which had not been taken in any big corporation.” (B0061 ref.1).

“Stages of innovation” compared to the innovation funnel. Various discovered phases of innovations can be classified as stated earlier (Davila et al. (2004)): innovation comprising of (1) idea generation, (2) execution and (3) value generation. These phases were found both in profit-and non-profit organizations, and were particularly related to product innovations. However, it has to be highlighted that often it was difficult to distinguish the different overlapping and continuously iterating phases from each other.

When compeering the different incidences, various dimensions of the “Stages of innovation” were discovered, and they will be discussed in the following paragraphs. At the end of the section the SMS, GMS and mobile phones related innovations will be discussed to epitomise a multiphase innovation process and their effects on the telecommunication businesses.

Idea generation

Idea generation encompassed generating multiple ideas and filtering ideas or related partners and technologies. Hence, the idea generation embraced the following dimensions:

Holistic orientation comprises a wide scope of multifaceted knowledge and time from past and present to the future. The following citations are presented to epitomize the holistic orientation:

> "The latest top knowledge was acquired, but that was not enough. What was needed, was taking that knowledge to a very wide perspective. I would say it was as if knowledge had been painted with a very big paintbrush. We asked questions like, to what direction is the knowledge developing and where the future is going? Is the development sustainable?
>
> By first integrating the different fields of knowledge and then finding the common denominators between them the big picture became clear. However, it was a long lasting analysis taking more than a year" (C0098 HT1B, about the early phase of a radical innovation).

In putting more emphasis on the combination of the approaches spatially and in running time, another informant mentioned:

> "I see the situation three dimensionally: observing it simultaneously from various different points of view, being at the same time aware of how they emerge in different phases of time." (C0091, about the development of business innovations)

Esteem of diversity and integration of the silos of knowledge. Previously in the literature reviews, the importance of the esteem of diversity as an enriching element of innovation had been portrayed by different scholars (Florida (2005), Johansson (2004)).

Based on the empirical data, diversity as a dimension of "the stages of innovation" was taken even further in the sense that *diversity and contradictions* were taken as imperatives, the pivotal sources of ideation. "Contradictions, irregularities, diversity are the grounds for innovation, they awaken up my interest" (623) expressed by an informant. Another dimension was found to be related to the *integration of the scientific knowledge* with the practical knowledge. "Integrating the silos of knowledge was present always, when the ideation encompassed the question on how to make innovation diffusion or making business out of the innovation". (A 0056 Ref 1)

Searching for the right problems and then finding a common denominator between them, appreciating their true essence and systemic linkages, and impugning the old innovation. It was said, "Rigorous analysis helps us to get to the heart of the problem when dealing with radical innovation" (A 0099, 672). Furthermore, one of the informants made it clear that, "from the helicopter perspective, the focal point, the common denominator was found from different fields" (B 0061 Ref. 1) Having a holistic view of a phenomenon and related problems and then impugning earlier innovations was referred as possibly the best way to discover an innovation. However, to understand what is the true nature of a problem and what are the systemic connections among the elements of a phenomenon were continuously highlighted.

The systemic approach to innovation encompassed furthermore the balance between the essence of both change and continuation. From the multinational organisation's management point of view, the role of continuation was stressed and the role of change was considered as a minor factor. It was said, "The equation among change and continuation should be something like 10/90." (A0048) Looking at the entire data, the continuation/change equation was however more complex. For many idea generation was based on counterpoints like the discontinuation zones, irregularities, even crisis and related emotions as well as all types of contrasts and the systemic linkages to their antithesis, like continuance, regularities, or balance.

Eureka or aha –innovations, their implication will be reviled through the telecommunication (SMS) innovation that is presented later in this section (5.2.4.1).

Execution stage of innovation

Different dimensions of the execution stage of innovation were discovered when comparing the incidences. These dimensions are as stipulated in the following paragraphs.

Communicating the idea and receiving the enriching feedback was found to be similar as the earlier described *idea market*. One of the innovators explained that, "the complex core can and must be expressed in a simple way when the innovation has matured. Otherwise it is not possible to receive help and advice from others." (A0099).

Another innovator stressed the importance of the metaphors to help to explain to the partners or to the companies the true essence of the innovation. It was "most difficult to explain the idea of a radical innovation which neither existed nor had any name". (604 and 608)

Execution involves entire organization. That was particularly apparent in a private welfare service company with continuous managerial innovations involving every staff member into the execution of innovation as well as to the continuous idea generation. The CEO of the company assured "here everyone shares what they have learned." (C0091). The daily operations, in the company, illustrated a great number of incremental innovations involving not only the staff but also the clients. Hence, the energy and eagerness of the company became pronounced.

Related to the **category of patenting,** the execution of innovation was categorized to four groups (four different dimensions of the category). They were as following.

The first dimension represents the execution of innovation when there was no need or use for patenting whereby in the opposite extreme, there was a strategy of “aggressive patenting” which was specifically underscored by one company manager.

Third dimension of patenting was related to the execution of innovation whose intellectual property rights were not protected due to the lack of know-how when the patenting should have been taken care of. Characteristically, as exemplified in one of the cases, the innovator regretted the missing patent by saying, “It was a bit annoying when I realised how giant the innovation and related economical consequences will be, and that was when I wanted just to forget all about it.(A0082B)”

Fourthly, various obstacles and disagreements related to patenting were commonly introduced.

What comes to the execution of innovation, **networking** was commonly applied in both organisational and individual levels. Interestingly, networking was however more often referred as a source of supplementary ideas rather than as a form of factual collaboration.

For example, one SME reported, “the planning phase of any joint EU funded project is the most valuable part. The value obtained through the cooperative idea generation is useful compared to the value obtained in the actual implementation of the project. Networked collaboration is too slow and too stiff compared to the agility of when operating on our own.” (WB1).

Various forms of international collaboration were found common among the high tech companies. Informants, who had personal experience from international companies or from life in various countries, had become the forerunners of off-shoring. (PC2, MI1, PC1, L, HT1, ME2,)

Involving financing, legal, and other types of **innovation services** were common during the execution and commercialization of the innovation, as will be discussed later together with the category of innovation ecosystem.

Failure of the innovation during the execution phase was found common and relatively easy topic to be discussed about. Potential breakthrough innovation in wrong environment (i.e., in wrong company, region, nation) were reported to turn "into water vapour," that had happened especially during the decline or when company was running out of resources or interests.

It also happened that, due to the too slow innovation process, the innovation had become outdated. On the other hand, as discussed earlier, innovation is systemic in nature and hence, for example, one of the pharmaceutical innovations is in danger of failure, since it has remained in isolation and because the systemic change, which would be pivotal for it, has been missing so far .

Value creation stage *follows the execution stage.*

Value creation stage embraced different dimensions as will be explicated in the next paragraphs.

The need to develop **innovation commercialisation** was highlighted especially in Finland. A previous member of the Parliament stated, "One of our biggest problems is that the innovations [scientific invention] are not commercialised. That is because people are not fully aware of those [protecting the IP rights and commercialisation] processes, and that the processes have not been documented. Another reason is the attitude. Too often people are satisfied with

what they have been doing so far and they don't create the "big things" they would have all the prerequisites and capabilities for." (A0056)

Timing related the market launch. Acting according to time when entering market was found to be an important aspect that effects the value creation. Nevertheless, there was found no one right pattern related to timing. insted when comparing the experiences related to the timing, three dimensions were found.

Firstly, it was commonly highlighted the importance of *precise timing*, the right technology turning to a product providing the biggest value to the end user at the right time and at the right moment.

The second dimension of a more *flexible and phased timing* is epitomised by the diffusion of the technological innovation of the SMS, which was at the beginning, "none-existing" and only later turned fast into a service innovation. The technological innovation was available for years, but remained hidden for the customer's notice. This dimension is contradicting the previous dimension in the sense that, in spite of the fact that an innovation appears to the market "too early" it can later generate a financial success or even an industrial innovation. The detailed discussion for this dimension will follow in the next section.

The third dimension concerns the *problem of being too perfect and hence too late at the market*. This was specifically highlighted in relations to entering the international markets. One of the Finnish informants clarified,

> "The Swedes have always been in international market, they know how to do it, they have courage and they have secured attitudes […] if the same business idea appears simultaneously in Sweden and in Finland, the Swedes are internationalizing it pretty quickly but the Finns do not even consider it, no matter if our innovation is better

> […]. This is our worst handicap. We are making things too perfect. It is typical that we are improving and improving, this and that. There is a saying that should be kept in minds, namely, 'the best is the enemy of the good.' If we make it too perfect, the time will pass by and the innovation will become too expensive. We have to have the courage to move ahead to the value creation even though the innovation is not yet quite ok." (A0087)

5.2.4.1 Innovations changing the telecommunication businesses

The story about how the innovations like short messages service (SMS), group special mobiles (GSM) and the development of mobile phone technology and services have laid ground for new telecommunication business illustrate the complexity and systemic nature of innovation. Furthermore, the way how the innovation has travelled throughout the innovation funnel illustrates the long duration of the process and the richness of the phases of innovating.

An informant explained how in Finland in 1970s three engineers of the national Postal and Telegraph Services worked around the analogical NMT technology (Nordic Mobile phone Technology), and then started to develop the digital equivalent called Group Special Mobiles (GSM). In 1980, they had been discussing about

> "[…] the future digital technology and its capabilities to handle not only speech but also data. [..data services..] That was how the idea of integrated services started to emerge, and was later included to the GSM.
>
> We were wondering what kind of services and capabilities should be embedded into the future phone. […] We had one specific problem in our minds. It was related to beepers, which were clumsy to use, due to the fact that you first had to call to the switchboard where they then wrote your message down and then send it forward to [the recipient's] pocket gadget.

> Therefore, the small group of us, we all were Finns, and all of us were civil servants working for Post and Telegraphic Services, started to go around this problem. We thought that if it is our challenge to define the future phone systems' qualifications, of course, we will define such qualifications, which will make it possible to use the push buttons, which most probably will exist on the phone for sending text. It was not more astonishing than that, to invent the text message. Moreover, 30 seconds later, came the additional idea, which of course was that if the gadget can send text it of course has to be able to receive and show the text as well. Therefore, it was at that time when the idea of the future pocket phone, also sending and receiving text had appeared."

Hence, it can be said that the selection of the final idea for the innovation of the text message appeared only after a long phase of thinking and product development, however, the actual insight was just a short moment of insight (previously called Eureka or aha innovation).

The incident of the SMS is parallel with Scharmer's idea of learning from the emerging future. As it was described, the engineers had had the capability of "seeing" the problems related to the beepers, as well as seeing the opportunities embedded in digital technology. Furthermore, they had the capability of "sensing" and imagining the future digital gadgets with the push buttons. That was how they "became aware" of the future ideology of the integrated services related to GSM.

The informant furthermore continued the story by explaining how the execution of the SMS took place,

> "[…] following the original idea the actual technical work on which this innovation relies took place in an international working group. […] All the members actively participated by writing specifications and the work took

> place both at office and at home. People brought the specifications to our meetings and introduced them as possible elements of the output.
> […] and finally in the beginning of 1990s, the capability to send SMS was embedded in the GSM systems taken in to use."

The innovator highlighted the importance of the open knowledge co-creation and the knowledge transfer among all those involved to the international collaboration. Based on the story, the innovation process of the SMS can be compared to the method, which now is called "open innovation" (Hargadon (2003)).

It took another five years before the idea and the SMS related technology concerning the integrated services become to its next stage. That was when an additional product innovation made it possible for the previous innovations to be converted into the actual business innovation, which furthermore has turned to a radical industrial innovation, nowadays utilised by telecommunication companies and their customers worldwide.

In this study this long process has been classified as a radical innovation for telecommunication industry, due to the effect of the innovation that has changed the way people communicate, and hence also the business logic of the post and telecommunication sector. Moreover, the process indicates how one type of innovation transformed to another type innovation, in the same way as argued while discussing "innovation as a chameleon".

The last episode of the SMS story tells how,

> "[…] this special capability [of sending and receiving text] remained hidden in the system until the year 1995, when Nokia's GSM mobile phone model 2110 made it very easy to send SMS. […] by that time, people had already got used to receive a type of SMS, the alert message confirming the incoming voice mail, since the phone had had the capability to receive the SMS already for sometimes.

> […] I had carried responsibilities for operating the GSM service in Finland, and hence, in the company we were aware of the embedded capability of sending SMS, however, it was not we but the young people and experimentation enthusiasts who first got the insight that this [the new phone] can be used, for example, for sending Christmas Greetings. Sending SMS in order to greet people became popular in Christmastime 1995 and 1996; and by Christmas 1997 it was already in. All this happened first in Finland, the other countries followed with a delay. One can say that the innovation is an ordinary gadget based on engineering insight, but it is the people themselves who decided what was handy and how the gadget actually was to be used. Often this type of engineering insights remains as the toys for the freaks, and they never turn to an as big phenomenon as the text message. […]" (A0082C)

The story of the development and diffusion of SMS epitomizes how the innovation started to create value when the lead users and opinion leaders (as Rogers (2003) call them) adapted the technology and then realised the new use for it. It can therefore be assumed that, the business innovation related to the telecommunication had not been possible without the creative users who accelerated the diffusion of the innovation. As explained earlier (Chapter 2.3.), the innovation ecosystem in Finland, had been favourable both for technological and business innovation and the market consisting of technology and innovation minded persons played a crucial role.

To sum up, Innovation does not appear in vacuum. The story about SMS has based in a long historical development and the actual innovation funnel had lasted for as long as 15 years. Moreover, the three engineers with their professional know-how and their open-mindedness made the innovation possible. Today, the development of the innovation still continues, at the hands of the original creator, in a more intellectual form of SMS (the so called iSMS, a two way interactive version of the traditional SMS).

5.2.5 Innovation deteriorating- and reinforcing factors originating to innovation

This section encompasses an additional review of innovation and the earlier discussed innovation categories and their propositions and dimensions. In this section the grounded theory analysis of data has been based on questions like "what kind of innovation setbacks and boosts are based on the nature of innovation/domain/industry?" or "what kind of innovation related matters deteriorate and facilitate innovation?"

In the analysis, there were found both positive and negative tensions as well as paradoxes related to the innovations, many of them emerged from the essence of innovation itself. Hence, the category of "Innovation deteriorating- and reinforcing factors originating innovation" comprises both setbacks and boosts related to and originating from the innovation in concern. When comparing the innovation incidences, different dimensions were found related to the reinforcing and deteriorating capacity embedded in the innovation. They were as following,

- innovation reinforce affected by the *nature of industry*,
- innovation reinforce and deteriorate associated with *the type of innovation*,
- innovation reinforce affected by the *quality or maturity* of innovation
- innovation reinforce affected by *patenting/not patenting*,
- innovation reinforce affected by the time used for the innovation, timing of the innovation and the discontinuation of the era,
- innovation reinforce affected by the *chameleon-like nature* of innovation,
- innovation reinforce affected by the *phase of innovation* and
- *knowledge and know-how* related innovation reinforce and deterioration.

These dimensions illustrate the success/failure and reinforce/deterioration continuums and related examples will be discussed in following paragraphs. They have furthermore been cross-tabulated (table 30), through the examples that

had risen from the data. The paradoxical nature of innovation appears evidently in the table, since one element of innovation can emerge both as a deteriorating- and reinforcing factors.

Table 30 Dimensions illustrating the success/failure and reinforce/deterioration continuums originated in innovation

	Deteriorate originating in innovation	Reinforce originating in innovation
Nature of industry	- Institutionalisation of industry - societal principles which are not questioned anymore	- Technological development generated the failure of traditional telephone services and created a new type of telecommunication industry
Patents	- Patents preventing innovation. - Patent failure as a hindrance for economic benefits.	- Aggressive innovation - Patent failure as a reinforcing factor - Patent databases boost innovation.
Quality/ Maturity of innovation	- Failures generate innovation. - The best is the worst enemy of good.	- High quality together with successful market penetration
Timing/time /discontinuation of the era	- Banking and financial sector remained as a prisoner of the era's restrictions and regulations. - Market entry neither too late nor too early.	- Agile development of successful banking and financial innovations. - Slow, time consuming innovation vs. eureka moment of innovation.
Type of innovation	- Dilemma of creativity vs. efficiency	- Economical and regional success due to market fit. - Social wellbeing due to compatibility among innovation and the current state of the society.
Chameleon like nature of innovation	- Criticizing linear innovation vs. improving non-linear innovation with linear methods - Utilization of chaos and bifurcation - Partial technological innovation deteriorating the systemic innovation - The changing premises of innovation cannibalise the benefits: Innovation deteriorates conditions for creative work environment	- Radical innovation encompasses the holistic view and simple insights[1] - Old innovation applied to new field generates radical development of the field. - Applying established technological to mining industry generated new innovations, production and businesses. - Use of operative innovation and meta-innovation when developing and selecting the right innovation

[1] "When the complex core of innovation becomes crystallized, it can be expressed in a simple way. Thus the complexity turns to simple enough and makes the innovations diffusion easier."

Phase of innovation	- One phase cannibalises another phase of innovation	- Controversial phases facilitate ideation and increased commitment to the diffusion of innovation. - Incremental notion of time associated with the acquisition of knowledge needed for radical innovation.
Interaction of - knowledge - know-how -from past to future - horizontal and vertical	- Professional secrecy, patents, expensive public knowledge disconnected the knowledge flow from innovations. - Off-shoring separate production from development. - Due to increased technology and complexity, more specialized knowledge is needed. - In the e-service based models new skills are needed, and the mentality has to change. - Lack of integration of the business context.	- Breath of perspective - Connecting week and strong signals, theoretical and practical knowledge and know-how. - Balance between technology push and the interface for the client's needs - Utilizing the window of market opportunity - Service by nature needs the involvement of user knowledge

The nature of industry deteriorating or reinforcing innovation

Because the analysed data was in many cases based on the informants' long scale experience and follow-up on the innovation and related industry, which in some cases was more than five decades, it is evident that both industrial setbacks and the successful development had emerged during such a long time scale.

For example the previously explained radio technology, moving successfully from the shipping to mobile phones, has been considered an example of the paradoxical aspect of development of the industry, illustrating how, the flourish of one scope of the field means the death of another. Transforming the radio

technology from the oceans to the shore turned to a successful business; however, at the same it generated the failure in the traditional telephone service businesses.

It was furthermore found, that industrial innovation often suffers from the institutionalisation of the domain and the lost capacity to question the logics and principles of the industry. This prevents the potential radical innovation from emerging, and from giving its contribution to the overall development of the field. The story of the pharmaceutical innovation epitomises the institutionalised pharmaceutical and chemical industry, in this case, the company behind the innovation did not yet have sufficient critical mass to become the radical innovation changing the domain. It was said: “The country and the market is too small for radical innovation when there is an entire empire of chemical and pharmaceutical industry and unions against the innovation, only a real crisis could change this situation.” (D0057B)

Related to the institutionalisation the field of industry a very common problem in the data showed how some the societal principles had proved to be so superior and had turned out so strong that they were not longer questioned. For example, the equal rights and solidarity, which are at the heart of the Nordic welfare society, turned to a political obstacle when it was put forward to open a school where only foreign languages were used. That was at first considered as a threat for solidarity and social cohesion; hence, there was not an equal opportunity for everyone to utilize the service. (C0090, 6)

The maturity of innovation affecting on the success of innovation

The maturity of innovations varied from failure to successful market penetration. Paradoxically, both the failures and maturity of innovation were found to be compatible for both economical success and setbacks.

On one hand, it was explained how “innovation failures were important sources for better innovation” (A0012), whereas, on the other hand, as one informant pointed out, “the best is the worst enemy of good when entering market” (A0087). It was also reported that, too high quality demands had prevented both the market entry and scientific breakthrough when the window of opportunity was open. The story of the SMS, which had the successful market penetration only when the environment had turned mature for the innovation in 1995-1996, has been seen as an example of the combination of good quality and success. The inventor was later awarded by The Economist magazine.

Patenting vs. not patenting and the successfulness of innovation

The data illustrated how, in our modern era, patenting has proved to be a controversial issue. It was found how both having patents and not having patent was considered as a reason for both setback and success depending on from whose point of view the situation was perceived.

In one extreme, some companies had generated economical success with *aggressive patenting* (PC2m HT1, MI1). Contrary to that, it was reported how, the *patent failures* had likewise enhanced businesses (C1, HT3) or facilitated development and diffusion of the invention (C1). Furthermore, inventors stressed that the public patent databases were useful source of raw materials for new innovations.

Time, timing and discontinuation of the era related to innovation

In the reported banking sector’s innovations, it was found that, during the discontinuation of the financing and banking industry when the restrictions and regulations had changed radically, the banks, which had been left over as prisoners of the era had deteriorated, while the other banks, which possessed agile development, succeeded to deal with the challenges related to the discontinuation. (BS1)

With regard to the aspects related of time used for the innovation and timing of the innovation, it was found that most of the innovations had been time-consuming, due to having been generated in months up to decades. For example, as it was explained by a CEO of a welfare company: "[…] the service innovation was developed slowly, in a very long process; hence, for us, there was no one moment when it was invented." (C0091)

Divergently, during the eureka-moment, the actual idea of the SMS had appeared suddenly. Irrespectively of the eureka-nature of the early phase of the innovation, the actual exploitation and diffusion lasted for some 15 years.

Similarly, the penetration of the reverse mortgage innovation was time consuming. (BS1, 308) Furthermore, an informant of an international corporation stressed the importance of timing, "if the radical innovation enters the market too early, it will destroy entire field of businesses, but if it is too late, the innovation will be lost." (C0098)

Success and setbacks associated by the type of innovation

In most of the reported cases, the economical success was stressed to have been due to the market fit. Corporations' and regions' success based on market fit was associated with a group of technological innovations namely, various electrical devices and machinery related to telecommunication, lifting and moving, forest and mining (like mobile phone, SMS, safety gadgets to electrical equipment, machinery used in forest and mining haulage).

Furthermore, the discussed pedagogical innovation, which was based on the integration of learning, research, and industrial problem solving, was associated with the quality of the higher education as well as on its impact on regional development.

Likewise, it was found how, the social innovation of providing basic education in a foreign language, had been compatible with the current economical state of the society and had furthermore generated social wellbeing for the citizens of the municipality. The educational innovation was based on a powerful vision combining the hands on activities, arts and science throughout the integration of kids, parents, teachers, and professionals from various fields. (DM, 7)

At the opposite end of the deteriorating vs. reinforcing conundrum, three types of setbacks were grounded on the dilemma of creativity vs. efficiency. Innovations were reported have failed or suffered of sever setbacks when:

- the solution related to the innovation was too original or radical for the needs and understanding of the organisation, or because of fear of destroying the business. “They are simply too busy in getting rich and optimizing their operations that they would pay attention to innovating new technologies and products,” said an informant from a lager multinational corporation (C0098B)
- the additional systemic innovations did not emerge as expected (pharmaceutical innovation, safety device, eco-innovation), and
- the welfare and immaterial innovation had been treated with the rules and principles of technology innovations.

Success and setbacks related to the chameleon nature of innovation

As illustrated previously in the category of “innovation as chameleon”, innovation has a changing and paradoxical nature, which will furthermore manifest as a managerial challenge and affect the successfulness of the innovation.

It was found, how a mature and successful innovation was converted into further innovation when taken to a new environment. For example, an emeritus CEO explained how new flourishing innovation and business was created, by transforming the advanced machinery innovation from the forest industry to the mining industry. (MI1). Additionally, the well-known case of bringing radio

technology from the sea to the mobile phones, taking place in the 1960s and turning to a success, illustrates how the success can follow throughout the transformation of innovation due its chameleon nature.

As discussed earlier, incremental innovation was reported to have the capacity to generate radical business innovation. It was said that, the radical innovation is often a simple insight, which emerges from the holistic perspective to a matter. One of the informants put it forward, “often radical innovation is based on a screamingly simple insight, […] why didn’t I make it up earlier! [all that was needed was a] holistic view encompassing the future and then simplifying it.” (A0099, 22)

Success of innovation was often related to the systemic nature of innovation. For example, apart from aggressive innovation and patenting strategies, the earlier introduced CEO of a pharmaceutical corporation highlighted the use of operative innovation and meta-innovation when developing and selecting the accurate innovations and means of entering the international markets. In congruence with the proposition of the “all inclusive nature of innovation”, another CEO of a healthcare company declared the importance of innovativeness in all operations.

In this relatively small sample of innovations, which was possible to analyse in this study, there appeared an astonishingly large number of controversial dimensions inhibiting and boosting innovation. For some, the success in incremental innovation turned to a failure in radical innovation, and for the others the incremental innovations made radical innovation possible. Explicitly, in one view it was stressed that, a success related to the traditional commercialized technical invention, “the so called non-linear incremental innovations”, had prevented the multinational company from examining the long-term opportunities for future technologies, whereas in the other view, it was emphasized that,

> “ […] improving non-linear innovation [radical innovation] with the linear methods [linear innovation or incremental innovation] should take place.

> Processes are linear and production is based on an established pattern or pipeline that guarantees the quality of production. Next to the traditional pipeline we need also people who question the processes now and then. In an established non-linear innovation process or pipeline, higher level of risk is permitted and the radical thoughts will be followed through. With the non-linear innovation pipeline, we can develop the innovation metrics and innovation as part of the organisation and trajectories." (A0048, 41, 58)

In order to explain how the non-linear innovation is generated, the informant continued by emphasizing the potential embedded in a purposefully created confusion. The informant said: "A transformation in the top-level of multinational organisation creates healthy flurry of activity into the lower levels of the organisation. For some time, there will be tension, while the organisation aspires for the new system. First, people rely on the traditional linear methods which they know best, but subsequently the organisation realizes that the nonlinear models fit better to the changing circumstances and people start to act accordingly." *This incidence stands as a handbook example that supports the earlier introduced theory, of how the power of chaos and the existence of free choice in the bifurcation points are utilised in practice in a multinational corporation.*

Furthermore, it was found how an economically successful but only a partial technological innovation had a negative general effect on the development of the complete system. For example, the use of an eco-innovation can be ecological, but its production and demolish can lead to a bigger carbon footprint[2] than a less ecological product. The informant explained how, "during its entire life span, the hybrid cars destroy more nature than a traditional car." Thereby the partial innovation can be against the systemic innovation or holistic development of a system.

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[2] A carbon footprint is a measure of the impact human activities have on the environment in terms of the amount of greenhouse gases produced, measured in units of carbon dioxide.

Likewise, if in spite of a change in the innovation premises, the innovation process continues as earlier, the process can cannibalise all the aimed benefits of the innovation. This was illustrated by the process of the wholesale switch to Digital Over-the-Air broadcasting in Finland, or as the informant said, "the premises of the early adoption of the digital television signal technology changed considerably, when the benefits for the Finnish industry had decreased and at the same time the problems for the consumers were considered extensive. That was when many people and organisations claimed for a new political decision to postpone the wholesale switch to Digital Over-the-Air (terrestrial) broadcasting. That decision had been a real radical innovation, which had degreased the disadvantages and stopped the destruction of the systemic innovation. As we now know, there was not courage for that decision." (A0084).

It was furthermore highlighted how; an unexpected side effect of an innovation can deteriorate conditions for the creative working conditions. The informant stated:

> "It was my mistake when I thought that accountancy could be automated without problems. During my technology euphoria, I didn't realise that, the technology will be useless, if the people do not meet face to face. […] consider for example taxation, clients [SMEs] should meet at least once per year the taxation authorities [in order to learn from each other]. Due to my invention, that does not necessarily happen, and the lack of mutual learning and understanding courses problems for both parties." (B0099)

Phases of innovation deteriorating and reinforcing innovation

The data illustrated diversity and many contradictory principles and rules of how innovation's various phases generated both positive and negative tension. One of the innovation phases could both destroy and boost the other innovation phases. E.g., an informant from a multinational corporation expressed how treating the

early phase of radical innovation with the rules of the execution phase of incremental innovation had deteriorated the innovation,

> "[…] expecting killer applications while still in the ideation phase or in the middle of problem solving can destroy the radical innovation. When dealing with a radical innovation time perceived by the innovator is incremental since time takes you gradually all the way to the future that will encompass the various fields of knowledge needed for the radical innovation. During the incremental knowledge acquiring process, you build up your scenario of the future." (A0099)

Knowledge and know-how related innovation boost and hinder

Poor access to knowledge and knowhow was considered as a major innovation-deteriorating factor. E.g., professional secrecy, patents, the high costs of public knowledge bases (like statistics) prevented the free flow of knowledge needed in all of innovation phases. A CEO of a successful technology company, based on his experiences on the purchasing activity of the municipalities, stated that "ignorance is our worst opponent in the diffusion of innovation" (402). Another respondent added that, "the problem, how to integrate the international user-knowledge to different phases of the innovation funnel, could be solved with an advanced e-media." (D00115).

Interestingly, in spite of the reported efficiency, off-shoring was furthermore perceived as a problem from the point of view of knowledge transfer, which is pivotal for the understanding and development of further innovations.

> "Problems occur on account of the off-shoring which separate the production know-how from the business knowledge. [Due to off-shores] the understanding of the value chain will not be developed among the staff, which will furthermore deteriorate creativity and innovation processes. If the production is in Asia, the linear visionary [in the r&d division at the corporation's home country] will, during the early phase of innovation, fail to see what is needed at the end of the pipeline." (60)

A sufficient critical mass of people was referred as pivotal for needed specialized knowledge. Thus, even a unit like a municipality providing services for 30 000 - 50 000 inhabitants, was said to be too small to produce the special knowledge needed for more advanced innovation. This was evident from an example given by a technology specialist, who stated, “whereas technology and complexity has increased, we would need more specialized knowledge and staff, the city became simply too small for innovations.” (D0095)

Likewise, modern service innovations are in need of multi-professional knowledge and agile strategies, as a one of the service field specialists clarified it. “New e-service based models are gaining momentum fast [...]. In our uncertain terrain, new skills are needed, and our mentality has to change – we have to be more agile, and integrate different domains with a more systemic view.” (D00115)

“Lack of interconnectedness” manifested itself as a failure to integrate the innovation to the existing business logics and other contextual elements, or as an informant from a multinational corporation said: “A lot of innovative ideas are abandoned in our innovation selection phase, due to their lack of interconnectedness with the business context.” (A0048C)

Based on the analysis of knowledge related innovation booster it was concluded that, whatever elements will make the environment and circumstance more rich in the different forms of knowledge, the better the innovation will thrive. This statement has as well been illustrated by the respondents as follows; “breath of perceptive is pivotal,” (A0082) “in our corporation, from vision to the market, we connect the week and strong signals, theoretical and practical knowledge and know-how,” (A0048) or “for me, going to the future, to the knowledge, which doesn’t yet exist is a prerequisite” (A0090).

Elements related to the *integration of user-, customer- or market knowledge* to the innovation process was furthermore found relevant for organisations, regions, and countries - this is to say, for the systems' different levels. The following citations epitomise the previous statement: "In the ongoing service innovation revolution, services by nature need the involvement of user-knowledge" (D00115). Furthermore, "the balance between technology push and our interface to the client's needs is our strength," stated a specialist from an innovation hub (IES4). Whereas an investor pointed out that, "Finland is a small country; we have to be among the first ones when the window of the market opportunity is open. However, we should realise that, it is open only for two to three years, not longer, and that is due to the fast transformation of knowledge. Chinese and Indians utilise the worldwide knowledge and that forces us to generate new value faster than they do. For us, the only way to create added value is to integrate the professionals from horizontal technology and vertical sector knowledge. These task-oriented teams are based on data fusion and swarming. Firstly, a fast transformation of knowledge and then swarming around that knowledge, generate the fast innovations. This way I say, innovation happens in hours or in days." (63). Furthermore, merging ideas was proved to be successful, "my idea became an innovation when it was integrated to her idea, the monkey jumped from my shoulder to her shoulder." (A0098)

5.2.6 The summarising discussion on innovation manifestation

The summarising discussion on innovation manifestation has been written in relation to the challenges related to the richness and paradoxical nature of innovation and creativity in the world of many controversial realities.

Whilst examining the essence of the found innovations from the various different perspectives, previous chapters (5.2.1. to 5.2.5) have portrayed the richness and paradoxical nature of different type of innovation. In addition, the literature review (chapter 2.1.) discussed the conceptual development and perceptions

relating to innovation. What has been then learned so far? From the point of view of management, it is important to grasp how the essence of innovation evolves and to realise the differences that occur among innovations. Correspondingly, this section will present a summary as to how the notion of innovation has been perceived by the respondents in comparison to the propositions presented in chapter 2.1.

As emphasised in the literature review, the complexity of the innovation environment increases with an accelerating speed, this is no less than partially due to the innovation itself. The data was collected in the most competitive countries and regions, which are coping with the turbulent economical environment. The informants had obtained their experiences in leading multinationals and public organisations, or in fast growing small and medium sized enterprises (SME), hence it is concluded that this study, the corresponding data and results are about *innovation in a competitive environment of increasing complexity and fast changing circumstances*.

Propositions concerning innovation (chapter 2.1.5) claimed that *systems (organisations, regions, individuals etc.) face the complexity throughout differentiation and complementary interaction*. As a starting point of the conclusions, the found categories the empirical data fully support this proposition.

The differentiation of the systems was manifested throughout the variety of specialized innovations, products, business strategies, as well as the national and regional strategies found in the data. That discovery is outstandingly clear, if approaching at the wider innovation ecosystem level (like regions and nations) from the point of view of those responsible for their management. Furthermore, those systems (some of the corporations, innovation hubs, municipalities) which were not yet particularly differentiated were urged to enhance more specialization throughout innovations.

Complementary interaction, as well as the integration and interconnectedness of innovation were strongly pronounced, along with the experiences of the informants, which covered various elements, from complementary interaction between different type and nature of knowledge and innovation, to various phases of time and innovation.

In support of previous research works, knowledge and time were found to be experienced as most important resources for innovation. Contrary to the literature, lack of funding did not appear as most crucial element for innovation. Due to this contradiction, it has nevertheless, to be reminded that, on account of the used research method, it impossible to firmly compare or judge the extent of the importance of the various resources, since in an open qualitative interview the informants normally express those issues which are mostly appealing in their minds. For this reason, the funding problems may have been relevant for them, but other issues appeared as more important to be expressed during the interviews. Furthermore, another reason may be that the data was collected from the world's leading regions, and from informants, most of whom had already experienced many economical successes. Consequently, the issue of funding was no longer as relevant as it might have been for those of the previous research.

The other conclusions concerning the results of the empirical data and the propositions based on the literature review are as following:

1. In the data of this study, apart from technology, product and process innovations the results also concerned managerial, business, social-, meta-, and operational innovations as well as innovations for industry and innovation ecosystem.

2. The data confirmed the first and the second proposition of chapter 2.1 that stated on the "all-inclusive" conception of innovation and creativity, as well as the paradoxical and controversial nature of innovation respectively. The

paradoxical nature had been verified by the data, whereby it was found that a parameter could appear as a constraint or facilitator of innovation, depending on the type, time, context and phase of innovation as suggested in chapter 2.1.

3. Additionally, the data supported the propositions that “innovation is all over.” Taken into an extreme, innovation is not only about inventing, patenting, and innovating new products; instead, it is about creativity and innovativeness that has to be applied in all of the organisational operations, from A to Z.

4. As suggested in the propositions in chapter 2.1, the all-inclusive way of using the word innovation, incorporates a risk of misconceptions. Even for this research, it at first led to a communication dilemma when dealing with the empirical data, since the different informants utilized the word “innovation” for so many different subjects. That is to say, they considered the notion of innovation and its connotations in a rich and multi-perspective way, and consequently put this inductive study into a position, where the concept of innovation has been discussed with versatility. This, most probably, illustrates the situation faced by anyone who in the modern society deals with the innovation phenomenon.

On account for the result, illustrating the “all-inclusive” and “chameleon like nature of innovation” and the “innovation, which is all over”, this study recommend *innovation specificity* for innovators, mangers and most of all for the researchers. That is to say, particular consideration in management and in research, namely, innovation type specific expressions may hinder misinterpretation.

5. Innovation definitions are based on different innovation features and aspects, like novelty and usefulness. Consequently, and with additional specificity, the propositions stated that *different ways of applying and using old methods in new contexts can serve as source of new idea and innovation*. This aspect was

proved by the informants' authentications, which illustrated how an old incremental innovation may turn to be a new radical innovation.

6. In the propositions, two types of approaches towards radicalness of innovation were pointed out namely, firstly, the level of extension between the status quo and the change and secondly, the Hamelian idea of the innovation's power to change customer expectations, alter industry economies and redefine the basis for the competitive advantage. With some modifications, the later was applied to discuss the found innovations. The empirical data revealed additional two elements, namely the potential competitive advantage embedded in an innovation, and an intensity of the change resistance towards the innovation.

The first part of the third proposition, which stressed on the importance of the differences in operation logics of radical and incremental innovations, was supported by the data. Whereas, the second part of the proposition stating that, "when dealing with the challenges related to the complex and fast changing or revolutionary environment, the radicalness and broadness of innovation increase" could not be assessed since, the used research method did not provides metrics for the evaluation of the complexity of the innovation environment.

During a discontinuation phase (like the Finnish deregulation of banking and financial sector or the economical regression in 1990s) confusion, tension, and temporary chaos appeared. Likewise, a healthy flurry of activity, or the "healthy tension" was found in the moment when the linear method was replaced with the nonlinear, which is to say, when the system is far from equilibrium, and is reinventing itself. During that phase, the iteration of contradictory signals, knowledge, and processes takes place, and makes the free choices possible in the so-called bifurcation point. Correspondingly, a multinational corporation used the power of temporary chaos by restructuring organisation regularly, and hence, created conditions similar to the bifurcation zone, which resulted to the commitment of the entire organisation.

The *interaction between the individual, domain, and field*, as Csikszentmihalyi (1997) has declared, was found from the data. However, the data indicated an additional nuance, whereby it was experienced how the gatekeepers of the field (scientific gatekeepers and other professionals) had taken the position of laggards and opposed the radical innovation when it already was approved by the market. It was only afterwards when the field approved the innovation to be included into the domain. It was inherently found concerning innovation and funding that, innovations that have changed things are not necessarily among the best funded. This indicates that, interesting innovations also take place outside the formal domain and field.

The findings moreover were parallel with the earlier studies' emphasis on the *innovation funnel and the fuzzy front end of the innovation*. Particularly speaking, the emphasis on the need to consider the hidden and future knowledge was made obvious during the fuzzy front end. In coordination to the innovation funnel aspects, the need of thousands of ideas particularly in the ideation phase but also during the exploitation and value creation phases was emphasized to take place. In addition, it was found how the systemic nature of innovation worked. Namely, it was found that an innovation failed when the complementary innovations were missing or occurred too late**.** Integration of ideas and professional interrelatedness were inherently found as pivotal for the holistic and multitude approach needed for the breakthrough of the ideation of innovations of the empirical data.

With regard to the fourth proposition of the chapter 2.1, articulating: "incremental innovations can be based on existing explicit knowledge and traditional learning. Radical innovation corresponds to new and tacit knowledge and deep learning related to the emerging future" got a strong - however only partial support from the empirical data. Interestingly, the data had revealed the fact that, both tacit and explicit knowledge were utilized in both incremental and radical innovations. Informants referred to the use of enormous

knowledge bases, generated during entire life spans and based on the formal sources of knowledge but also on the exploration of the day-to-day circumstances, or the emerging future and the hidden knowledge and emotions. The hidden knowledge, which is referred as the invisible part of the system, was hence found to be important.

To sum up, there are many stages in the lifecycles of all systems from the most macro to the micro level. Those phases encompass success and decline. Due to that variation, the need to shift the management logic from either-or to the both-and –approach was evidently discovered as fundamental for the full use of the variety of innovation. Therefore, the acknowledgement of both growth and chaos were taken as natural parts of any system aiming at innovation. With regard to the empirical data, it was apparent that the phase of discontinuation had drawn the attention of many informants and was regarded as an elementary aspect of innovation. The essence of change and innovation was considered to be found specifically with the help of the discontinuation of an era, paradigm, market, innovation, or knowledge and flow of ideas.

Based on the evidence, emerging from the empirical data, it is suggested that, *'a prior' to the discontinuation phase, there resides, a moment or phase when controversial truths are accurate at the same time, the truths related to the old paradigm as well as those concerning the new emerging one*. The *contradictory nature of that phase indicates that, the system is far-from-equilibrium, which means that a temporary chaos is manifested*. As it will be discussed in the next section, *the chaos facilitates the pivotal awareness, insights, emotions and decisions related to the innovation*. In previous literature, that moment, which is 'a prior' the pivotal change, has been called bifurcation point. The following *indication of the existence of the innovation related bifurcation points* were found from the empirical data:

- The comprehensive *discontinuation of industrial era* (like ecological industrial revolution) and the *field of business ventures* (as was the case

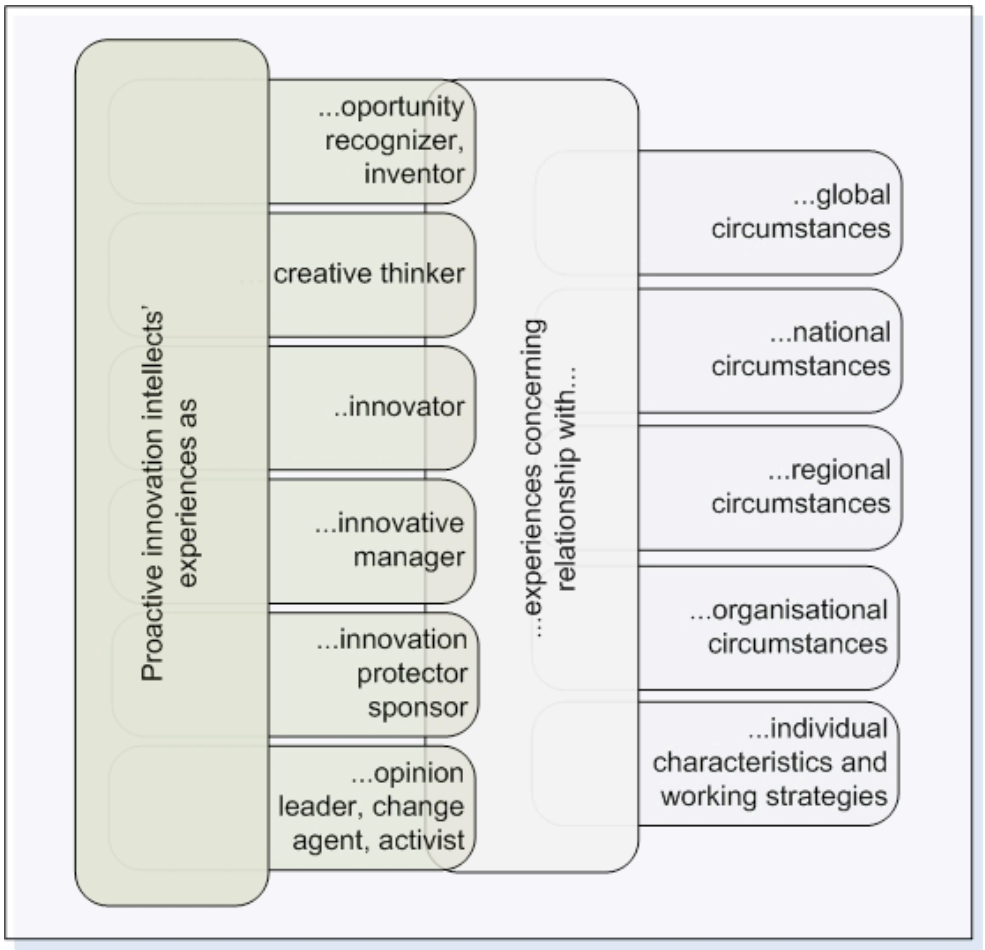
concerning the banking, telecommunication, and pharmaceutical fields), as well as minor discontinuations arising from the contradictories and tensions inside a system (like the generation of innovative pedagogical solutions inside the field of education),

- *The breakthroughs in ideation* (like the eureka -moment of the insights related to SMS),
- The breakthrough of *idea or innovation approval in the organisation* where the innovation has been generated (like any idea selection and commitment to the execution of innovation), and
- The breakthrough of *market approval of commercial innovation* or *approval of a social innovation* (e.g. the market adoption of the SMS during the Christmas in 1996; gift economy; the outsourcing of accountancy to the scientific business domain; approval of the human experience embedded theory of crises to the nursing science.)

5.3 The main category of "the proactive innovation intellects"

The main category of "proactive innovation intellects" is based on the questions like, what is the nature of the creative people and their working methods, and what are the different human based factors that may lead to reinforcing or deteriorating the innovation.

Altogether, the data cover many different innovation related roles. Innovative working methods and creativity are altogether the common denominators of the data, notwithstanding the fact that the roles varied from creative thinker, inventor and innovator to the roles of innovation manager, protector, opinion leader and activist (see table 8). Apart from illustrating the experiences from various functions, the data covered experiences gained from various levels of the innovation ecosystem (figure 49).



If compared to Saatcioglu's (2002) (table 6) earlier research, it can be said that the informant's strategies for idea management was more similar to that of the imaginative managers than the adaptive mangers. That is to say, the informants were found to be imaginative intellects of innovation, but more than that, they are proactive and entrepreneurial. Hence, the category has been named according to the qualities of the informants "*proactive innovation intellects"*.The category comprises furthermore four subcategories as presented in table 31.

Table 31 The main category of "the proactive innovation intellects" and its subcategories

Main category	Subcategories
Proactive innovation intellects	Innovation intellects' pre-career phase Personality characteristics, values and attitudes Working and life strategies and methods Deteriorating factors originating in innovator's own creativity and way of working

In the following section, the subcategories will be discussed independently and evident connections between the categories and their dimensions will be discussed together with the category or dimension in concern.

Discoveries concerning the characteristics and working strategies were, for the most part, consistent with the results introduced in the literature review. That has then been considered as an indication of the informants belonging to the universal cluster of creative individuals, the *creative class* as Richard Florida (2002) calls it.

Nevertheless, precise comparison with previous results is not the aim of the Grounded Theory. In the previous chapters the rich and multifaceted essence of innovation was discusses, and it should be kept in minds when comparing results of different research, since precise comparison may be not reliable, and it is consequently not the aim of this study. Due to the fact that, there exists no precise way to measure innovativeness, the few comparisons with the previous results will be discussed only in a very general level; similarities and differences between various studies has be used as sources for further questions and understanding concerning the empirical data.

5.3.1 Pre-career phase

"The innovator's pre-career phase" illustrates those *pre-career* factors, which have been perceived as important by the informants. They cover aspects of informants' own *childhood and adolescence* and advices for the potential youth, explicitly, for those who could become the future pioneers of innovation in their own field of knowledge or industry.

Personal growth

It was found that personal growth as a human being was highlighted as a most important factor of an innovator throughout the entire lifespan. Regardless the age, continuous personal development and transformation during ones whole lifecycle were reported. Constant learning was discovered obvious, all the way to the age of 70. However, more emphasis was kept on the importance of childhood, youth and early adolescence concerning the personal growth and the process of acquiring the needed personal characteristics and aptitude pivotal for the visionary work.

Informants had experienced the following personal dimensions as important in the early adolescence. To describe their own personal growth they often used

expressions like, *development of self-knowledge, becoming to whom one is to be, good self-esteem, and trusting one's own passion and strengths.* Informants furthermore provided this elements as an guideline of advice for potential young innovators to foster the basis of personal growth necessary for creativity, innovativeness, and entrepreneurial characteristics which are pivotal particularly in turbulent and controversial realities of our era. Moreover, it was found that in youth the focus should be in one's own strengths not in getting rid of the weaknesses. All informants highlighted the significance of *trusting and developing ones personal strengths* in order to become the leading light in the society.

Furthermore, acquiring a *wide and holistic scope of the professional field* and learning to know how to avoid the professional's group thinking and narrow-mindedness were considered important. That is why experimenting different works and working environments in ones early carrier was recommended. For the same reason, the informants emphasized going abroad for work or for studies. This was explained important because, "if forced to learn the diverging logics of other systems and countries, it brings the capacity for diverse perspectives into ones thinking and analyses. Foreign activity and experience from abroad develops the capabilities necessary for the leading lights – those who will show the path to the future." (A0090)

Then again, due to "*the need of deep professional tacit knowledge, and networks of the field*" (C00100B), which are both time consuming to acquire, an early decision should be taken regarding to in which profession one want to work. Some of the informants had particularly stressed the importance of the correctness of the early choices, since, they can later limit ones further opportunities to a great extent.

These experiences correspond with the earlier discussed theory (Csikszentmihalyi (1997)) about the creativity with capital C, and the importance of internalizing the domain and having an access to the field. However, also

reverse examples were found, epitomizing drastic but successful transfers in ones career. For example, it was discovered how, change to an occupation, where the creativity could flourish, had taken place after successful careers as CEO, and how engineers or medical doctors among others had became successful and a content entrepreneurs.

Similarly, as discussed in the literature review, some respondents referred to recalling their own *dissimilarity* already during their early childhood and youth. T*endency for curiosity and a need for deeper understanding* had been a common character of the informants' childhood. Hence, exploring things they had found interesting, had made many of them *to enjoy being on one's own*.

Then again, for some, being different had been a reason to be a target of mockery at school, due to that they had *felt lonely*. A radical innovator expressed this feeling it as following:

> "I was a good student, and I was a kind of a yes-person, so I was never mocked. That is why I could go to school in peace, and I had the ability to be the true [different] me inside myself. I did not allow my other side [diversity] to be seen by other pupils so that I would not irritate them. […] I have witnessed that people with a very radically different thinking compared to their peers have been severely mocked. It is difficult for the peers to approve that these people are thinking in a very different way, and it appears in the form of mockery. Most probably, these people, who are thinking in so radically different way, are very different already at their childhood. I believe, and I argue that, many of them are mocked at school. We should approve the diversity and see that these [people] may be the top intellects, who have the capacity to change the world. Diversity always irritates, and we do not approve it in our fellows. We should perceive the diversity as strength and determinedly find the strength in the child that makes him or her so different from the others. We should perceive it as strength and not as a problem. […] why at schools it is allowed to perceive those who are different as odd, what if

> the oddness is actually a characteristic of the people that perceives others as odd?" (ASI)

Among the respondents, there was a person, who later became an influential European citizen, and who referred to herself as a *"legal struggler"* during her school time. This person explained how she acted as a fighter "by hook or by crook" against mockery at school in order to protect those who were mocked.

As Ettlie (2006) put it, creativity is going beyond the current boundaries also socially, likewise the respondent's behaviour illustrated *courage* already in early adolescence. Furthermore, it was discovered braveness interlinked with the *strong values* about what is important in one's life. Compared to Rogers (1995), who referred *to self-actualisation creativity* as an essential humanness, and it can be said that the previous "legal struggler's" life-protecting core values had started to appear and take tangible forms of action in a very early phase of her life.

Role of the childhood family

Furthermore, it was discovered how the families and communities had different roles in the creative individuals' lives. In one extreme *families' and communities' supportiveness* was perceived as *constructive*, where as in the other extreme it was perceived as *deconstructive*. This is to say, the creative capability of the person, had paradoxically been due to either positive or negative circumstances during the informants' childhood, youth and adolescence times. This dilemma will be explained in the following paragraphs.

For example, it was found that, an *easy and peaceful childhood and adolescent* times sometimes provided an opportunity to develop ones creative abilities. Some of the respondents reflected their past by pointing out experiences incurred during their childhood and youth, whereby their safety and supportive lives in the countryside had given them the peaceful environment for their

development. Furthermore, it was also referred to the parents as the source of useful values, good advices and skills. Alongside the encouraging mothers, it was found that sometimes fathers were experienced as more important for the development of the individual, as one of the informants stated, “My father was extremely creative, every day he came home for the lunch with all family members at the table. During those family lunches he discussed the importance of creativity to all of us.” (ITS)

Nevertheless, another respondent reported of the reverse, whereby she had outlined that easy and peaceful childhood and adolescent times turned out to be problematic for the progress of self-knowledge, pivotal for an innovator. Similar result was not found among the previous studies discussed in the literature review. The informant explained: “For me it has always been very easy to do all types of things, and I experience that it has been a *huge burden to get too easily in my early life*. Due to my cultural and educational background I got too easily during my education and also occupational opportunities appeared too easily for me. In that regard *my self-knowledge did not develop* and later I suffered a lot because of that”. (NAI)

On the other scene, the experienced *difficulties and misunderstandings among the family members were later perceived as the source of strengths for present capabilities*, namely gaining and applying braveness whenever it was needed in order to protect the radical idea or innovation against the existing conventional paradigm.

It was furthermore found that, many respondents reported how their ability to innovate was shaped by their *life-experiences, which varied in difficulty* during childhood and adolescence times. The finding contrasting the earlier discussed literature.

Due to the fact, that some of the respondents lived their youth during the times when the development was not pronounced in all regions in Europe, it is evident

that, very severe obstacles, like war, hunger and becoming a evacuee, were also experienced by some of the eldest respondents. “At that time, we made preparations for the worse days by collecting firewood and berries from the forests, and we saved money. We also armed ourselves with knowledge. Today’s youngsters do not have the same concern for tomorrow. (ISS)”

Personal illnesses lost of family members, or disagreements among the family members, as well as too many and too rapid changes of environments were reported as experienced challenges during the early phase of lives. Obstacles related to the experience of *shame* were furthermore reported.

The positive thing was that, the pressure and inconveniences had *taught these respondents to learn to solve problems and use their creativity, determination and ability to take risks.* Furthermore, as children, they learned to *withstand difficulties, to be persistent and to generate patience*. Since, “if the method you used was wrong, you had to develop new creative solutions, so that you would survive (MIK)”, one of the informants explained the childhood in 1940s.

Capability to observe and perceive was considered as important for innovators, and additionally that capability was explained to have been developed in difficult conditions, like one of the informants said, “due to those conditions [war], even children had to learn to perceive and listen carefully.” (ITT)

The families’ professional background had *influenced* both *positively and negatively* informants’ professional affiliations. In referring to the positive influences, some of the informants had regarded their *families as their role models for creative* and entrepreneurial work. This was pointed out especially if the informants had entrepreneurs or inventors as family members.

Regarding negative influences, it was found that some of the informants had rejected to acquaint the family member’s professional affiliation due to perceived irrelevance towards the respondent’s future interests of work. That is

to say, as a young person, some of the innovators and visionaries followed their own professional initiatives; in spite of the common believe of the family. However, it was also found that, in many cases the respondents did not report about any past influences related to their professional affiliations, or innovative professional carriers and its results. Hence, it can be said, based on the relatively small empirical sample that *all the roads lead to Rome* what comes to the childhood families' role in proactive innovation intellects' carriers.

Those who lived their childhood in 1940s and 1050s referred to the importance of family values concerning *working hard*. As a consequence, one of the informants explained how the experienced hard labour work in agriculture and forestry in ones childhood had later stimulated many innovations making the life easier for those working in farms or in the forests.

Another, one of engineers, enlightened how, "the home values highlighted the importance that one has to be ready to work hard. It was told that, in this country the lazy ones do not make it. And, since I came from a very poor family, there was actually only one possibility, to gain a better life economically, and that was, to study hard and to acquire an education. That was engraved on me at my home, especially by my mother. (ASI)"

Apart from hard work, it has to be highlighted, that the empirical data proved that later, in the adulthood, the *balance between the commitment to work, leisure time and relaxing moments* was stressed as the only proper tool for creativeness and economic success.

Education and evolving creativity

Informants considered the relationship between education and evolving creativity both from the point of view of the leading lights and the prevailing creativity among all the citizens.

When informants discussed the school time tensions and difficulties from the point of view of their evolving innovation capacity, their scope was holistic. They referred to the diverse needs of the society and to the fact that it is a challenge for the educational institutions to foster simultaneously abilities like creativity and obedience. School was seen like an arena where the tension between the different aims, values, and principles logically meet. That was however not possible for them to understand at their childhood and hence school time had been rough time for some of them.

The role of school was discussed widely from the basic education, to the professional and scientific education. Apart from the imperative role of knowledge and its impact to innovation, additional capabilities related to innovativeness and sound development of self-knowledge and self-esteem were highlighted. The following citations epitomize the role of school and education:

> "School is supposed to provide the individual and society an *impetus for a new orbit (OMS)*", "it is *opening up the windows* to the world (ILU)" and "school has a role of *the change agent* in the society (ALI)."
>
> "If the *capacity for change* would be a basic value of education, that is to say, the capability to adjust oneself to the new situations, then formal education would look very different from the present one, which now aspire to particular fields' specialist education. (IKK)" Furthermore, "the role of school in increasing *the awareness of the diversity and compassion*, which are inherited from the multi-pluralistic world (INU)", was highlighted.

Some of the respondents perceived their own formal education as a *pivotal tool or driving licence* for their professional success. Others perceived "*the school of life (MIK)***"** (methods, like, working and exploration, reading, and lifelong learning) as far more important for their success in creativity and innovativeness, than their formal education.

In one extreme of the *continuation of successes vs. failures in studies*, some of the respondents had been exceptionally successful, they had been either very good students at the basic education, or had successfully finalised their doctoral studies in their early twenties, or both. In the other extreme of the continuation, respected innovative and successful managers described about severe failures at their school time. Nevertheless, with initiative, creativity and hard work, they had turned the failures in their education to success in carrier.

Because, informants' experiences encompassed a long period, it was interestingly found how the transformation of the working life had taken place regarding *the changing role of formal degrees*. As a respondent said, "the competition is so hard for the companies that they cannot afford putting the formal education ahead of the individual's personal know-how and capacity. (AHN)"

Regarding the experiences related to the methods used at their school time the views and experiences of the respondents varied. Some had experienced the school and university as a place where there had been both *space and opportunity for different types of students and studies*. Most of the respondents however, expressed their concerns and spoke about personal experiences relating to the schools' tendency to level all students as if they all were "*average individuals* who however, paradoxically do not even exist". It was asked as to "whether the school could *differentiate* their methods for different types of learners and learning styles, and hence, apart from the development of cognitive skills and knowledge, furthermore support the *creative development of the students' character*".(MIKP)

In the *early school years*, the schoolteachers and methods used by them had been perceived as both positive and negative. *The positive experiences* were reported with reference to all type of *encouragement*, especially those related to "critical questioning", "acceptance of the pupil's curiosity about odd things", "feedback and support related to personal characteristics, peculiarities,

aptitudes", and methodological differentiation providing "holistic learner an opportunity and support to approach the substance not from its atomistic components point of view, but from the holistic perspective. (MIK)"

Apart from the lack of support for the development of social and communication skills, the absences of the previous factors were referred as negative experiences. The most negative experiences were related to the *teacher downplaying*, and thus removing the joy of learning. Also schools' and society's inability to react to the mockery raised strong rational and emotional concern among the informants.

The experiences and views related to the *academic studies* were found to be controversial. Apart from the advanced special studies, also multidisciplinary and *vertical studies together with the holistic and horizontal orientation* were highlighted as an important guideline for someone who opts to develop his knowledge and understanding as a designate pioneer of his field or society. As an example, one respondent holding leading patent, explained how important it had been for him to study many subjects related to medicine, instead of concentrating to the main topic.

It was furthermore discovered that university's role in knowledge society was considered important. Interestingly, those who specifically highlighted this topic, did not see University as an entrepreneurial innovation booster as the national innovation strategies often see them. Concerning the *dichotomy of the practically oriented versus the more holistic and general universal university*, the all-around Humboldt's concept of University education was found to receive apparent support by the empirical data. Many respondents referred to the need of "*Bildung*", or as Humboldt himself highlighted, the need of dissemination of education, truth and virtue and to the humankind. A scientist put it forward in following way:

> "Universities nowadays educate civil servants [instead of creative professionals, innovators, or entrepreneurs]. In Business studies, we educate civil servants, the same concerns engineering studies. My idea about universities is that, if we really want to increase innovativeness, we should go back to Humboldt's idea about education. That is to say, we should create "Bildung, or *en bildad människa* [to build up a person that is provided and equipped with knowledge, know-how and good ethical guidelines]. [That person is] somebody who studied literature, who knew where we come from and where we are and why, but he did not know anything extremely well, but he had a wide view of what the world is about. A part of that person [with the Bildung] then decides that, from now on, I will dedicate part of my life e.g. for biology. However, he did not start by studying the ABC of biology; instead, he first created the platform, or foundation for the more specific education. When we say that many innovators have taken the *school of life*, it is misunderstood by thinking that, studying and reading makes people softheaded. I believe, that those who had the school of life have seen a lot, travelled a lot, they often read a lot, not necessarily in the university; it is them who have attained the Bildung. Our problem is that, we educate but we don't provide the 'Bildung' for our students." (NHEU22)

But then again, another respondent stressed the importance of *practically oriented deep knowledge, integrated horizontally to another field*. This leading innovator referred to the modern and flexible pedagogical model of his studies in the late 1960s. That was when some of the Oulu University's professors (Finland) had involved their students into collaboration with Finnish companies. The professors had thus provided an opportunity for the students in engineering to test and apply their theoretical knowledge to the product development of the corporations. The informant furthermore was crateful for the opportunity to integrate many different subjects his academic degree. Later, it had appeared that due to the self-confidence acquired during the previous type of studies, he had gained the pivotal courage and wisdom to apply the logic of the specific

knowledge from his main field to radio technology, which he had not studied at all. This intersection of two topics had then helped him to get the insights, which had afterwards led to commercially successful innovations.

The importance of including various types of *meta-skills* into the educational programs was furthermore emphasized. Meta-skills from our ability to memorize things by heart to the capability to internalize knowledge, and then to attract that knowledge from our memory with various simulating and conditioning methods. Knowledge was to be used as such, or to be broken up and then to be integrated again in a new way. To sum, with the words of the professor in business studies:

> "[…] it is important that we will not romanticize too much our kids capability and wish of to apply their knowledge, but we have to demand that they also learn the concepts and frameworks by heart, even though they wouldn't like to do it. I believe in *mugging up*, [but unfortunately] my students' memory is not good enough. The brain is like a muscle to be exercised, if we want to reach the ideal of 'Bildung', there is no simple way." (FLA)

Transitions period from education to professional life

The respondents furthermore kept the transition period into the concern. Some of the informants had experienced a very positive impact from their *first colleagues* in working life. The relationship between the *apprentice and the journeyman* was referred as the most fruitful for the career start.

On the other hand, some of the respondents, namely those who become *entrepreneurs, had been innovators already for some time*. All of them had created the inventions or innovations on which their business ideas were originally based on. They had experienced that, it had sometimes been a challenge to get all of the innovations through and, hence starting an own

company had been a true opportunity for them in spite of the prejudices in society and among the relatives. One of the respondents described, how being an entrepreneur was perceived in the 1970s.

> "Already when I studied to become a medical doctor I was innovating. In addition, when I graduated, the big decision was to be taken, as to whether to become a community doctor or to start a company. Due to the fact that my innovations were not approved by the industry, I decided to start my own company. I did not become a doctor as was expected by my grandmothers, it was a big decision. At that time, doctors were respected and it was asked [from the grandmother]: 'Didn't your grandson become a Medical Doctor since he had to turn into an entrepreneur?'" (OMS)

When the focus of the interview was on *providing advice for future leading lights,* the proactive innovation intellects of today highlighted the importance of *gaining the working experience in a foreign country*. The ambitious and talented youths were encouraged to find their way to the leading and agile organisations of their fields, preferably to international corporations, "where they could acquire the best possible understanding about the wide scope of challenges that might come to ones way during the later career." (ITT) Young ambitious professionals were warned about being stocked into the "dusty corporations." However, making the choices, which the young person believes are correct, is most important. It was furthermore highlighted that the advice would be different for different type of people with different type of capabilities and wishes.

To sum up, **all roads lead to Rome,** in the sense that, *despite the differences in the respondents' backgrounds, they all became innovators, visionaries or pioneers of their fields*. Had it been simple and easy, or complicated life, they all had found a way to generate or support innovations. Encountering challenges and support, they had learned the hard and rewarding way towards their success as innovators.

5.3.2 Personality characteristics, values and attitudes

Based on the previous discussion, innovators had faced different experiences that had shaped them with their innovative capabilities. Matters relating to family life and community, and the various ways in which they had affected the innovators behaviours and learning, as well as managing different decisions by themselves were highlighted. In this chapter, the subcategory will further highlight the experiences and views concerning values, attitudes and characteristics that innovators account for, as they possess during innovative work.

As earlier discusses, scholars like Csikszentmihalyi (1997) and Runco (2007) have described how the human "paradoxical nature" is associated with creativity, and the antithetical pairs of our minds (like smart and naïve) are integrated in a dialectical tension, providing row material for creativity.

The category of "Innovation intellects' personality characteristics, values and attitudes" supports the previous research by describing the wide scope of characteristics of the great minds. At the first glance, it looks like in this section as well all roads would lead to Rome. It was found that, the scope of descriptions and experiences of innovators attitudes, values and characterises was *wide and partially contradictory*. Contradiction may be due to an opportunity, that the respondents had implicitly highlighted *the balance among* their different characteristics and their capability to both *exaggerate and moderate* their characteristics according to the circumstances. As an example of found balance between two extremes, the equilibrium among hard work and deep relaxation and leisure were emphasised. Likewise, it was found that the *opposite poles of flow and satisfaction together with tolerance of pressure and frustration were both unmistakably present in the empirical data*.

Additionally, an 'acid test' of *extreme conditions* was used in order to find *the* essence in the difference among the creativity embedded in every individual

(creativity with small c as Csikszentmihalyi (1997) called it) and those who managed to change their fields, or who proved to be successful when innovations and innovativeness were ‘under the gun’ (Creativity with capita C). That is why special attention had been paid to those experiences, which took place in the extreme conditions, like economic regression, or the discontinuation phase of the field, or when innovation saved the company from bankruptcy, or when the radical innovator had faced exceptional resistance. The peculiarity of the extreme circumstance appeared in various way, which is epitomized as follows.

A young and successful researcher, whose concern has been to widen the discussion and the scope of business sciences, has been described as exceptional due to his innovativeness. His research on creativity, and his experiences about creative entrepreneurs had highlighted the *entrepreneurial aspects* of creativity. He furthermore stressed that, innovativeness is about taking the *risks of radical thinking*. He also described the *oddness of creativity as a natural* or nearly pivotal element for innovative people. That was due to the difficulty of breaking apart the conventional knowledge categories and moral aspects related to innovation. He explained:

> “Those who are the real innovators, and who can really be entrepreneurial, they do not have these locks in their minds and the conventional ways of thinking as the others have, or [if they have them, they do not appear] in the same place as the others. What distinguishes the innovator from a normal person is not that, we are more cleaver, but we can really be odd or fool (5751), [..] that is to say that the innovator does not have any unnatural creativity, but that, those locks in his brain do not work as they work for the others.
>
> The reason for my success in academic life is that I can break the existing categories and conceptualize odd or extreme notions, like gift economy. […]. That demands that, I can [temporarily] get away from moralizing things, which is the most difficult part. That is where many scientists are

> locked, but it is there, where my brain really starts to operate. And that is what makes the biggest difference.
>
> [...] I have seen so many different types of people being successful. One type of them is those, who get trivial results, since they are often dependent on the sensation of security. The other type is the truly successful ones, who have chosen a different approach from the others. They are breaking the rules and the boarders; they have the tolerance of taking risks.
>
> [...] I believe the true innovators have entrepreneurial genes. If I decided or wanted to do something, I would do it. This is how the entrepreneur is doing it. He is doing what has to be done, without thinking if all of this will 'end up at divorce'." (FLA)

If taking into consideration the paradoxical characteristics of innovation, the demands of the discontinuations phases, and the tensions in the circumstances of the innovator, it is evident that, those individuals in charge of the change have some characteristics, which will not always be perceived socially acceptable by the majority. In this section however, the point of view of the relationship between the individuals' characteristics and the innovation is the most important.

Paradoxically, it was found that, the *same characteristics can sometimes deteriorate and can sometimes facilitate the innovation.* Critical thinking for example, was found to be a very important skill and characteristics in the enriching and selection phases of innovation, but it was a deteriorating factor in the ideation phase. Hence, it can be said that innovators knew how to apply their *intelligence and situational sensitivity* to decide when to reinforce or restrict their characteristics. *Sensitivity towards the weak signals* was pivotal in order to react early enough before the 'accident to happen.' Human agility, capacity to change ones rationale, and emotional perceptions towards the

situation or problem were needed, since always now and then, they had to do ‘an about face.’

Therefore, the innovators have to *know themselves well*, in the sense that they possess the ability to *scrutinise their mindset* in order to find out creative solutions. Innovators *strong personality* enhances the emotional energy and the *capability to stand difficulties and hence being able to generate their own path*.

Self-confidence and self-esteem

Self-confidence and self-esteem were stressed as an important characteristic for innovators. It can furthermore be claimed that self-confidence was the *common denominator* for the rest of the characteristics in good and bad moments. “I am convinced that ultimately, *only people matter*. Behind every corporate success, there are individuals who have faith in themselves and on each others.” (NAI)

Self-confidence was most evidently *pivotal in the tough moments* related to hard competition, economic regression, risk of bankruptcy, or breaking of the paradigm. “One has to have good self-confidence in order to avoid getting bitter when ‘all hell breaks loose,’ chaos, disorganisation, confusion and trouble take place in the field due to the discontinuation point of the field.” (AHN) Related to the envy and jealousy, surrounding the success and entrepreneurial efforts, good self-confidence gave an important support, as a multitalented respondent and entrepreneur stated, “It is extremely important to accept the fact that, always someone will envy and even hate you.” (TIG)

It was furthermore found that, the *poor self-esteem was the ‘Achilles’ heel’* of inventors. Informants pointed out that poor self-esteem concerning ones creativity was related to envy and jealousy, and it appeared as a problem concerning the exchange of ideas. It was explained how the inventor had lost the momentum to enter the market at the right time, when being too afraid to share

his idea and receive pivotal feedback. “True inventor is not afraid that his ideas will be stolen, since he is convinced that more and better ones will come.” (TIG)

Flow

Together with the self-esteem respondents expressed gratitude for the privileged opportunity to dedicate oneself to the complex issues, those, which one believes, are important in the difficult world. Being able to feel *desire* for work *and joy about what has been learned* was furthermore highlighted**.** *Satisfaction about the results* was covered with *humbleness*. “I am quite eager because we are reaching the level that we have aimed at for years (MIK),” said a CEO, regardless of the years lasting effort to rescue the company from bankrupts. In these comments, alive with positive expressions, the *sensation of Flow* was permanently present even together with the pain of pressure, as has been described in the literature review:

Flow refers to our own free will to engage our psychological energy to perform something valuable and difficult. As the previous theory by Csikszentmihalyi ((1991), 41) explained, the complexity of the self increases following the sensation of flow, and as a consequence of that, the self might be said to grow. A psychological process of *differentiation* involves a movement towards uniqueness, and together with the opposite movement of *integration*, “a union with other people, with ideas and entities beyond the self”, they encompass the idea of increasing mental complexity. *Overcoming a challenge provides a person a feeling of more capable and more skilled***.** In the state of deep concentration (flow) consciousness is well organized and harmony is experienced, which *integrates the self and furthermore provides a feeling of being “more together respect to other people and the world in general”*

Autonomy or as Csikszentmihalyi calls it “separating oneself from the others”, appeared from the respondents way of working, and it was furthermore

highlighted as, “a capacity to think on my own, is what I have been most pleased about during these forty years. (ISS)”

Together with the autonomy, the *excessive eagerness* towards what one is doing was found common, and there was a continuous sensation of joy of work together with all the experiences that were explored. Paradoxically, even the hard memories of many of the respondents were illuminated with the same positive sensation, which somehow was sensed even during the hardest moments of the interviews, when the tears or cry, due to the painful memories, forced to interrupt the storytelling.

Together with their autonomy the respondents expressed their need for *interconnectedness* (“integration of the autonomous parts” as Csikszentmihalyi calls it) with others, the union with other people and their intentions, thoughts and feelings. Sometimes, it was as simple as “a need for another individual to ask the basic questions (ATT),” or sometimes it was the desire for guidance, but at the very heart of the reunion with other people there was an accurate need for the *sensation of relevance with what one is doing*. “Interaction with other people and culture is the *sounding board for creativity*, and if it is missing it removes the emotional energy pivotal for creativity. (AKK)”

Spirit of work and the spirit of a place were found to be important. Creating the spirit, enjoying and utilising it, transforming the sensation of spirit and the capability to inspire others, were all intervened to the interconnectedness with other people and the issues the respondents considered as important. “Spark should not be lost in a critical phase; later there will be no risk of losing one’s motivation. (MIK)”

Interestingly, *peak performance, happiness and flow, vice versa capability to tolerate frustration and setbacks seemed all to be parts of the same phenomenon*, the life of innovative leading lights. Later it will be discussed more

in depth, how the reported personal diversity had caused tension during different phases of one's lifespan.

Curiously, it was moreover found that there resides a *paradox of making fun with one's own diversity*. In spite of all pressure, inconveniences and discomfort, the respondents often looked at their own diversity with humour, or explained how their diversity had affected even their sense of humour. As one of the respondents put it, "Even my sense of humour is different; it has to be, since my thinking is based on logic which is different from the others. (MIK)"

The previous results resonate also with what Katz (2004) said about intrinsic motivation and work, by referring to "the sense of having fun."

Knowledge, intuition and learning

Regarding to the importance of the *formal knowledge and learning*, as described in the literature review, it was found that apart from "knowing all the fundamentals of the field and the domain", the innovators' "*intuitive talent" or "spiritual intelligence*" were also found to be often used, although they were not stressed by every informant. The intangible knowledge, and the know-how how to reach that knowledge, were highlighted concerning the challenges related to the future. Intuition was used for decision-making, or as it was said, "In many crossroads, I realised that the *intuition* was useful and I trusted it." (ASI) *The discovered importance of intuitive talent and spiritual intelligence, as phenomena, have been interpreted in this research as indicators of how people can move from one cognitive space to another, as stated in the U-theory* (Scharmer (2007)), when the learning of the future takes place.

The respondents stressed that, they do not have a monopoly for the creativity since "*creativity applies across the board*, it belongs to everybody" (IKK). When the topic was discussed, many of the respondents questioned their own creativity or innovativeness compared to other people. Creativity, for them, was

a commodity among all the other characteristics, and it was referred as “all in a day’s work.” (MY)

It can be argued based on the innovations introduced in the section of “innovation manifestation” and the incidences told from the innovators’ lives at work and leisure, that there resides *a combination of ‘creativity’ and ‘creativity with capital C’* (Csikszentmihalyi (1997). “The flood of ideas”, or “the innovation appearing all over”, were described by the informants, which is to say, they found ideas all over, and the ideas could “start from the scratch,” or creativity was considered as “useful to get rid of too many ideas.” Gaining insights, being creative, or an innovator, were furthermore *described as a lifestyle*. In the other extreme, creativity was also reported to occur when *forced to be creative*, in order to prevent the bankruptcy, or to survive in difficult conditions, like during the wartime and economical regression, or when facing difficulties in personal life.

Katz (2004) referred to obsession for creativity, likewise, for some of the respondents, *creativity was like the oxygen* we breathe; and when it was restricted, life turned painful. It was told:

> “I worked for 15 years as a manger, [whereas] I operated all the time as if I had been some other person […]. Until, paradoxically, the routine in that work killed my capability to continue with those routines. Not even when with the flow –sensation, could I take care of those routine jobs anymore. That concerned especially the most unpleasant routine assignments. [… In order to survive] as a manager of the company, I had to find a creative solution [to the problem, and], to find someone who could take care of the routines, […] that’s how I got more time for thinking and for the creative work. […] The thing, what I am most proud of in my life, is that I survived, because at that time I was really at the rock-bottom.” (NAI2)

Soft and hard values

Innovators' actions and the accomplishment that were esteemed most valuable in their lives were based on a *demanding and multifaceted world of values,* which were considered as important for the innovators. "Everything is based on values. The first imperative value is *respect* and the second is *openness* - sharing what is in your mind. (MIK)" Respect towards fellowmen, as it was discussed, encompassed dignity for all, and in some cases, it was stressed to have been extended even to those, who had mistreated or tried to destroy them. Or, as one of the informants told, "so far, I have attempted to strive to understand those who mocked me [in a large corporation], in order to forgive them in my mind. […] I sometimes wonder why it is so difficult for the linear people to approve us [the radical innovators]? (ASI)" Similarly, the respect towards others can be *assimilated with trust*, the trust expressed by the manager towards his team, or the trust towards the managers and colleagues. Without trust innovation is deteriorated especially concerning group innovation.

Loyalty towards the agreements with partners and other stakeholders was stressed by one of the entrepreneurs as one of the cornerstones of his economical success. It appeared that the "tolerance of diversity," (Florida (2005)) had come forward to the respect of the diversity**,** or all the way to the obsession for diversity**.** This is because creative people combine so very different things in order to find new categories, as was discussed in the literature review. Apart from carrying the responsibility of ensuring whether the work will be done, a special concern was carried for the *holistic understanding*. Altogether, the respect and loyalty towards ideology and one's own aims materialized as the main driver for intrinsic motivation**.** "It is my motivation to see that innovation will be brought into play," (ASI) the informant voiced.

A CEO explained how the *openness* could be taken to the extreme as a competitive factor, and he said, "sometimes people have asked me, if I am nuts, because I speak so openly and honestly […]. Sometimes I use openness as my negotiation tactics." (MIK3) An internationally influential individual referred to

integrity and sincerity as a good pillow “openness and straightforwardness makes me to sleep well, I can live with that.” (MKA)

Responsibility, together with *generosity and humbleness,* were found in innovators experiences concerning their willingness to share and contribute, as well as receive ideas and help. Some respondents explained of being ambitious for learning more and solving problems, without being a power minder, which is to say, to be neither greedy for power nor fame. Based on some of the informants, particularly in a management post or as an entrepreneur, it was evident that, the rationale behind the businesses, or the mission of the organisation, demanded the capability to disconnect personal desires and emotions from the work. It was furthermore found that, *patriotism* was related to their motivation towards work. Often the worry about economical situation and employment of their countrymen was their main concern.

Nevertheless, a different scenario on the importance of values was recognized, when one of the respondents had gone beyond the organisational values and patriotism, and lived accordingly. The entrepreneur who, apart from possessing many innovations, gave his contribution for the development of his country’s legislation, in order to enhance entrepreneurship practices, since “there are too few instances providing true help for the entrepreneurs.” Additionally, the common good of the people seemed to be at the very heart of his value system whereby, to enhance the quality of working life was his driving force for the innovations concerning financial management. Furthermore, the respondent had dedicated time for community development economically, socially and politically. When asked, as to what among the achievements he was most proud of, the response was “I am most proud of me having been a farmhand, [knowing the labour work].” (ILU)

Soft aspect of the values was a common nominator, of all the values discussed above. They were directed to “making the world a better place” or as some of the informants put it forward, “the small utopian live inside me.” Basic *faith*

towards life seemed to provide the *courage* needed to incur the values embedded in the life bigger than ourselves.

Behind the visionary and ideological perspectives and mindsets, being open-minded and sensitive for the need of change, and to discover unexpected opportunities as well as systemic analytical thinking was present in respondents' stories. It seemed that, *being brave of having the needed courage to be different, and to try different methods, had made these people more sensitive for new perceptions*, which was stressed as a prerequisite for the holistic view, in connection how to recognize the direction to go. The *holistic view* was highlighted to be especially important in the early phase of the radical innovation funnel. *Curiosity* about all kinds of topics and even curiosity about details and small phenomenon together with the insatiable need to learn more, as well as the capability to distinguish what is import, or "to see trees for the forests" and to react quickly seemed to be another common nominator behind the visionary characteristics of these people.

Seeing the work, the challenges, and the opportunities, with *enthusiasm and passion* illustrated the respondents' spirit of their life experiences. Doing something that has never been done earlier, when necessarily no support is available "one has to have the capability to empower oneself, in order to convince oneself that, one is in the right track." (ATT) As one of the multinational corporation executive explained that, one has to know how to be one's own sponsor, if one cannot find a sponsor elsewhere in the organisation. (IKK)

Having been exploring the softer values, attitudes and characteristics, the harder aspects namely *determination, commitment, persistence, patience, courage and tolerance of frustration and inconveniences* will be explored next. Related to innovation, as discussed in the literature and in the main category of innovation and creativity, there reside many difficulties and vicissitudes, and hence, the innovator is often in a situation where 'the bullet has to be bitten'.

To support Csikszentmihalyi's (1994) findings of creative people's commitment to their work, it was discovered among the respondents, that there was a tendency to *internalise the problems* and to devote themselves to the businesses and the innovators has a true capability to *commit themselves to their work*. Determination and persistence were found in statements like "If I decided or wanted do something, I did it and I got it", and "It is possible to change things, there is a solution for the problems". There is to say that, the respondents' determination illustrates the *butterfly effect* (Lorenz (1963)) in relations to innovating.

Based on the analyses of the empirical data, it can be said that *determination, persistence and courage become the 'part and parcel' of innovation lifecycle*. The finding is in accordance with Ettlie's (2006) discovery, who said that creativity is an act of going beyond the uncertainty boundaries. To face the frustration and unclear situation related to unsolved problems; when 'the ball seemed to be lost at the high weed', the innovators have portrayed never to give up, in the sense that "if the innovation will not happen during my lifetime, it will happen later […] during the next generation" (OLI).

Courage

Courage has conventionally been associated to carrying the risks of innovating, however, it was found that, the courage related to the decisions concerning the radical changes' in one's own or the personnel's careers was experienced as emotionally hardest. It was pointed that, "it demands courage to get rid of those who are not good enough," (AHN) or similarly courage was needed "to exempt oneself from professional duties in order to get more time and space for life and creativity" (IKK3). Furthermore, if was described as painful experience to perceive how "those [experienced] managers, whom the time had surpassed [because of the change of the paradigm] were sent to the sidetrack (AHN)", and who had shown the courage to survive that vicissitude.

Nevertheless, the innovators had portrayed courage in the diverse outlook whereby, despite one showing courage to solve the confusion, the courage to realize the difference that one possesses in comparison to others in the corporation, had been obvious from the responses. As one respondent pointed, **"I** felt myself as a freak in that company" (ASI). Therefore, courage to realise oneself can lead to the utilization of one's innovativeness in a more effective way. Since the innovator's aim is to lead to the appreciable results, it can be learned that both courage for personal and interpersonal decisions are important; in other words, innovation sometimes requires 'Dutch courage'.

Sensation of satisfaction and frustration

In innovators' life both, the sensation of *satisfaction and frustration* were present. The scale of discussed emotional frustration varied from mild to serious and furthermore its frequency varied. In innovators' lives, there could be *long phases, when the frequency of the milder frustration or inconveniences was high, since challenges, uncertainties or time-pressures were part of innovator's everyday lives.* On the other hand, there had been *phases when many serious professional and personal disasters related to the innovation took place at the same time*. There were many different types of pressures, frustrations and inconveniences, which the innovators had to tolerate. *Despite of all those frustrations innovators furthermore articulated the continuous experience of joy, or happiness and the sensation of flow related both to their work and to life in general*. This can be considered as a confusing paradox.

The sources of frustration and inconveniences

As Schumpeter (1952) stated, creative destruction is an essential part of innovation. Furthermore Csikszentmihalyi ((1997), 54) wrote, "If he or she manages to accomplish something novel, that novelty is likely to be ignored or ridiculed."

In the empirical data, the sources of frustration and inconveniences varied from *economical-, legal-, social-, psychological-, ethical- and political aspects to company policy and to professional discrepancies.* They have been classified to two categories: the internal and external sources of inconvenience. An example of an internal and ethical frustration can be seen when, one of respondents portrayed the guilty feelings, due to the fact that his innovations, which according to his perception had decreased the opportunities for creativity and increased stress at work.

Internal reason for frustration was experienced by most of the respondents in relations to the failure of grasping the holistic and systemic view, pivotal for innovation, due to the combination of the mess of unorganized ideas and the missing solutions. Some of the informants analysed the essence of diversity of different types of people, as the core to enrich the creative ideas, despite the innovators' perception of the fact as an inconvenience.

With regard to **external reasons for frustration** and inconveniences, in dismissive organizational cultures, life had turned difficult for innovators since, instead of encouragement, new ideas frequently had met an astounded and baffled reception. Different individuals had experienced mockery incidences encompassing tolerance of pressures like loneliness, envy, jealousy, 'insult to injury', illegal threats, abandonment and mistreatment.

Alongside the external sources of frustration, the informants referred to ethical, social-, and political aspects as well as company policy in relations to **pressures for levelling,** that is placing persons on the same level. It was experienced that the innovator's relative position was not supposed to exceed the limited range, which is to say that, the people had felt that their thinking and behaviour were blocked. Paradoxically, they neither were approved to be successful, nor were they approved to fail. These experiences were reported from all levels of the systems, starting from the communication among the individuals, towards the wider organisational and societal communities, all the way to the international

communities. It was reported that there was a risk that the radical innovators would be out casted due to their radical thinking and views, which were considered to exceed the conventional framework of the domain, by the mainstream of the field.

The final frustration was related to economical reasons due to the experienced unfair treatment related to missing economic compensation for the patents, loosing ones job, lost the market or experiencing the personal or company bankruptcy. This type of frustrations and inconveniences decrease creativity and courage, like an informant in managerial position in a multinational corporation puts it: "I was threatened to be discharged several times, but always afterwards I was applauded for my courage to appoint the right problems. When aiming progress in one's career the courage often vanishes." (IKK)

Above all, the mentioned **frustrations and inconveniences required tolerance from the respondents**, in order to manage with the situation. One of the innovators stressed the importance of tolerance of inconveniences and related frustrations as follows, "When you are taken through the mangle that is when your strengths become even stronger. When the *carbon is compressed, it turns into diamond. (MY)*" Another respondent, who had faced a wide scope of professional obstacles and personal losses spoke about the needed scarifies "the price one pays for is not too big to be paid, for such an important matter for mankind […] since this kind of a mission has been provided to me, so I have to do my best to carry it." (OLI)

5.3.3 Working and life strategies and methods

The previous category relating to the proactive innovation intellects highlighted the different qualities and accountabilities that they possess in reality. Not only has the innovators nature focused on their early and adolescent grounds, but also it had been shaped by their early maturity and life consequences. Moreover,

this category of "innovation intellects' working and life strategies," continues the discussion on exploring the innovators ways of working, the aspects considered as important for innovation process, as well, as how ideas have been generated in order to reach the climax of their innovative works. In this section found strategies (the category and its propositions and dimensions) will be approached from the point of view of the individual.

Universal and specific strategies

It was discovered that, the experiences describing the innovative individuals' working and life strategies and methods encompassed both universal and specific aspects. *Universal strategies* and methods refer to the general approach and attitude to work, innovation, and life. Most of the experiences that were classified as universal, often referred to the entire lifespan of the innovator from his childhood to the anticipated future; as they pointed out for example that, "innovating is a way of living" (MY), "already as child I marvelled about everything" (ASI), or "I have a tendency to go to the future" (EKK).

Innovation phase s*pecific strategies and methods* are those used in a certain stage of innovation; however, the specific methods were neither linear nor straightforward working means. Since, the found strategies and methods used in the various phases of innovation, in most of the cases, encompassed *the holistic view of the entire lifecycle* of the innovation.

It was interestingly found, that the respondents, by no means restricted their creative working methods to the ideation phase of innovation, but introduced strategies, which were more or less a combination of creative approaches and conventional state of the art methods throughout the innovation process. Irrespectively the phase of the innovation, their way of thinking and working around the innovation covered the innovation *pre-phase* and all the way throughout the innovation funnel, to the *post-innovation phase*, which possessed the consequences and impacts of the innovation and possible new innovations.

From this, a conclusion was drawn, that the working strategies and methods were holistic, what comes to the time dimension (running of time) of the innovation. That is to say, the innovation phase specific strategies and methods, found by this study, are by *nature holistic in time dimension*.

The strategies and methods used by the informants were furthermore found to have *potential to explore* the innovation related phenomena and innovations' relations to the circumstances both *vertically and horizontally holistically*. Sometimes, the methods were portrayed *spatially so multidimensional,* as if the innovation and its relationships were approached and dealt with the magnetic resonance imaging (MRI). That is to say, layer after layer, from one perspective to another, the innovator portrayed how the *systemic composition and connectedness* of the innovation was to be reached.

Moreover, when the innovation itself was supposed to be trans-illuminated, it was described to be taken to the spatial environment and its *systemic connections to circumstances were explored*. The working strategies and methods were like a Russian Doll, signifying how, when one layer of the phenomena was ready, it was taken into a larger context, again and again. The found result can be seen as parallel to Scharmer's ((2000) and (2007)) idea of encompassing oneself or ones thoughts, as a part of the larger entities. To sum up, the innovation phase specific strategies and methods, found by this study, are by nature *holistic in spatial dimension*.

Parallel to Shapero's (2004) description of the (preparation and incubation) phases of innovation, it was furthermore found that, the working strategies were *holistic, in one more aspect, namely by encompassed both the tangible and intangible methods,* covering both the visual and non-visual aspects of innovation together with the constructive and unconventional problem solving. That is to say, *the innovators combined traditional learning, explicit knowledge, and ordinary work* (done in the libraries, offices, laboratories or other experimental fields, including ones own life,) with *intangible methods*.

Intangible methods refer to methods, which are out of the range of the conventional and customary learning, research and development methods. They were used to compel new ideas, to learn from the emerging future, to reach the hidden knowledge and experiences stored in individual or collective subconscious, or to find original ways to interlink the knowledge factors in a new way. For example, commitment to intuitive talent, spiritual intelligence, free association and evocative techniques, meditation, post-suggestion, relaxation, and conditioning ones mindset were named as examples of methods used in order to encompass an insight about the invisible part of the innovation, which did not yet exist, "the innovation which had no name yet".

Intangible methods included furthermore, the capability to perceive a tangible and rational problem throughout *empathize*. E.g. a medical doctor described how, while development of an innovation, related to pharmacological analyser, he had put his "soul to the problem by thinking that, what if I was the molecule, what would I like they would do for me next?" (OLIB)

To sum up, found aspects of the *holistic strategies, in encompassing tangible and intangible methods, can be related to theory U* by Senge et al. ((2004); Scharmer (2000), (2007)). The result is parallel with the principles of the theory U, which underscores the intangible, invisible and future oriented aspects of the creation of radical innovation. Furthermore, letting the old practices go and bringing in the new practices, as well as seizing and sensing of the paradigm, can well be associated with the aspect of the intangible methods.

It was furthermore found that, the used innovation working *methods varied based on what was considered as the core or essence of the innovation related phenomena*. "Knowledge, insight, experience and observation" were used to approach the "heart of" the phenomenon, and to find the promising and attention-grabbing "inconsistencies", "analogies" or other "opportunities" or "sources" to take the work further.

Richness of properties and dimensions related to working methods

Expressions used to describe the fundamental working methods were rich in description, and the following paragraphs tempt to illustrate the richness throughout some authentic examples.

- "It was like I had been a 'fly on the roof' scrutinizing the situation. In the early phase of the innovation [in 1980s] we observed our clients; we talked to them and to all other stakeholders and partners. Collaboration with everybody was very important. Later, in a doctoral thesis, the method was proved to have been as crucial for our commercial success." (MYC)
- "It was important to have the courage to step outside the conventional box" (IKK),
- "Odd and unusual contexts were explored, questions which nobody else asked were asked by us." (ATT)

Being aware of what was not only needed, but might be the future desires of the markets, what the people might next have the passion for, was considered as vital by some of the informants.

Informants explained how approaches like, "rigorous analysis" (LIN), "continuous questioning" (ALL) and "critical thinking, since there is no one truth, and then even more rigorous analysis continues, in order to get behind the phenomenon, and that continues all the way to the predicted futures (ATTC)" led up to something that was called "common nominator" (LIN, ALL, ATTC). They described how there was "a series of relevant factors that were related or connected in a new way" (MY).

The input of the ideation process, the insight and solution, were often referred with worlds like, "the solution is many times so simple, that I normally wonder, why did I not come up to it earlier" (MIK), or "the core of radical innovation is a simplification, often it can be compressed to a couple of words or lines. (TTA)"

In order to approach the multifaceted and complex problems the innovators used various sources of *diverse explicit and tacit knowledge* (Nonaka and Takeuchi (2000), Hakkarainen et al. (2004)), *continuous learning and self-taught, as well as the help provided by the networks.* Related to knowledge harness, it was explained why during the second half of the last century, it had been fundamental but at the same time very difficult to acquire the latest international top knowledge for

> "the remote and small country like Finland […] One had to offer something relevant for those [international knowledge] networks, and for that, we had to develop something that was outstanding, better that anyone other could provide. […] Sometimes we had to use the kitchen door to reach the right forums." (UKKTK1)

Apart from finding networks useful for the exchange of summit knowledge, networks were used for exploiting diversity, as well as for searching and testing the found ideas in the "spirit of opportunity finding" and "group creativity". Alternatively,

> "If creativity doesn't go to this direction [group innovation], what possible directions could it go then? Problem is that, we go after the person, but *creativity is networked energy*, it is born in the connections. Creative persons are needed, but we should not forget the supporters and blockers of the innovation [as part of the connections and tension as a source of creativity]." (FLAB)

It was furthermore found that the idea generation was based on finding *analogues between different independent matters* like, applying the idea of monitoring automated production systems to then development of health follow up system and devices. The CEO told how,

> "The catalyst to the innovation came from the building automation system where monitoring the minor and primitive signals can provide information about the failures of the machinery. Similarity, when I

> perceived the problems of senior citizens and the social and health care system, I started to develop a solution with the analogy of signal monitoring." (B0061 ref. 1)

In the present day, invention databases and internet, especially its figure and picture functions, and the social media, providing an opportunity to exchange ideas over the net, were found stimulating. Sometimes, a publicly organised call for proposal for EU funding was found to be "most useful to enrich the ideation without having all the trouble of applying and administrating those projects" (MIKC).

Informal networks among the professionals seemed however, to be pivotal for the knowledge and idea acquiring and testing, due to the common values, trust and empowerment embedded in them as one informant put it, "it was a natural, respectful and permissive community, where stupid ideas and question can be presented. (UTA)" Dynamic informal contacts among likeminded international colleagues, those who shared same passion and interest were considered fruitful. "When flourished, the free flow of knowledge generated a collective sensation of Flow." (UKKF) Moreover, the knowledge, from where to search and find the needed knowledge, was found to be a result of a long carrier.

Nevertheless, *to prove that the old paradigm's essence of belief is wrong*, and then to prove the new belief correct, "as long as no tangible evidence existed" (ASIF), was considered as difficult and to rely solely on innovator's capability to trust on him or herself, and to "*empower himself*", or to *"be one's own sponsor"*, "supporter", or "protector". There were pressures and many inconveniences related to this phase, sometimes it meant "carrying the pain or joy of knowledge alone (ATTF)" until the idea or innovation was ready to be presented to the gatekeepers.

Knowledgeable professionals, which could be called "*authorized dissidents* (ASE)", to whom one could go with a new idea was found important in large

organisations. Some of the innovators and managers reported that type of a post as important. It was stressed however, that in spite of the fact that "those posts are and should be based on trust among the staff members; they should furthermore be connected to the CEO or other top management (ASE)".

Managing the challenges and setbacks, related to a months or years lasting radical thinking, was considered as releasing, if a *protector* (Hamel (2002) or a *likeminded co-worker* was available. Later, when the radical thought has matured, it was said to be important to continuously receive critics and questions, in order to find the incoherence, or gaps in the logics. At that phase the critics and questions helped the innovator to conceptualise, visualise, prepare prototype or otherwise prepare idea more understandable.

Communicating the idea inside a big organisation, or in any wider innovation ecosystem, was found challenging. It was said to be a two way process, where both parties has to do their best in order to make the communication to work, or as one informant put it forward, "Innovator's responsibility is to make his innovation to sound attractive and the manager's job is to keep his or hers ears open" (UKK)

For the *selection of the right idea*, informants made use of all available knowledge and hence tried to "overtake ignorance, fight against the lack of perspective and the lack of ideology in order to see the forest for the trees," (MYF) as one of the informants put it.

It was said that during the economic regression the need of real *visionary management* had been even more important than in normal times, a manger put if forward as following, "during the non-linear phase or in the 'joint' of two eras the world demands radical changes."

When introducing the innovation ones credibility should be assured, and for that, "*you have to know all the fundamentals*. Otherwise there will be no

opportunities." (AHNF) A radical innovator stressed the importance of learning from the communication during the selection phase: "I always listen very carefully the feedback I receive; I specifically pay attention to the gesture language, since it is most *truthful feedback* (ATTF)."

A serial entrepreneur nevertheless reported by, how he finally had *resigned from a big corporation*, due to the death ear for his ideas, "I made several suggestions, but the middle management rejected them always." (B 61 MYF)

For the *exploitation of an innovation,* an experienced manger stressed the importance of perspective and awareness, as well as *courage to make unpleasant decision*s and then to include them in a good strategy. (AHN**A 87)**

> "If there is an immense resistance against the radical innovation, you have to first create the strategy and then you have to churn it up [implement]. You have to get the right gang that agrees that this is what we do [no matter what]. Those who say that we should not do that, you have to get rid of them, otherwise there is no way for the radical innovation to succeed."

He furthermore highlighted the importance of the *composition of working team*, and thus found different roles for them, like innovator, opinion leader, implementer (compare Rogers (2003)) for the different type of people. With diversity, teams were assumed to have a better opportunity to integrate the different type of knowledge and to generate both tangible and intangible energy in the team, and thus, to make the rigidity around the innovation smaller. Another innovative CEO, stressed the importance of the tolerance of inconveniences and a capability to generate energy to resist them, "I never get into panic, and never get provoked."

It was furthermore stressed the importance of a mandate for the innovation to be executed, "you have to have a board which is supporting you, one which is *providing you the mandate*. Without a mandate there is no point even to

try".(AHNG) The importance of the *wisdom of the board and the CEO* was emphasized, but if that wisdom and the mandate were missing, and the innovator was really convinced about the importance of his innovation, he was encouraged to find another, a more open-minded and agile company.

Informants perspective concerning the *isolation of radical innovation* recommended commonly in management literature, varied. It was both strongly supported and opposed. The isolation was supported arguing to the time-consuming effect, needed due to the rule breaking nature of the innovation. Hence, it was argues, the radical innovation among the mainstream would not survive, or if it was to survive, it would decrease the effectiveness of the mainstream process.

Isolation was apposed referring to the need of making the linear and non-linear sides of the organization into contact:

> "There has to be balance, and it is, 90% of all of the energy has been used for the linear operations, measured by the meters of the quarter economy, and 10% should be used for the new creative craziness [non-linear].
>
> Nevertheless, the energy has to be distributed horizontally so that everyone has 10% of energy available for the creative functions [so that the contribution of that creativity for the company will be maximal]. Of course, people are different. Some provide 50% of their energy for creativity, and it is ok. But then the communication and processes according to which the company operates and transmits knowledge between the people, it has to provide the opportunity to find the point and space where the creativity of every individual takes place and gives its contribution for the entity." (KKIG)

Communicating and introducing the innovation to those outside the organisation, like the funders or civil servants providing legal, financial and other services for innovators and companies was find to be another target of

innovative solutions, due to the challenges which will be discussed in next section (innovation ecosystem).

Especially radical innovations were a real challenge to be introduced, and one of the serial entrepreneurs condensed the strategy as following: “I am taking the innovation forward little by little, in ‘small pieces,’ which weigh no more than one kilo each of the.” (MYG) He explained that there was no way to make the outside organisations to cope with a radical innovation as a whole, due to their institutionalized principles and operations logics.

Value generation and growth of the company or the success of the region were a common concern for most of the interviews. One manager from the media field stressed the success factors when innovating without coercion,

> “There always has to be an aim for creativity and experimentation, the idea of how they will lead to something that can be applied. I think the managers have to provide the needed resources, and point the direction by saying that ‘here are the tools, start digging somewhere over there, and bring me something that can be used. - Of course the direction of an innovation can also be based on coercion, like the innovations of the banking sector, which took place due to the chaos during the depression.” (MAIK)

The *systemic interaction and connectedness* between the innovation, innovator, and organisation were stressed. Particularly organisation’s aim to create value as well as the managerial measures was found to be important for the innovator. An informant (KKIG) from a large company condensed the message in the following citation,

> “Persistence is needed for the innovator to take the innovation to the next level; nobody else will do it, but the innovator himself. The inventor-entrepreneurs have to have a holistic view of everything, from vision to the market. If there is no sponsor, he has to sponsor himself. [...] Management has to generate regular organisational changes in order to

> facilitate the development of the holistic view and healthy flurry in the organisation. […] Vertical and horizontal organisational solutions has been applied here, and it is the holistic responsibility together with the authorization of the units that works best and then the collaboration between the units must be emphasized."

The various *challenges related to the growth of businesses* will be discussed in the following categories, however it is important to point out that the creativity and innovativeness were furthermore relevant elements of the approach to growth measures. In order to find resource the entrepreneurs integrated internal and external resources. "For us the development started from inside the company [with our own resources], but making the internal resources to be integrated with the external resources has been important."(MIKF) Another entrepreneur stressed that, "always when making agreements, possessing the [external] professional legal knowledge has been pivotal for us, especially when dealing with the large corporations."(OLIF)

The following citation provides an example of the working methods of an innovator, who has the desire to expand his businesses:

> "My parents worked as entrepreneurs. […] The growth of our business started when I came to the corporation, since I have the tendency for the expansion of the businesses**. […]** We developed the corporation's new service innovations in some of the firm's units, and then scaled them up, to encompass the entire country. For me, behind my fast decision making, as my partners referred to it, there is however, plenty of background work and thinking, and when the moment has matured, the decision will be taken quickly." (MIKG)

Conceptualisation of the findings

In order to develop a more abstract and conceptual thinking for the emerging Grounded Theory, the previous results has been concluded as in the following

paragraphs. The following four aspects were discovered as the interlinking elements of the discussed strategies:

- The properties and dimensions of the strategies covered a wide range of time related and spatial dimensions, and hence encompassed a *visionary and holistic approach*. The holistic approach encompassed the capacity, to first diverge, and then to converge the ideas or phenomena related to the innovation.
- *Complementary interaction* and integration of different ideas and knowledge.
- *Tolerance of pressures, inconveniences and frustration*, and
- *Generation of tangible or intangible energy*.

In a more conceptual level, the previous rallying points of the strategies should be seen *hand in hand, namely, the first and second approach belonging together, and the third and fourth going likewise together*. They represent different aspect of same phenomenon, and hence support each other, in order to encompass and compress all the dimensions of the analysed strategies and working methods.

To epitomise this conceptual approach, a public example of Paul Krugman, the Nobel Laureate 2008 in economics, will we examined. Krugman described in a public interview (BBC), when awarded with the Nobel Prize, how "the breakthrough ideas are developed, by listening to the heretics, questioning, and by being fool and simplifying". - How does this citation then allude to the third and fourth rallying points of the strategies used by innovators? In view of the fact that, "listening to the heretics, questioning and being a fool" can be said to stand for the courage of being different, and thus to tolerate the pressures of the most probably unavoidable mental, cognitive and emotional inconveniences. Similarity, they can be interpreted to indicate the innovators capability to generate positive emotional and mental energy in order to tolerate the social side-effects of being fool, or even to have fun when listening to the heretics.

As discussed in the previous chapter, there are different types of pressures, inconveniences and sources of frustrations around the innovators. They can be faced if the pivotal energy is available. Systems, including individuals, can *generate both intangible and tangible energy*. For example, knowledge exchange provides cognitive energy, or empowerment provides emotional energy, as discusses in the literature review (Losada (1999), Hänninen and Saarinen (2007)). More importantly, the amount of available energy is up to decisions made by people. Individuals themselves are responsible for the generation of intangible emotional and cognitive energy. Likewise managerial decisions concerning prioritising lay ground for the tangible energy, like funding, labour forces, or equipment, need to overcome the obstacles related to innovation.

In order to open up and explain the found four linking points of the explored strategies, some more citations and arguments will be discussed. For example, a citation by a respondent from a multinational corporation represents an example of the emotional energy ("getting eager"), holistic view ("both strong and weak signals"), and finally the interaction (seeing the connections):

> "I don't know intensely about anything, but I know something about many things, which makes it easier for me to see the connections. I get easily eager – they have classified me as creative, and without any critics I am listening both to the strong and weak signals." (IKKH)

As described earlier, many of the working methods as well as the innovative lifestyle were classified as *visionary and holistic*. Furthermore, the exploration of new methods and development of strategies in order to cope with the increasing systemic complexity alluded to the holistic approach. It was illustrated, how the innovators had strived for the capabilities, pivotal for holistic methods and approaches. Lifelong learning, in order to guarantee the needed expertise and understanding of the increasingly complex challenges, breath of perspective and wisdom were urged from all partners and levels of innovation. The following examples are put forward to support this conclusion.

Statements referring to the holistic view were like,

- “opportunity to think big during once carrier [in a international multinational] made my holistic approach possible”(IKKH),
- “observing the development of the field and the transformation of the world from a real viewpoint [in the Future Committee of National parliament] supported the systemic thinking” (UKKH), or
- “making continuous multidisciplinary synthesis and studying all the time by myself [in a growing SME]”.

The following citation epitomizes the ideal holistic model for a working day, “Working during the mornings, whilst most creative and dedicating afternoons for the informal meetings or for reading” (USA). Working hard, and being productive in what doing, was a common characteristic for all of the informants. It was however, a sign of a holistic attitude towards one’s life, to include proper and *regular rest and leisure time* as a sound bases for innovating. Most of the best ideas were reported to be found, when out of the office, for example when in the morning walk, playing music, admiring the beauty of the nature, or reading something completely irrelevant form the point of view of the innovation.

Concerning *complementary interaction,* it occurred as exchange of ideas, knowledge, know-how, expertise and experiences. The interaction happened among individuals, organisation, regions and nations. Due to the specialisation of the individuals and organisations, interaction and networking was considered pivotal. (Like earlier presented citation by the venture capitalist, about the professionals swarming around same problem, illustrated.)

Innovators divided their time between the moments of being alone (in order to think), work, or to acquire more knowledge, and the moments, when they were networking or exchanged ideas and feedback. Informal reflection among likeminded, in an open and trustworthy environment, was considered as a

prerequisite, for the ideation and the support of the likeminded, which were considered as a source of psychological energy. Some of the informants highlighted the big difference between the formal and informal networking, in favour of the informal connections. In some companies, "sharing all the skills and know-how" was considered as one of the core values among the professionals. Being lucky and having good relationships with the venture capital and business angels, was highlighted as a source for solid bases for the expansion of SME. (MIKI)

Complementary interaction was furthermore considered as one of the main targets of development in all of the explored levels. That considered particularly management, since "isolation is often the reality of today's leaders."(NAL) It was referred to the,

> "collaboration and interaction with other people as the deepest essence of one's existence. However, a paradox of collaboration is due we have missed the learning opportunity to collaborate since we have all been trained as solo learners. […] Previously, culture used to work as a springboard of collaboration and networking. We should learn from that, take example the community of the lake Tuusulanjärvi [an area near Helsinki, where the Colden Age of the Finnish art originated] where the artists enriched each other's work and promoted moreover the national development." (AKK)

More and better interaction was urged also from the point of view of the corporations as the following citations illustrate,

- "What is needed in a SME is the sparring support including exchange of ideas and minor sums of financial help, in order to solve the problems and to move ahead quickly."
- "Finland is networking too much inside the fields, which can be considered as a fatal mistake" (USAI)
- In societal level the lack of fast distribution of knowhow between "the knowledge silos" as well as the leading companies and the educational

> system were urged to develop and use better interactive methods. "Finland has to internationalize, we can't live any more like in a bird's nest" (SIL)

The *tolerance of inconveniences and the generation of energy* are based on the following incidences and arguments. Related to the result of this research, stressing the importance of positive emotional energy, the following scholars' work has been discussed earlier in the literature review. Each of them discussed energy from different viewpoints; however, altogether, all of them highlighted energy as an important element of innovativeness.

Researchers like Losada (1999), Csikszentmihalyi (1991) and Senge et al (2004), Doz and Kosonen (2008), and Pearson (2003) have found relationship between positive energy and creativity or the related ability to examine and control our own assumptions. For example, Senge et al (ibid.) have discussed the "voice of judgement" (which refers to fear, judgement, and chattering of the mind) together with the Ilya Prigogine's idea of the importance of positive feedback, in order to create conditions for self-organising structures.

Furthermore, Csikszentmihalyi (1991) has highlighted the psychological energy or control of consciousness, related to the sensation of flow. Due to attentiveness and the control of external and internal conditions, individuals are capable to resist both genetically and socially originated deteriorating factors. In this research, the relationship between tolerance of inconveniences and generation of energy was found to be at the heart of the innovativeness of the informants.

'When the chips are down', the creative minds often find creative ways to solve the problems, however, sometimes there is no other solution but to "face the critical situation and to play with the cards that have been provided". Likewise, some of the informants mirrored their own awareness of their tendency to face the difficulties and not to escape them. "There must be some madness at all this, since life could be lived in a lot easier way." (ASIT)

The capability to find methods and life strategies to withstand the small or large constrains until they can be solved or removed, seems to be characteristics for the proactive innovation intellects. As one of the respondents expressed it, "ideas can be implemented in spite of the constraints of capital, time and know-how" (ERR). Similarly, like earlier was discussed, the carbon is compressed under high pressures to turn into diamond. Based on the data it can be claimed that without tolerance of pressures there would not be less diamonds of innovation.

What is then behind tolerance is more difficult to prove based on the present data. It can however be assumed that two slightly different types of reasons may be connected to the capability to tolerate the inconveniences, which people normally try to avoid.

As discussed earlier, innovators' softer values relate to their faith in common good. Furthermore, the harder values like persistence and courage, together with the capability to act hard-edged, or to use the hard measures if necessary, were found to provide optional connections to the tolerance of frustration and inconvenience. This supports Csikszentmihalyi's (1991) idea of the dissipative structures[3] of the human's mind (referring to the courage, viciousness, persistence), which were said to create more complex order from chaos.

The *hard and soft values together with innovators capability to generate emotional and cognitive energy seem to provide the bases for this tolerance. Emotional energy* (Losada (1999)) as proved earlier is based on individuals and teams' capability to empower themselves and others with positive energy. It is

[3] "A dissipative system is characterized by the spontaneous appearance of symmetry breaking (anisotropy) and the formation of complex, sometimes chaotic, structures where interacting particles exhibit long range correlations. The term dissipative structure was coined by Belgian scientist Ilya Prigogine, who pioneered research in the field and won the Nobel Prize in Chemistry in 1977." http://en.wikipedia.org/wiki/Dissipative_structures

well known from top athletes' peak-performance or the descriptions of the sensation of flow related to the creative individuals' work (Csikszentmihalyi's (1991)).

On this study, evidence was found of similar positive energy behind the tolerance of inconveniences and frustrations. With *cognitive energy*, this study refers to the earlier discussed mind power and wisdom, generated by the innovators with their holistic and interactive approaches. Cognitive energy is based on the holistic and interactive approaches providing the rationale to understand the requisite inconveniences and their temporary role in the progress of innovation.

To sum up, respondents continuously reproduced or internalized the outside system and circumstances in their minds while describing their working and life strategies. They mirrored not only the multifaceted organisational and innovation related realities, but the society and the global context as well. Thus, when dealing with the many simultaneous and often controversial realities, the creative individual's life and working strategies related to tolerance and generation of energy. Consequently, a GT narrative has been put forward.

Developing GT narrative based on the previous concepts

Chaos is a fundamental part of systemic life and unavoidable during the non-linear phase of discontinuations. The innovators, consciously and intuitively, understand the importance of energy embedded in the temporary chaos, hence, sometimes they welcome the chaos in order help the system to make the needed change. That happened in the Finnish Banking sector during the regression in 1990s, since, "discovering unexpected opportunities, becomes easier during the temporary disorder (NAIC)". Taking the importance of chaos even further, as an example, a multinational corporation changes its organisation to facilitate innovation.

It was proposed (in chapter 2.1, proposition 3) that creative individual has to master the domain and they furthermore have to have the access to the field. This proposition was evident among the participants of this study. Moreover, the interaction was crucial in order to obtain the intersection of domains. However, the acquired knowledge of the domain was often questioned, and the knowledge-categories were broken in order to develop new ones. Innovators were independent and self-organising concerning the domain and it maybe because of their capability that they become the "giants which our country needs." (ITSI)

Innovators also knew when the rules of the system have to be broken, and they all had the needed courage to do it, when time was mature. "The decision to start the institution was made, because it was what the citizens needed, even though the politicians approved it only afterwards (SILI)", said a respondent concerning the courage needed for starting the execution of an innovation without political decision.

Another one described the courage needed for dealing with the official domain, "one can't be restricted to the old paradigm and neither can one be afraid of being aware of what will come out from the analysis. (ASII)" Being heretic and opening the locks in one's mind was one type of method, while others prevented those locks from being locked.

"At the name of efficiency industrial fields have become overspecialized, and hence, there is no more space for creativity" (KKI B 61). Innovators paradoxically stressed that, due to the market situation, there is a need to be more agile, however, at the same time one should be more patient, for the fact that innovation matures slowly. (MIK)

Likewise, it was paradoxical when, the middle managers had claimed for the killer applications, while top management had requested for new, wider

frameworks for the future radical innovation. Other paradoxical cases were related to the situations, when the innovator's radical innovation was in position to destroy the entire field of business.

When facing the paradoxes, the respondents used simultaneously several different methods to tackle the variety of different challenges. However, coping with the contradictory principles and rules was not easy, and had hence led to ultimate parting of ways between the innovator and the organisation. In all cases, the positive emotional and cognitive energy received from like-minded professionals had proved to be pivotal. Furthermore, it was reported that "protector from company's board and isolation of the innovation" had made the long-term work fruitful.

Generation of positive energy for oneself can implicitly be seen embedded in innovators strategies and actions. Respondents had since their childhood kept their minds busy with curiosity, and their attention had then been focused on various interesting topics. Passionate and enthusiastic about learning, together with the courage to contest the existing knowledge, provided the holistic understanding of problems and related phenomena. "This is a continuous expedition, driven with the curiosity of discovery – and it is not the end of the story, a new innovation would be the most exciting outcome." (NNAM)

Due to the capability to rebellion what concerned the conventional truths, principles and rules, the innovator had an advantage of holding the most probable vision for how the domain might develop in the future. That provided a sense of control and a sense of self-growth, which were the main drivers of their work. According to Csikszentmihalyi (2005), these are the characteristics of sensation of flow related to the increasing complexity.

Interestingly some of the respondents reported about being a perfectionist or control freak since only "control helps me to take care of the routines quickly enough, so that time will remain also for creative thinking and action."(ALI)

Addiction to creative thinking prevented however, some of them from working with routines. “Luckily there are also linear people, those who like the repetition, they are my salvation,” (IKKE) said a manager who stressed that he is one of the rear non-linear persons.

Apart from being able to empower him or herself these people reported about being empowered by other people, receiving something that can be called emotional and cognitive energy. Being open to wisdom, knowledge, ideas, positive feedback, and criticism, as well as emotional expression like compassion or joy and happiness of other people, was found to be characteristics for the respondents.

Providing positive energy for other people was a trademark of the innovators, as one of the informants put his starting point, “I do not accuse those in trouble, or who created the problem, I look at myself and ask what I can do” (CIR). In a multinational company, the guideline of the manager was to provide the business units and their staff with the needed resources and authority for their operations.

The compassion towards others had encompassed even those who had been mocking the innovator. A visionary entrepreneur had received feedback from being able to “empower people to use their creative capacity”, (MIKE) and another one was “liked by [her] staff, due to providing them a sensation of [her] trust towards them and the support if needed. Authorisation of the people and providing them resources, and letting them know that my support was available whenever needed, paradoxically they seldom needed it, [was the guideline of my leadership]”(NAIS)

Both intangible and tangible energy was received also from the external innovation ecosystem. Affecting public opinion, especially throughout culture, internet and media, had been found as an important channel for empowering the collective mind and memory with elements, which are fruitful for innovation

and creativity. (In Cambridge region, it was considered that, providing information about innovations and innovators for the public, was considered so important, that the business angels had funded a new magazine, which was dedicated for this purpose.) Media, politicians' support, researchers and educators' contribution as well as the legal and financial help were found as pivotal for innovation, and they will we discussed more deeply with the third main category.

5.3.4 Deteriorating factors originating in innovator's own creativity and way of working

The creative individuals furthermore discussed the possible deteriorating factors, which were found to be embedded in innovators, in their own characteristics or behaviour. This subcategory encompasses the following dimensions or twin concepts, namely the deteriorating factors leading to *mental blockage, social discomfort, or difficulties in value creation*. Each of these dimensions was found to have internal or external origins, multiplying or provoking the individual related deteriorating factors for the innovation. Each of the dimensions encompassed also ideas about how to manage, or to cope with those deteriorating factors.

Deteriorating factors leading to innovators' mental blockage were categorised to individual involving internal and external sources. These factors were more often dealt as a threat, than an actual everyday experience of a problem. Mental blockage refers to the state of mind (219,187,188) when *ideas are draining or one has blind spots*. One is "lacking a vision" or has "a restricted vision", or the innovator has "been locked with the old" nor capable for "creative or radical thinking" or "to distinguish what is really crucial."

Internal, individual based deteriorating factors causing metal-blockage

Internal, individual based deteriorating factors causing metal-blockage were found to be connected to an observations concerning

- "inadequate self-knowledge (248)",
- "being too critical towards oneself (229, 230)", or
- "being naïve or stubborn and turning the death ear for advises (894)",
- "need to know everything about everything, and going all the time to the future encumbers ones working memory (298,235)", and
- "failure in acquiring the needed knowledge and know-how or in using the subconscious" (145,627, 296).

There were two different types of ways of *coping with the internal deteriorating factors and getting rid of the mental blockage or its fear*. One was paradoxically the devastating way, referring to those incidences when the innovator had faced serious difficulties or pain forcing him or her to stop the life for a moment. These problems related to difficulties like losses of family members, facing long lasting illness or personal economical crises.

Serious problems were referred as an opportunity for personal growth, the growth, during which all the crucial values were reorganised, and a new insight was obtained, after having scrutinised one's mindsets. The attitude towards the personal growth can be compressed to the citation, "Better late than never". Since, after a long period, the self-knowledge had increased, and due to the sensation of returning control of oneself, ones self-esteem got better and provided trustworthy mental milieu for the creativity.

Second way of managing the deterioration was based on *networking or finding a forum of interaction* providing not only needed knowledge and straightforward feedback, but the "vital sensation that one's message or idea has been understood," and if possible, moreover approved. Interaction could also lead to better balancing among the administration, technical productivity and

creativity, and hence providing more time for the actual innovating, like one of the innovators said:

> "Finally they organised the groundwork for the broadcasting of the Eurovision Song contest in such a way, that I had to participate only very few administrative meetings. That was important, due to the time pressure and the fact those meetings provided very little, if any benefit to the actual creative output of the project, which was in my responsibility, and which after all, was at core of the show. (EKK)"

In both ways (throughout devastation and networking) of overcoming the internal deterioration causing mental blockages, the informants highlighted the importance of personally appreciated *sources of tranquillity, like silence, rest, experience of being bond with family members or nature*. "I do not anymore overload my mind and brain by watching TV, or reading magazines. I need to leave space for the thoughts and creativity. Luckily the atmosphere here [in the corporation] supports the idea of going to the future, I take the advantage of that, (999)" was described by a manager who had gone through a process of personal growth after some very painful losses.

Externally originating deteriorating factors, causing innovator's mental blockages

Externally originating deteriorating factors, causing innovator's mental blockages**,** were substantially often based on the two-way *social discomfort, due to the continuous need to manage the shame of loosing ones face, or because of the jealousy and envy* towards the innovator. The pressures related to the culture of shame (also called management by shame) were associated both to the fear of failures and success.

Comments like, "how special do you think you are?" or another modification of "what do you think you are?" had been common when an innovator had become internationally successful, but they had appeared together with a lot more

modest success. The culture of shame was experienced as a means of threat and pressure. There was pressure to be similar as others, to avoid the risks for failures and too extensive success. *Management by shame* was explained to be the main explanatory factor for the small number of Born Globals and growth companies.

Sadly, it was found, that no matter how well intentioned the innovator was, there always seemed to be people around, who did not approve the diversity of the innovator or his ideas. Envying and downplaying innovators took place, along with putting pressure to be similar as all the others were. Hence, an innovator often received comments like, “Keep your hair on! We have always done it in this way, we never did it in your way (900)”, “go away, go fly a kite! (899)”, or “why are you whistling in the wind, it will be a no go. (898)” Or even worse, the innovator knows that, the comments are there, but they are expressed behind ones back.

Obviously, this type of continuous, but so useless, pressure can generate a mental blockage, or even a desire to move to a more fruitful environment, as it was explained with one of the world leading creative professionals,

> “The creative individual cannot carry on, if after having wholeheartedly dedicated him- or herself on something very significant, and when the work has been done and the results are there to be celebrated, one faces only people implementing the strategy of downplaying. The desire to move, to a more mature and encouraging environment, increases in a hostile environment like this. Sadly, I know that, many people have done it.” (AKKTofI)

Another informant explained that because of the pressure of shame, the radical thinkers often try to hide their diversity, but “the diversity often finally brakes out of all recognition” and “I believe we should break cover, so that the [linear] culture could finally change.” (207, 261)

Apart from envy towards success, it was furthermore, widely discussed about what are those reasons that provoke discomfort and mockery among the others. Innovators characteristics, which are simultaneously pivotal for the innovation and socially undesirable, were found to be at the heart of the discomfort felt by the others. In order to illustrate, what kind of behaviour and characteristics irritates the others, the informants used expressions like:

- "I just cannot keep down the line (203)",
- "I have a difficulty of coordinating the abstraction of the radical thought with routines other people speak about, and due to that, I have been misunderstood so often (629)",
- "I hate routines (NAITofI),"
- "I look as mad as a hatter when doing things so differently (282)", or
- "the best entrepreneurs, they are real crackpots, as I am (212)."

Innovators' most important means to cope with the sensation of "being hurt, (622)" , "publically humiliated or debarred by the others (OKKTofI)" were then based on *good self-esteem, self-empowerment, balance and tranquillity in one's life and networking with likeminded*. The lucky ones had *an encouraging manager or a protector*. *Going separate ways* was the final solution to manage the unbearable situation.

Deterioration factors related to the value-creation phase of innovation

Deterioration factors related to the value-creation phase of innovation were many, and in this category, they have been associated with patenting, internal collaboration of large companies and organisations, and the generation of new businesses.

"Victory has got many owners! When, we finally reached the phase of patenting, people who had earlier generated only problems, appeared to the scene, and wanted to have their shares. (ASIP)" It was hence reported, how *patenting had*

turned to a nightmare, due to the people purposefully harming each other's patents, something that had led to full failure of innovation.

Plagiarizing of immaterial innovations had been taken both as flattering and as stealing among the informants. "They are copying everything, but we are one step ahead and have removed the cream. (MYP)" The disagreements concerning patents were either overlooked or settled in the court.

In large companies and organisations, the difficulties accumulated with the contradictories concerning various innovations. Concerning the innovators' experiences, it was found painful when the innovator was not allowed to introduce his or her idea, and "it was like the baby had been removed from the parents (897)." That had happened for example "due to the number of levels of hierarchies separating the innovator from the decision makers (633)". *Middle managers and power struggles* where most often referred as reasons for the failure of the value generation in large organisations. Furthermore, it was said, "in those power games the innovation and an innovator were used as pawns (679, 612)."

Apart from good management, "legislated dissenters" or "technology fellows" were found useful to avoid problems. Innovators own actions were mainly restricted to the earlier described ways of increasing one's own emotional strength, if stayed in the troublesome organisation. That was said to be possible, since "a radical innovator can start a new process from a scratch, again and again. (ATTTofI)"

Informants, who had operated as protectors for other innovators, confirmed that sometimes the risk just has to be taken by the management. A manger in a multinational corporation said, "As a board member one sometimes has to give the unofficial permission for the innovator to continue – 'just do it, but, we will not yet speak about this for the others'. (IKKP)" It was furthermore reported

how, as a protector, one had to "shepherd all the time the execution of the innovation in the organisation. (SILP)"

The roadmap to entrepreneurships

The roadmap to entrepreneurships faces several *interlinked external and internal deteriorating factors*. Apart from the earlier discussed problems related to the general attitude towards success, *finding financing and legal support or finding good staff and fighting the public windmills* were furthermore found as deteriorating factors and will be discusses relating to the next main category.

With *internal difficulties,* the respondents referred to "inventor's difficulty to find motivation to make businesses with their innovations". It was reported, for example, how "the innovators, behind the original technical solutions of the internet browsers, where encourages to commercialize their ideas, but sadly that did not happen" (850).

On the other hand, it was found to be difficult for some of the inventors, to let the innovation go, and to sell the innovation or his company. "Some of us are simply too fixed with our inventions and that is when compromises become impossible. We do not sell we continue developing. (TIGS)"

Innovators found it sometimes difficult to take the risk of allowing the funder to interfere the management of innovation or company. In the other extreme, others said that they had found it very useful and releasing to "make myself useless, and to get rid of the burden of the execution of the old innovations and management of the companies (190)."

Hiring a good manger, or selling their companies, had provided the innovators the needed time and capital to generate innovations and business. In short, "to do what I like most and what I am best at. (MYS)" In general "positive realism

(164)" and "capability to react to new opportunities (253)" were found as important when taking the risk of making business out of the innovations.

5.3.5 The summarising discussion on innovators managing the innovation related contradictories

Chapter 5.1.2 has introduced the subcategories related to the "proactive innovation intellects." Even though there was some variation in the backgrounds, as well as in the essence of the creative individuals, the main results were essentially in accordance with previous research, and it might be said that the respondents of this study can be considered creative or innovative in a very much similar way as the baseline in the literature. It can be compressed that,

> **the proactive innovation intellects** *of this study who are the forerunners of their fields, or the leading lights of the societies, saw what was next needed and why. They fought for the better, sometimes by behaving like true heretics, because before the big majority, they knew or understood the unavoidability of transform, and despite all the discomfort and frustration, they found the satisfaction from what they were doing by perceiving themselves as the ingredient of something bigger than themselves*.

As many roads lead to Rome, many different backgrounds, characteristics and working strategies were found embedded in the proactive innovation intellects. This result resonates with Jacksons (2005) idea of complex systems were different situations call for different methods.

Innovators life and work experiences were found to develop not only during the harmonious phases, but also during the phases of turbulence. Due to the *many tensions* concerning, not only the essence of innovation and radical breakthrough thinking, but also the many controversial realities the innovators face, it was

found that the *phases of turbulence or chaos* provided an important starting point for a deeper analysis.

It is however, important to highlight that the findings related to the tensions, did not include any specific moral aspect. That is to say, the informants illustrated and reported about their experiences but they did not criticize or complain. That is why in this study, the *incidences loaded with tensions, pressures, setbacks, frustrations, inconveniences got a more important role than what has been the case in the earlier discussed literature*. Logically but furthermore painfully, setbacks, which had happened during the pre-carrier face, were found to be one way to build up the needed capabilities for the future discomfort related to innovation.

As the radical innovators were concerned as the litmus test for the essence of creativity, the breakthrough moments related to the radical thinking, the phases of discontinuations, and the tensions in the system were all used as an acid test for the essence of radical innovation process. So to say, to analyse what was the extreme innovation like, experienced by the radical innovators.

When the innovators were analysed during the different type of life and working phases, it was found that, the solid bases for the pivotal characteristics for innovations was related to the *alteration of the harmonious and turbulent phases*. Due to this alteration, the self-knowledge and self-esteem had gradually developed, and individual's solid value system, possessing both the hard and soft values, had matured.

It can be said that, Csikszentmihalyi's (1991) idea of the *embryonic and flourishing complex self* was found to take place both in the form of differentiation and complementary interaction. *Differentiation* appeared not only at the form of uniqueness of one's mental self, but furthermore, when acquiring the needed knowledge and know-how, in the form of professional specialisation. *Complementary interaction* encompassed the interaction among

people, integration of knowledge, and the integration of oneself. Differentiation and complementary interaction proved to be pivotal when facing the multitude internal and external tensions and discomfort related to the innovation.

There is seldom only one breakthrough moment in radical thinking, instead a long-lasting exertion takes place during which there are many tipping points. A *bifurcation point*, the moment when the decisions are made, resides '*a prior*' every tipping point and moment of breakthrough. It was found, that the innovators' *internal* tension and other innovation difficulties often referred to the milder aspects related to these moments. The *external* tension and difficulties refer to the bifurcation points, the moment when the external system is in the far-from-equilibrium state.

With the help of the acid tests, it was altogether found that together with the internal and external tensions, the following *four intervened aspects pointed the essence of innovator*.

Firstly, apart from the specialised professional knowledge and knowhow, the innovators were found to apply the *holistic approach* to the innovation and additionally to the life in general. Based on the results, the holistic approach has been described to cover the time and space dimensions, as well as the tangible and intangible aspects of working methods.

The holistic approach supports the fourth proposition (saying that, "an incremental innovation can be based on existing explicit knowledge and traditional learning. Radical innovation corresponds to new and tacit knowledge and deep learning related to the emerging future.") This finding equals altogether to the discussion about the importance of different knowledge types as the bases for the exploration of future innovation. Most importantly, *the holistic approach encompassed the deeper levels of cognition and the process of becoming aware*, similarly as the earlier discussed U-learning curve and the related theory states (Scharmer (2007)).

Secondly, together with the holistic approach, the *complementary interaction* was found to happen. The complementary interaction implied both the internal processes related the innovation problem solving and the perpetual progress of *the self*. The innovators' introduced methods of integrating a wide variety of tangible and intangible knowledge, abilities, emotions, knowhow and skills. Integration and interaction encompassed furthermore the external world knowledge wise and emotion wise.

Consequently, it was throughout the complementary interaction, that the rationale, behind all the exertions and discomfort finally was founded: To become heard and understood by others, and to be able to give ones contribution. Both of which were important sources for intrinsic motivation, and they become materialized only throughout the interaction with the others.

Integration and interaction are two-way processes, which both provide the needed energy for the individual and the channel to provide his or her energy for the wider systems. Apart from a work contribution, individuals can provide energy for other systems in the form of cognitive energy (knowledge, ideas, and insights) or emotional and psychological energy. The energy fields of knowledge and emotions were found particularly interesting from the point of view of theory building. This fact is compatible with the systemic approach introduced in the literature review. – In short as the open system puts it, *systems need energy in the form of input, which will, during their throughput processes be converted to another type of energy or output*.

Thirdly, the innovators provided the evidence of enormous and continuous *tolerance of pressures, tensions, uncertainties, discomfort, inconveniences and frustration* related to the abovementioned internal and external factors. *Tolerance is possible because of the attentiveness concerning the internal and external conditions, or control of one's consciousness*. As Senge at al. (2004) put it, one becomes aware of one's thoughts and is able to think freely about the

future. The *tolerance of inconveniences* has been considered to be related to the psychological energy or control of consciousness related to sensation of flow, as illustrated by Csikszentmihalyi (1991).

Fourthly, alongside the tolerance of inconveniences comes *individuals' ability to generate emotional* (compare with Losada (1999)) *and cognitive energy* (compare discussions related to different form of knowledge). In the earlier discussed phase of idea diversification, a prerequisite for the radical thoughts to emerge and mature, the innovators had to generate cognitive energy. *With the help of the emotional energy, they could control their experiences and tolerate the tensions related innovation*. Furthermore, to take it to the extreme, they could find pleasure in manipulating the complex and challenging symbolic systems. Cognitive energy helped in generating the holistic view of the issue or innovation under construction.

What concerns the found subcategories and their dimensions, the previous four interlinking factors were furthermore found to be *valid when the individuals possessed harmony*. Methodologically, it has to be highlighted that the four connecting factors had remained hidden without the use of acid tests (that is to say, throughout paying a special attention to the internal and external tensions and the codes related to them).

It can furthermore be said, that the respondents of this study dealt multifaceted experiences concerning the "all-inclusive and all-around" conception of innovation and creativity. Lastly, the propositions in chapters 2.1.5 and 2.2.4, and the found results concerning the category of "proactive innovation intellects" go well hand in hand.

To sum up figure 50 puts forward the intervened key discoveries into one figure. The black curve at the bottom illustrates the solid bases for innovation, the trustworthy and encouraging culture. While the green curve (a helix) and the red spiral refer to the mechanism throughout which the breakthroughs related to

the innovation take place. The mechanisms are imbedded in the individuals and are as following. The curve shown in red refers to the core of this mechanism the interrelated holistic and complementary integrative approaches. The green curve represents the two way process of the tolerance of inconveniences and the generation of emotional and cognitive energy.

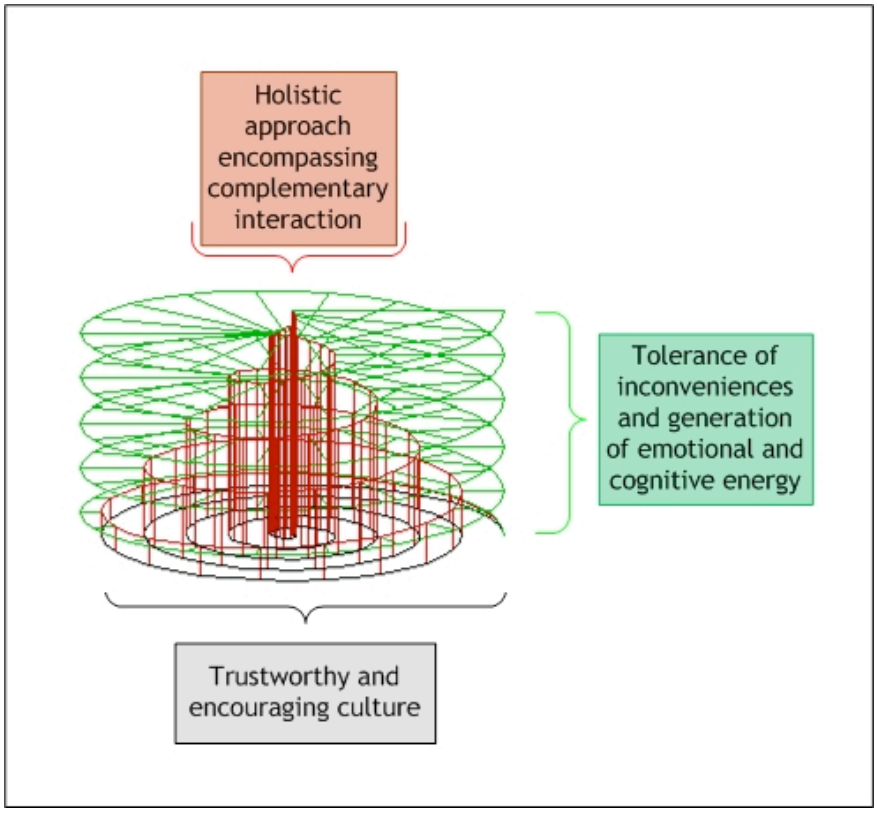


Figure 50 Intervened factors of extreme innovation experience

5.4 The main category of “innovation ecosystems”

“Innovation ecosystems” is the third main category investigating the aspects of the innovation-individual-context relation, which has been experienced as relevant by the informants. The main category comprises the following subcategories:

- Innovation related Subsystems in interaction
- Relationship systems between the context, mainstream, and incremental and radical innovation
- Relationship systems between the context and different phases of innovation
- Local – global scope of innovation ecosystem
- Elements of Self-renewal and self-organisation

These subcategories encompass deteriorating and reinforcing factors relating to the organisational aspects as well as the wider societal or international innovation ecosystems (tabel 32).

Table 32 Innovation ecosystem subcategories emerging in the macro and micro levels and in the hard and soft systems.

	Hard subsystems	Soft subsystems
Macro level IES	- Strategic management and the role of vision - Local – global scope of innovation ecosystem - Funding, growth orientation and the role of market - Taxation and legislative framework of innovation and businesses - Innovation & business services and innovation arenas - Knowledge and education - The role of UNI and other HEI - Diversification and complementary interaction of universities and industry	- Autonomous Individuals as the heart of Self-organising - Atmosphere and attitudes - Values as a source of consistency and security while the system is in chaos - Self-organising relying on the responsible teams and individuals - Empowerment and psychological energy as a means of self-organisation - Energizing leadership, innovative media and educational institutions as driving forces
Micro (organisation) level IES	- "Change or die," the motto of the vision and strategic management - Management in Innovation ecosystem - Communication about innovation - Contradictions, like "efficient mainstream vs. radical innovation" - Implementation of radical innovation - Economical aspects related to innovation - Power struggles due to innovations	

5.4.1 Systems Approach to innovation ecosystems, developing the Grounded Theory

Like the two previous main categories concerning innovation and creative individuals also, the innovation ecosystem is a rich and multidimensional phenomenon. Continuous linear and nonlinear changes appeared in innovation ecosystems under inspection. Systems, their subsystems and innovations were described to evolve, flourish and expire in cycles of recurring steady state and a state, which is far-from-equilibrium. The cyclic movement of systems was found to be critical when the political and economical leaders described the conditions when an innovation ecosystem had managed to generate radical innovations and exceptional leap jumps to the next and more advantaged level of order.

The **core category** of this study, namely **"the reconciliation of many innovation related controversial realities at the same time"** has been deduced from the main categories of "innovation and creativity", "proactive innovation intellects" and "innovation ecosystem". Due to the many overlapping layers (micro, macro and meso levels), various time horizons (past, present, short-term and long-term future) and controversial realities of the system-of-innovation, this study has utilized systems approach in aiming to reach a more comprehensive overview of the innovation ecosystems.

Systems theory has been found as useful, as it has facilitated the analysis and synthesis of the environment-system-subsystem interactions from different viewpoints. It has furthermore increased the awareness of the cyclic alterations in systems. Continuous alteration between status quo, the minor changes and chaos appeared and were perceived as natural phases of the systemic life cycles under examination. The cyclic alteration was furthermore found to be fundamental for the conundrum of innovation; from preparation and ideation of innovation to the execution and breakthrough phases.

However, no one single type of change was found from the innovation ecosystems, but the change, as a phenomenon, was multidimensional. Especially, the found deteriorating and reinforcing factors of innovation were related to the *tipping point* of change. The moments before the change and actual innovation reside at the very heart of the analysis concerning the innovation ecosystems. Consequently, with the help of the systemic approach, *bifurcation points* were indentified prior to the more radical innovations.

Another simultaneous phenomenon, namely *autopoiesis*, was indentified to be in relation with the more moderate incremental innovations. It turned up that *during the phase of status quo and the more moderate developmental phases, systems acquired more knowledge, capabilities and potential to cope with the more turbulent eras*. As the radical innovations involved great risks, furthermore

the paradox of success was considered as a risk for the system during the more moderate developmental phases or status quo.

As a result, the core category of the study points out that, in the conundrum of innovation, self-productive (autopoiesis) and self-organising (takes place whilst the system is in bifurcation zone) phases of systems are in cyclic alteration and, furthermore, the status quo, and the linear and nonlinear changes take place simultaneously in the different innovation subsystems.

Therefore, once again it can be argued that, related to the innovation, there are many simultaneous controversial realities present at the same time and the *management takes place in the innovation subsystems rather than as a comprehensive managerial activity of the innovation ecosystem.* This result furthermore triggers the *human centric and bottom up approaches* of the innovation ecosystems, the immanence of human individual.

Table 33 sums up the conceptual relationship between the innovation conundrum and the alternating phases of innovation ecosystem. The results related to these topics will be discussed more in detail in the following sections related to the subcategories of innovation ecosystem.

Table 33 Functions of the status quo, and linear and nonlinear changes of self-organising systems in relation with the conundrum of innovations

During the Status quo	During the Linear change	During the Nonlinear change
Efficient mainstream is maintained, it often prevents radical innovation. Organised system focuses on its main mission and does not waste energy. It may however use its energy (tangible and intangible energy, like increase of awareness, knowhow, attitudes) to prepare itself for the nonlinear phases of the system. There resides an evident risk of the paradox of success.	Slow development of the system is based on incremental change and innovations. Innovation related subsystem is based on autopoiesis (self-production). Energy maybe used to prepare the system for the nonlinear phases.	Radical bottom up change of the system takes place due to the entire system's strong commitment. There reisides a bifurcation point *a prior* the breakthrough of the radical and systemic innovation. After the bifurcation zone new order in the system becomes possible. The tipping point, when the self-organisation takes place refers to the laissez faire or permissive management. Management *in* systems, (not of systems), makes it possible to reach this moment. Subsystems capability for self-organising requires better awareness and knowhow, more knowledge and emotional energy due to the increased disorder in the system (ideal organised disorder).

5.4.1.1 Systems thinking; system priority versus environment priority

The results of this study triggered the question related to the more recent systems approaches (Ståhle (1999), Maula (2006)); namely to what extent are the systems adapting to their environment and when are the system and their radical innovations proactively changing the environment. As an example of the latter, in the autumn of year 2008 the (negative) financial innovations had turned the world's economical environment systematically and radically. Likewise, but in a smaller scale, some innovations discussed in this study namely telecommunications, mobile phones and SMS had changed the business environment of communication.

The open systems approach has laid ground for the earlier analyses of the system–environment relationship. It has been learned how systems can develop throughout their vision and the critical information about the environment. Open systems approach reminds of the importance of systemic learning encompassing both the past and future. This study stresses the importance to be aware and to manage the two time-horizon (short-term and long-term) simultaneously, since it enables incremental and radical innovation. It is however important to realise that the continuous *cycle of recurring steady state and far-from-equilibrium encompasses controversial factors and risks. E.g., there is an embedded risk of steady state and incremental innovation cannibalising the system's capability for the leap jump to the next stable period.*

Helsingin Sanomat provides an article to epitomise the argument with today's economical situation. The editorial concerned about the countries economical situation wrote on 18th of October 2009, "There are no new Nokias in horizon because at the 1990s companies learned to concentrate on their core businesses and to cut the runners – once Nokia's electronic division was such a runner."

That is to say, the incremental development of the existing businesses during the last decades has cannibalised the development of new radical innovation. This was not the case in 1970s to 1980s in Nokia, which instead of concentrating solely on the development of tyres and rubber boots allowed the electronic division to mature.

Furthermore, it can be inferred that the system-environment congruency, which was stressed by some of the system approaches from the past decades, can be considered as a logical hinder of the development of radical innovation. This risk is evident, if the system is not proactive or agile in reacting to emerging future opportunities, due to the fact that the required congruence has locked the system to the present or even worse to the history, and thus maintains any preceding situation.

Notwithstanding the system-environment congruency, radical innovation claims for the capacity to perceive and learn from the emerging future and it challenges the system to be proactive in generating a change in the innovation ecosystem. From the point of view of radical innovation, the adaptive-organic systemic approach has been perceived more fruitful. Thus, throughout the analysis of radical innovation in the system-environment relationship the idea of self-organising innovation ecosystem becomes more apparent, which furthermore leaves space for the understanding of ‘the open innovation’ and ‘the public innovation’, both of which are more recent and most probable future development trends of innovation. The idea of self-organising innovation ecosystem is parallel to Hamel’s (2002) notion of the Management 2.0 and the bottom up development of organisations and systems of the emerging creative era.

5.4.1.1 Individual, the link between innovation and innovation ecosystem

As the previous research literature (Scharmer (2007)) has claimed, systemic learning has been found to be a prerequisite both for the linear and nonlinear change (incremental and radical innovations). Alluding to the previous research, it was furthermore found and explained in chapter 5.1.2 that the role of *individuals' increased awareness and the pluralistic values* are crucial reinforcing factors for the systemic learning both in organisational and wider societal innovation ecosystems.

Therefore, individual can be seen as the link between the innovation and the innovation ecosystem. The found interlinking mechanism however, deviated from the rationale behind the dominating networking ideology of our era's management literature. It was namely discovered that, the individuals are neither physically nor virtually networked with the other people all the time.

Nevertheless, the interlinking mechanism operated throughout the visionary individual in a more abstract level, namely, throughout the *individuals' awareness of himself as a proactive part of the innovation ecosystem*. Based on the informants' experiences, creative individuals were conceived to reside in *cyclic and altering periods of solitude work and enriching interaction with other people, organisations and the wider economical, cultural and institutional systems around them*.

The visionary individuals were found to be the subjects of their communities' creativity. They were people capable of doing the time-consuming thinking and learning in isolation; however whenever needed they integrated themselves with the larger entities and communities surrounding them. Furthermore, the following was discovered

- denoted connection between individuals' awareness, organisational learning and pluralistic communal values,
- trust towards individuals' capacity to be creative, make decisions and carry responsibility,
- balance between open access to knowledge, knowhow and critical thinking, and
- balance between doing things together and alone.

Previous discovered experiences will later be taken into consideration when developing the model related to the management of the simultaneous and controversial realities.

The following citation by a technology company's manager epitomises these findings. The context of the citation alludes to the transformation towards the digital transmission of TV-signal in Finland.

> "Due to the fact that the innovation systems are unaware, it is the individuals' high level of awareness which is crucial. People should be acquainted with who they are and where do they come from. Expressing one's aspirations are crucial for any innovation ecosystem. Continuous questioning, asking why and why not are the prerequisites for systemic learning. On account of the fundamental characteristics related to the systemic unawareness, whenever setting up societal experiments, utilizing technologies as an instrument for progress, those decisions should be accompanied with wide societal debates asking why, what for. […] The importance of the societal pluralistic discussion is highlighted specifically while in chaos, due to the fact that in chaos there never is one right decision". (ISS20)

5.4.1.2 The emerging core category and the 'innovation ecosystem'

The core category of this study, "Reconciliation (management) of many controversial realities", alludes to the earlier discussed fact that many different

subsystems reside simultaneously in organisations and in wider innovation ecosystems. For example, Katz and Kahn (1978) the pioneers of system thinking, explained that the function of some of the subsystems is to maintain the existing order while the others are adapting the system to the environment. Applying to an industrial organisation, 'maintaining the systemic order' refers to the efficient mainstream productive activity, and the 'adaptive subsystem' refers to the product development and to the changes in the organisational structures and life.

Based on the more recent management scholars like Hamel (2002) or Doz and Kosonen (2008), the systems thinking can be extended to the point where the most agile systems tend to generate new order to the companies operative environment throughout radical innovations. Management of the different, controversial systemic functions refers furthermore to the *simultaneous management of productivity and creativity as well as the different time horizons any organisation or system has to take into consideration.*

From the viewpoint of the parallel management of the controversial realities of the mainstream and the generation of new innovations, it can be referred to March's (1991) thinking and his notions of exploration and exploitation. Throughout simultaneous exploration and exploitation, he encourages the simultaneous management of productivity and creativity. For example, Doz and Kosonen (2008) have illustrated how in business life a large multinational corporation, Nokia, has been able to reconcile both the short-term productivity, (reporting every quarter year what has been exploited), to the long-term, explorative and agile operations and success.

As Vasara et al. ((2008), 22) state, *reconciling two time horizons looks suspicious due to the logical differences*. They furthermore refer to the wider innovation ecosystems by writing how in a country like Finland, "we have to be in the front line when creating management looking at these two time horizons." Additionally, referring to March (1991), they state that integrating

the time horizons is possible, in spite of the logical incompatibility and difficulties.

The innovation experiences of the respondents of this study pointed to the reconciliation of simultaneous, controversial innovation related incidences and realities in the innovation ecosystems. These realities are based on different management logics and principles as well as the innovation incidences developing along different lines. The controversial incidences are part of the same reality and affect each other. The 'innovation ecosystem' represented the simultaneous and controversial realities.

5.4.2 Subcategories of 'innovation ecosystem'

The found subcategories of 'innovation ecosystem', summed up in table 32 (previous section), discuss the interrelation of innovation-circumstances considering both micro and macro level innovation systems, such as organisations, regions, nations or global business systems as well as their various subsystems like funding, knowledge transformation, value generation, management or social systems and values.

The subcategories of 'innovation ecosystem' refer to organisations, regions and nations,

(1) as *systems that can learn and renew* themselves continually *(self-productive*) and

(2) as complex systems that have a *capacity to create order from chaos (self-organising)*.

Systems that can renew themselves have been referred as self-productive (autopoietic) (Maula (2006)). Capability to create order form chaos have been described as "self-organising and self-structuring decentralized processes" (Doz and Prahalad (1993)) and "self-renewal" (Nonaka (1988) Ståhle (1998)). This study uses the expressions self-organising (2) and self-productive (1) as explained above.

In order to lay ground for the understanding of the reconciliation of many controversial realities at the same time, the results will be discussed together with notions of change, innovation and self-production and self-organisation. In this study the relationship of these notions has been illustrated as in figure 51

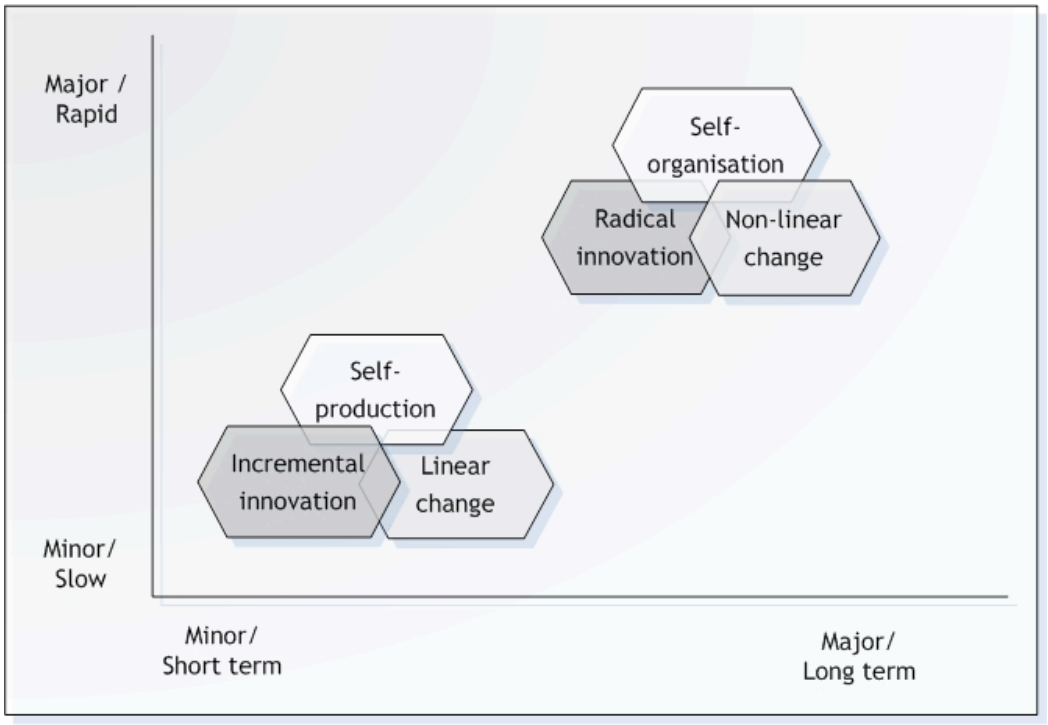


Figure 51 Relationship of the notions related to innovation and used in the emerging Grounded Theory.

The found subcategories related to the macro level system advocate a somewhat different approach to the innovation environment than the conventional National/regional systems-of-innovation approaches (NIS/RIS) which have been put forward by others. As discussed in the literature, the national/regional systems-of-innovation have conventionally focused on the hard side of the system. The result in the macro level deviates most on the importance of innovation's contextual elements, which in this study, have been referred as invisible and intangible or soft and human centric subsystems. *The significance of the human centric subsystems* was moreover found pivotal concerning the

micro level innovation ecosystems (like corporations, organisations, predefined professional entities or networks).

It was found that in the micro and macro level innovation ecosystems, consisting from the intertwined visible/hard and invisible/soft elements, it was the *interaction between those subsystems were most of innovation deteriorating and reinforcing factors can be deduced. The interaction was however paradoxical*. It was found that both the hard and soft subsystems complemented each other and facilitated innovation, however, at the same time the tension and friction between the innovation related subsystems also, reduced both the tangible and intangible energy needed for innovation.

From the point of view of societies and organisations, innovation can be considered as a litmus test, continuously questioning and testing the existing structures and processes designed for the past era's demands. Hence, as it is evident that tensions are fundamental in continuously self-renewing systems, the question remains of what kind of systemic and managerial innovations are needed in order to make the innovation ecosystems to evolve in accordance with the changing demands.

Obviously, the innovative people and their innovative ideas is not sufficient, since the hard side of the innovation ecosystem, the structures and processes are pivotal. The results indicate however, that the soft elements are embedded and take actively part at all of the innovation arenas and circumstances during the crucial moments of innovation. Tangible challenges and innovation deteriorating factors, like problems with the taxation systems or the lack of funding (hard subsystems), were most often told to reflect moreover to the fragile mental innovation processes (soft subsystems).

The data focused especially on experiences concerning radical innovations, and hence, consequently tensions and contradiction between the various subsystems were found to reside in the innovation-circumstances relationship. It was

analysed how the viable systems dealt with the contradictions, paradoxes and tensions, and it was found that the *"reconciliation of the many controversial realities at the same time" was not easy, but when it happened the (1) holistic approaches and strategies, as well as (2) the methods integrating the various subsystems were utilized successfully.*

That is to say, holistic innovation ecosystems, which reconcile simultaneous realities and encompass different time-horizons, *use a variety of different type of managerial tools for different challenges.* The result is parallel with the first proposition in chapter 2.4.3. (stating that variety of methods and tools are needed for the management of innovation), and it furthermore supports Jackson's (2005) findings about the importance of employing creatively the different systemic approaches to organisations.

This study is particularly concerned about the interaction between innovation and the prevailing real life circumstances when viable systems drive for success and survival. The core category of "reconciliation of many controversial realities at the same time" refers to the *conflicting forces for stability and change. These forces create both tension and cohesion into the systems and thus simultaneous productivity and innovation is a strategic paradox.* It was found that the paradox of cohesion and tension among the linear (self-production or autopoiesis) and nonlinear changes (self-organisation during the phase of transition) and the subsystems maintaining the current status quo reside at the core of the innovation ecosystems.

Maula (chapter 2.3.1.3) has earlier provided a comprehensive description about how autopoiesis takes place in the form of learning and renewal in the visible side of organisations. In her book, "Organisations as learning systems" Maula (2006) introduced, based on Maturana and Varela's autopoiesis theory, the theory of living, self-producing systems. Referring to enabling environments and infrastructures – the socio-cultural and technical conditions, she writes, "The theory of self-production can help managers to understand alternative

approaches to organisation components in a structured way that enhances the potential for self-organisation. (Ibid., 42)."

This study suggests that the understanding of the found "human centric subsystem's" mechanism completes Maula's ((2006), 78) idea of the non-physical system's boundary elements (sensing) and strategic elements (memory), and provides hence an even more comprehensive understanding about innovative systems that can learn and renew themselves continuously. The core result of this study, namely the human centric approach to innovation ecosystems, might furthermore increase our understanding about the simultaneous efficiency and creativity related mechanisms in systems and their operations.

However, as discussed earlier, there are moments when systems may be pushed into a state of far-from-equilibrium. In this state of transition, self-organisation may produce new order or create entirely new systems. Obviously, if unlucky, the system may also fail in creating the new order and system will then run down.

The purpose of a schematic figure 52 is to illustrate the transition, as interpreted based of the data, *when the subsystem of "nonlinear change" successfully takes place and creates new order into the system*. It demonstrates how the innovation ecosystem consequently grows into a new order in the evolving (future) time-horizon. Based on the experiences of the informants, it is obvious that the dynamic of that transformation is curial to be understood in management. However, how does the transformation actually happen, is a difficult question to be explored. The used method or the obtained data of this research does not provide tangible answers or descriptions of the transformation process. However, *the found features of the "self-production and self-organisation as well as the <u>management in</u> innovation ecosystems" outline the factors which seem to have most relevance concerning the discontinuations*.

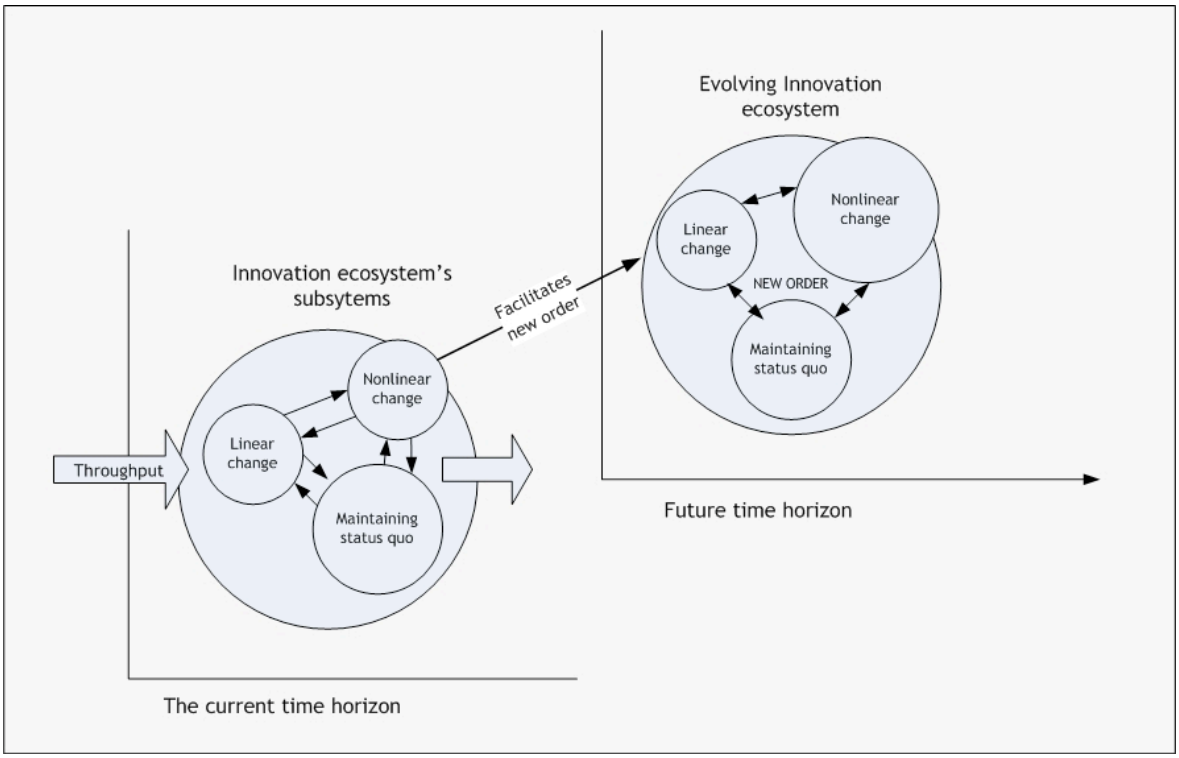


Figure 52 The two time horizons of innovation ecosystem.

Innovation ecosystem's change and maintenance related subsystems are in interaction with each other. The nonlinear change subsystem facilitates the transition towards the new order in the emerging time horizon.

From the point of view of the evolving Grounded Theory, it is highlighted that similar holistic and integrative elements (5.1.2.) which resided as elementary in the innovative individuals' attitudes and working strategies, were also found at the systemic level.

Moreover, in the renewing innovation ecosystems, *the role of human beings and societal values (among various other human centric subsystems) were found to be crucial when the innovation related tangible deteriorating factors were to be managed*. If the soft and hard elements were properly interlinked, the systems capability to facilitate its own development from bottom up appeared even more evident.

An example from computer game industry, which dated back to early 1990s, epitomises the bottom up development of an innovation ecosystems. As a group of innovators had been rejected by the governmental service and funding agency, an informal network of innovators, SMS and investors decided and then also managed themselves to generate a business innovation ecosystem for the digitalised amusement industry. The creative and entrepreneurial individuals however needed the tangible assets from the investors and their powerful networks. (HCS)

The findings furthermore support the proposition number four of chapter 2.4.3., which stated that, the already established macro level system-of-innovation notions, like NIS and RIS, should be complemented with an additional notion of innovation ecosystems (IES) in order to develop both pragmatic and scientific understanding of the circumstances reinforcing innovation. When considering this result, it should be kept in mind that, the data of this study was collected form pioneers and visionaries operating in environments, which already had proved their successfulness in concern to innovation. The result might have been different in some less victorious environments where the basic physical infrastructure, funding, legislation or other tangible fundamentals are still under construction. Hence, based on this study, *the suggested notion of innovation ecosystem (IES) is related to the most evolved and successful regions and countries proven to have provided a fruitful environment for innovations* (see chapter 2.3.2.3 for details).

The results related to the interlinked and partially overlapping subsystems of the macro and micro level innovation ecosystems will be discussed more in detail in this section. The Grounded Theory categories which refer to the hard and soft subsystems, will be introduced in table 34 (earlier table 32). Then, the relations, which have been constructed by comparing the categories according to their characteristics, will be discussed more in detail. The relations between the categories defining the respondents' innovation-circumstances experiences are:

1) "Cohesion and tension in the subsystems" and

2) “features of autopoiesis and self-organising innovation ecosystems & management in innovation ecosystems”

Figure 53 describes the relations of the innovation ecosystem related categories.

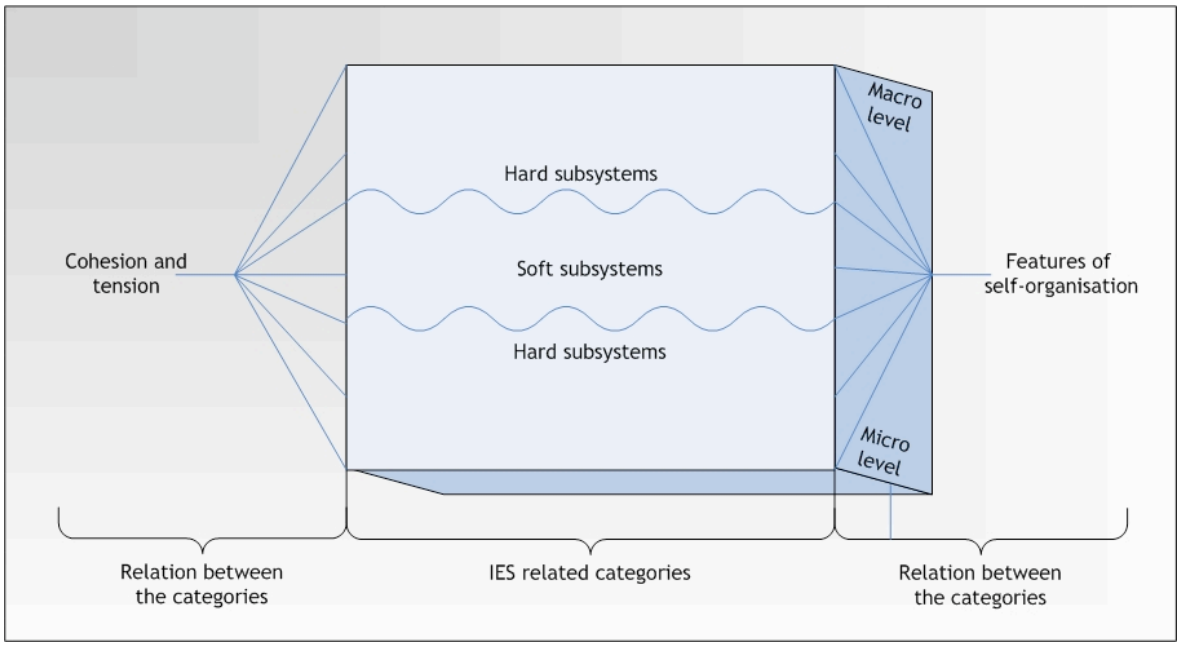


Figure 53 Relations among the IES categories “Cohesion and tension in the subsystems”, ”Features of autopoiesis and self-organising innovation ecosystems & management in innovation ecosystems”

It should be kept in mind that, in this study, the notion of innovation ecosystem has been defined broadly, and it refers as well to organisational, local, national as to global environments and innovation circumstances.

Table 34 Innovation ecosystem subcategories emerging in (1) the macro and micro levels and in (2) the hard and soft systems.

	Hard subsystems	Soft subsystems
Macro level IES	- Strategic management and the role of vision - Local – global scope of innovation ecosystem - Funding, growth orientation and the role of market - Taxation and legislative framework of innovation and businesses - Innovation & business services and innovation arenas - Knowledge and education - The role of UNI and other HEI - Diversification and complementary interaction of universities and industry	- Autonomous Individuals as the heart of Self-organising - Atmosphere and attitudes - Values as a source of consistency and security while the system is in chaos - Self-organising relying on the responsible teams and individuals - Empowerment and psychological energy as a means of self-organisation - Energizing leadership, innovative media and educational institutions as driving forces
Micro level IES	- "Change or die," the motto of the vision and strategic management - Management in Innovation ecosystem - Communication about innovation - Contradictions, like "efficient mainstream vs. radical innovation" - Implementation of radical innovation - Economical aspects related to innovation - Power struggles due to innovations	

5.4.2.1 Cohesion and tension in the subsystems

'Cohesion and tension' describes both the visible/hard and invisible/soft sides of macro and micro level innovation ecosystems. In macro level, *visible/hard subsystems* refer to the elements of the hard side of innovation ecosystem, like the innovators' access to funding and knowledge or the legislative framework for innovative enterprises. These elements have conventionally been included into the definitions of successful national and regional innovation systems. In the micro level the visible innovation related subsystems refer to the elements like managerial innovations, or structures and processes supporting innovation. *Soft elements*, like the atmosphere, attitudes, values and other intangible elements, are often hidden or more difficult to distinguish in the macro and micro level innovation ecosystems, and hence, they refer to the invisible side of the system.

Obviously, the innovation–environment relation consists of complex interaction of many factors and subsystems, none of which can alone explain the innovation. However, to get a clear idea about what might be the most crucial factors, the data was first coded to categories (table 34) by asking, what are the macro and micro level factors or subsystems, which have had most impact on the innovations. Then, the relations between the factors was re-explored and compared case by case. That was when the cohesion and tension in the subsystems became apparent and manifested the connection between the soft and hard elements of the innovation ecosystem. Another aspect, namely the viable systems' self-productive and self-organising capacity and related management in systems illustrated the relation between the categories.

In the following sections, due to the richness of the data, the discovered categories will not be introduced independently one by one, but they will be discussed right through relations of the categories. This section highlights the cohesion and the tensions of the subsystems, and hence the categories will be introduced and discussed by interlinking them to each others, as they appeared in the data.

Complementary interaction among the innovation ecosystem's subsystems was found to work at its best like the *"parallel stepladders moving up and down independently,"* generating not only cohesion but facilitating the systemic diffusion of the innovation remarkably.

A respondent in a high rank position (ALESL) in European Union used the metaphor of "two parallel stepladders" in order to describe the complementary interaction between various subsystems in the macro level innovation ecosystem. He used the metaphor in order to explain the complex interrelation between the new ecological innovations and European wide business innovation ecosystem. The change of legislation e.g., may support the development of the emerging markets for eco-innovations and the eco-innovations then foster the

societal transition businesswise and ecological wise. He used the analogy of the moving stepladders (figure 54) which he said, are common in amusement parks (like Vekkula in Linnanmäki, Helsinki). In the moving stepladders, there are two parallel stepladders, one for the right foot and one for the left. The stepladders move up and down separately, and thrust you up the stepladders faster, if you can time your movements correctly. Nevertheless, if ones coordination is inadequate, one will remain at same level and continue moving up and down with the stepladders.

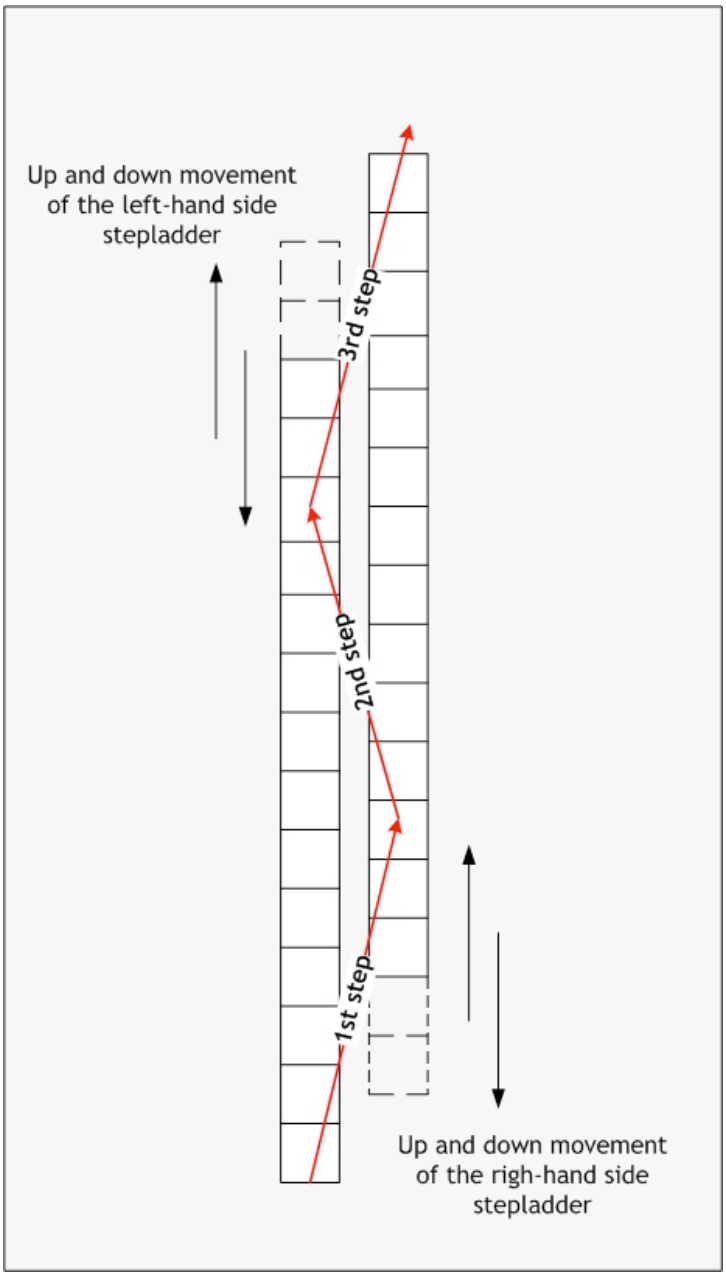


Figure 54 The operational logic of the moving stepladders making the climbing faster provided the timing of stepping is correct. The moving pair of stepladders is a metaphor for the complementary interaction between innovation and innovation ecosystem.

As the correctly used moving stepladders, the evolving innovation together with market forms a mechanism, which facilitates businesses. In long run the businesses will furthermore provide the innovation ecosystems different type of energy (e.g. in the form of feedback for legislation or research) or tangible resources (like the taxes to be used for the fundamental research) which are

needed in the macro level innovation ecosystem in order to generate circumstances for the next possible innovations.

This study conceives the analogy of "parallel stepladders moving independently" as a type of "systemic and interactively operating innovation". This type of innovations were been explained to exist both in national economies and in the legislative and economical environment of European Union. Systemic and interactively operating innovations has furthermore been conceived to facilitate the innovation ecosystems self-renewal, which will be discussed in the following chapter.

To epitomise the operation of the stepladders one more case will be put forward. Respondents from different countries referred to the *"symbiosis" of Nokia and the innovation ecosystem in Finland*. The complementary interaction between the Finnish government and the multinational corporation of Nokia was explained to have developed for more than hundred years. Despite the experienced pressures and tensions of the interaction, it was explained to have been fruitful for both parties. Nokia for example was explained to have accelerated the political decisions concerning for example the Finnish energy supply system and European Union membership. Those decisions have thereby facilitated the development of the Finnish economy. On the other hand, it was explained that the governmental decision in 1990s accelerated Nokia's product development and success in international market.

There are many different subsystems in the macro and micro level innovation ecosystems and in the interaction mechanisms between them. In addition to the interaction of the subsystems of the innovation ecosystems, there was found, as described in section 5.1.1., a continuous interaction between the current mainstreams and different innovations. Sometimes the interaction prevented the diffusion of the innovation (like the case of the security device), and sometimes it facilitated the systemic change throughout autopoiesis, and at long intervals throughout chaos and self-organising of the system.

Categories and their relations ("cohesion and tension") will be next discussed more in detail with some examples as following:

- Strategic thinking and vision embracing both the hard and soft sides of innovation ecosystems
- Local – global scope of innovation ecosystem
- Funding, growth orientation and the role of market
- Taxation and legislative framework of innovation and businesses
- Innovation and business services, innovation arenas

Strategic thinking and vision embracing both the hard and soft sides of innovation ecosystems - the "lighthouse and navigation tools" when in a situation to "change or die"

The found common nominators related to the visions and strategic thinking concerning the micro and macro level innovation ecosystems has been reduced as in the following figure (55).

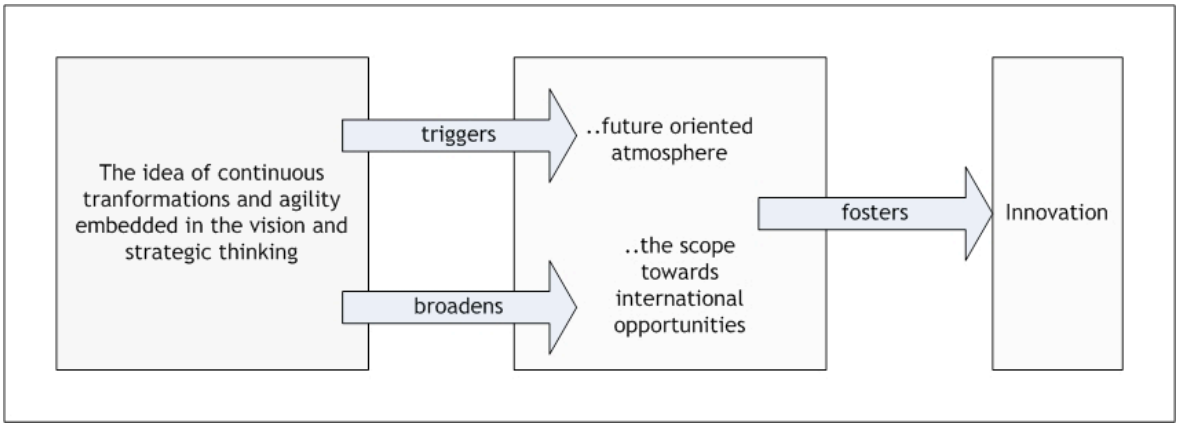


Figure 55 Vision and strategic thinking trigger future oriented atmosphere and broaden the scope towards international opportunities. Consequently, innovation will be fostered.

The informants reiterated the role and significance of vision as a prerequisite for all type of innovations. *Vision, encouraging to continuous transformation and strategic agility, was found to be a common denominator of success in profit*

and non-profit organisations, cooperative innovation hubs, as well as the regional and national systems-of-innovation. The importance of visionary thinking in the innovation environment was highlighted by all informants irrespectively their background or the innovations they had been operating with.

In the data, the content of the visions however, varied apart from strategic agility and transformation, which were highlighted in all of them. *Agility* referred to the sensitivity and capability to react to any change in the internal or external innovation ecosystem. The motto of the strategic thinking in micro level organisations can be compressed to the exclamation "*change or die* (OMS)" of one of the interviewed CEOs.

Visionary and holistic view was expected to encompass systems' own future as well as its historical roots. Superior vision was furthermore said to demonstrate the systems' role in a wider framework, for example in a society or in the global market. The vision was expected to provide the answer to the question why or why not an innovation was needed. *Vision and visionary leadership were found to be the main contextual factors facilitating or inhibiting innovation; they were referred as the "innovation ecosystems' lighthouse and navigation tools.* (MIK50)"

Supporting the previous research results, particularly the visions of the top management, owners and politicians were claimed to be most decisive prerequisites for the innovation. *Innovation was considered as a very difficult assignment without the mandate from the owners/voters and/or the support from the top management/politicians.* Often the mandate was secrete. However, apart from the mandate, a *"dream team" is pivotal*. As a bank manager put it forward, "an innovation with a poor crew is doomed to be failed" (AHN55).

It was however discovered, that *innovations can sometimes take place despite these confines, but it had demanded from the true pioneers a very strong*

believe, that they are doing the right thing, and that "all the suffering is worth the innovation" (KAA55)

The earlier research results concerning the importance of the visionary top management of companies, organisations and political system were given support by this study. According to this study, *apart from the top management or without its support, the visionary media, educational institutions, public audience, individual citizens or shop floor level workers, can generate radical innovation.* It is not easy, but it seems to be possible, but for that heretics are needed.

Visionary thinking embedded deep inside the systems were said to trigger the future oriented atmosphere, which facilitated the innovation generation and diffusion in societies, companies and other communities. *Positive encouraging atmosphere, trust and passion* were said to be the cornerstones of the innovation atmosphere. Unfortunately, often the opposite was experienced to be the reality, which was found from the common comments like the following ones.

> "Often people commented the new innovative ideas by saying; 'nothing will anyway come out of it'. People rather referred to the old and approved practices" (ATT56) or
>
> "they [funding and business service providers in Finland] clapped the young entrepreneur on his shoulders, in order to give some moral support, and that was all of it! Look at Sweden or the United States. For example the entrepreneur behind FilippaK [a fashion house] was a very young and inexperienced woman when she introduced her business idea, but that did not prevent those [the Swedes behind the innovation funds and start-up services] from supporting her business idea." (NHE56).

To create a future oriented atmosphere was explained to be a difficult challenge, due to the "the strong circles and logics" (ALU56) maintaining the

continuity in the societies and big organisations. This result has a confluence with the concept of groupthink, which was discussed in the literature review.

Informants puzzled over the problem about how to acquire a fruitful environment for continuous operations building up the future oriented atmosphere. In order to handle the related deteriorating factors, informants illustrated how the mechanisms and logics maintain continuity and prevent the discussion about transformation of the society.

Informants furthermore referred to various actors responsible for the renewal of societies; *the role of researchers, intelligentsia, media, government, politicians, and growth oriented entrepreneurs and education* was mentioned to be crucial. All of them were however, said *to suffer of failure, due to the internal logics in the systems*. The following deteriorating reasons were mentioned:

- The foundation of any *political system* was considered to suffer from being consistent with the public opinion and thus operating in too short-term cycles. Experienced politicians, known from their future oriented and creative initiatives all referred to the challenges related to coping with the short-term and long-term time horizons and involving the citizens to the discussion.
- The same applies to the *media* due to the commercial reasons. Governmental broadcasting companies have pressures for short-term operations pleasing the great majority of public opinion due to follow-up of the viewer and audience numbers. “You get what you measure”, was said (MP3).
- Due to the above mentioned reasons, the Finnish *intellectuals* were explained to have an increasing tendency to contribute the worldwide discussions, instead of discussing in the national media or other public arenas.

- Especially *researchers*' impact was longed-for in the analytical societal discussions. It was however explained that researcher do not participate in the reformative societal discussions on account of the short-term r&d funding system and due to the risk of failing the funding, if deviating too much from the conventional knowledge-domain and paradigms. The current situation was compared to the resent development of the changed role of higher education institutions in Australia, where "the universities have been pushed to adapt their operations to the market mechanisms [and hence their role in the societal discussion has diminished.] […] Independent research and genuine desire for knowledge and 'truth' can survive only in autonomous institutions, which boost for open and free discussion. […] Only universities which are independent from economical and governmental interests can give their critical and best contribution for the development of the future societies." (Lloyd) From the point of view of future oriented societal visions and open societal discussions, these results support some of the earlier introduced criticism provided by Miettinen at al (2002).

As a conclusion to the question about what reinforces the future oriented visions of innovation ecosystems, this study claims that, *the open and critical minds, both at the top and shop floor levels are pivotal for an innovation friendly atmosphere*. In the modern societies and organisations the *true challenge is, 1) to educate and support people to think independently, and paradoxically, at the same time, 2) to encourage them to maintain the societal values, already tested during previous decades.*

That is to say, *the essential societal values provided the bases for the sensation of safety needed to withstand the insecurity and inconveniences related to changing world and related innovations.*

Related to the values, a challenge was addressed by the informants for the basic educational system. Namely, the *educational institutions* own understanding

about the mechanisms related to balance between renewal and continuity in the society. This understanding was considered as a prerequisite for the education of critical and innovative minds.

Form the point of view of the subject of this thesis; it was fascinating and challenging to realise, how the scientists themselves claimed for a more *renewal-oriented perspectives to the innovation studies*, especially what comes to the business sciences.

Furthermore, societies were said to benefit from the *independent think tanks*. Within them the challenges and possibilities related to the future were said to be discussed separately from the background organisations' interests and motives to bargain.

As an example of macro level think tanks, it was mentioned the 'Finland Scenario -workshops', organised by Sitra. The workshops said to have laid ground for the common language and thinking patterns among the politicians, managers and labour market parties who are responsible for the changes in the country's economic policy. These workshops were seen as a common informal arena for the representatives of employers, employees and civil servants, (ÄÄP) and the common understanding of the future challenges was furthermore considered as an important facilitator for innovations.

In the micro level innovation ecosystems, *communicating about radical innovation was found to be the 'Achilles heals' of the big companies and organisations*. It was explained how members of the top management had had to sheltered the early phase radical innovations by isolating them form the "effective mainstream organisation", until they were mature enough to be communicated for the rest of the organisation. (ASI57)

Lack of vision was considered as a common deteriorating factor especially during the periods when organisations or countries were successful. Informants had

convened that, acquiring shared vision encompassing innovation and change in an organisation or wider community was more difficult during the phase of success than while in difficulties.

To epitomise the finding Finland was provided as an example. At the time, when Finland had, for several years, led most of the global competitive and innovativeness indexes, and furthermore Helsinki metropolitan region had experienced many years of economical growth, the informants had experienced that, the capital region had been "drifting". At that time, the lack of shared vision how to maintain the competitive position was experienced as a deterioration factor from the point of view of innovation. It was said that the vision should have encompassed an idea about how to make metropolitan region internationally acknowledged and attractive for people, investments and growth companies. This result was supported by Sabel and Saxenian (2008).

"The high number of powerful municipalities in the metropolitan region", with a relatively strong position to develop an innovation infrastructure, was explained to hinder the formation of a powerful regional vision. It was referred to "short-sightedness of local politics," "unfruitful competition between municipalities" and to the "difficulties of reaching conclusion about how to reinforce the competitiveness of the regional innovation ecosystem."

It was furthermore found that, the municipalities competed with very similar and rigid strategies while attracting people to live or companies to operate in their territory. The far too big margin between the strategic intentions and the actual operations in the regional policies obviously frustrated some of the respondents.

All in all, drafting a common vision for the capital region of Finland was said to have been "in a deadlock." During the interviews, which took place prior the global financial crises, the informants discussed their worry about the risk of the

paradox of success. The lack of vision was argued to be partially due to the long lasted successful period, when a positive development had taken place.

As a reason for the deadlock, it was furthermore referred to the Finnish consensus driven society, where the consensus is easier to reach during the difficult times, than when the system is stable. It was said e.g. that, "during the hard times, like during the wartime or in the economical depression in the early 1990s, Finns had been more united, and the consensus about the new vision had been established easily, and people had also stood behind the shared vision." (MIK58) This discovery is parallel with the earlier discussed results by scholars like Ståhle (2004), who explained that when in the bifurcation zone the system is mature to make free choices.

As previous experiences highlighted the enhancement of the vision and strategy of the metropolitan region, the conventional *consensus driven society* was said to be two-sided. Firstly, the principle of consensus was said to have had benefits when big decisions were made in order to modernize the Finnish society. However, at the same time, the society was said to have relied too much to the institutional 'three-lateral agreements' and to the consensus between the government and the labour market organisations (labour union[4] and employer organisations[5]). That was said to have made the citizens more passive and the society hence less democratic. Thus, it was suggested that, *individual citizens and corporations should be activated to be involved with the generation of the vision for their own region*. The more people are involved, the more ideas and the better vision. Furthermore, commitment to the implementation of the vision would be stronger and it would be more fun. Ideas about integrating the companies to the generation and to the implementation of the regional vision were introduced.

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[4] Central Organisation of Finnish Trade Unions (SAK), the Finnish Confederation of Professionals (STTK), and the Confederation of Unions for Professional and Managerial Staff (AKAVA)

[5] the Confederation of Finnish Industry)

For example, public private collaboration was highlighted in order to improve the circumstances for the more informal innovation and learning networks and enhancement of an advanced lead user market. Public-private collaboration was said to have an important role in generating the advanced and demanding market for new services and products. Apart from complementary service innovations additionally, visions and motions to integrate the legislative, commercial and product development subsystems were considered important.

Based on the result, it can be inferred that, the basic idea of the *Finnish Triple Helix model was implicitly supported* by this study. An idea of a *proactive bottom up innovation ecosystem, involving individual citizens and companies*, was moreover convened.

What comes to the content of the analysed comments concerning the visions, it was found that the responses from the diverse countries and regions varied. Due to the used methods the results of the comparisons should be considered as rough indicatives. Likewise in Finland, the public private partnership was also highlighted in the visions encompassing collaboration between the Portuguese municipalities, companies and higher education institutions. In Cambridge people highlighted the "Cambridge spirit" and "serial entrepreneurs (called heroes) as role models empowering the entrepreneurial activities". In these peoples' visions "the local municipality authorities were given the assignment of taking care of growing traffic jams" (HH) and "the government was asked to stay out of the way of innovative entrepreneurial activities." (HERB) However, the governmental financial support for innovation collaboration between the innovative communities of MIT (Massachusetts Institute of Technology) and Cambridge cluster was seen as an important reinforcing factor for generation of new Born Global (BGs) companies due to the strong investments on internationally relevant STI.

Finally, it was highlighted that the visions and strategies of the innovation oriented companies and organisations' deviated from those who preferred to

maintain the continuity. Agility and transformation were embedded in innovative systems strategic management. It was said e.g. that, “it is easy to realise if an organisation is innovative since things start to happen quickly while the others are still talking.” (SUA60)

Even though many companies’ innovativeness was said to be due to the “situation where one has to change or die,” (AHN60) companies were told to use most of their resources to the nonlinear processes and to the maintenance of productivity. That was because high productivity generated resources which were then allocated for the creativity and nonlinear processes. On account of the multifaceted challenges faced by the macro and micro level innovation ecosystems, a variety of management strategies were utilized. Management will we discussed more in detail in connection with section 5.1.3.2.2.

A simple schematic figure (56) is an interpretation of the previous results concerning the *ideal of an innovation ecosystems’ vision*. The figure illustrates a collective macro level vision process (large arrow) which mobilizes individuals and organisations’ innovative ideas about the shared collective innovation environment (small arrows). The thinking behind the figure claims for a combination of the bottom up and top down approaches. It is furthermore imitating the idea of interpretative industrial innovation, which refers to the testing the innovations in the market, and allows the market to decide about the direction of the development. Equally, during the collective vision process, the shared vision emerges when the participating individuals and organisations are encouraged to introduce their interpretative strategic innovations and the ideas will be tested in the innovation ecosystem. While the process continues, the system adjusts its strategic processes based on the ideas, which momentarily fit best to the given circumstances. The process takes place within the limits of a leading idea of the systems future (big arrow). Empowering and mobilising the individuals and organisations to the macro level strategic processed increases the general awareness of the future challenges and decreases the power struggles related to the top down decision processes.

Alternatively, as one of the informants from a multinational corporation put it, “The prerequisites for any development are universal. In Helsinki metropolitan area, we also need a vision considering what we want to become during the next ten years, and what do we consider as the strengths of our industry and universities. […] The implementation of the regional strategy process should include the mobilization of the people; we need various ways to integrate the common people and companies to the process. The fundamentals, and all the reasons, have to be shared with the citizens and the companies, we all have to know the fundamentals. […] The fundamentals must be shared with the people in more innovative ways. E.g., in the invoices for public services, there should be two sums, firstly the price the individual has to pay and secondly the actual price of the service. The difference will be paid with the tax money. That is how we will learn to pay attention to the fundamentals.” (ikk66)

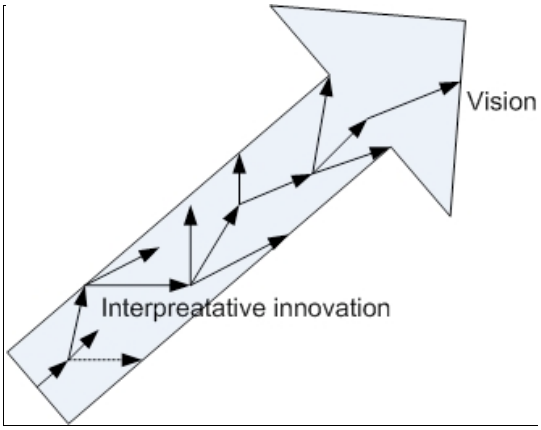

Figure 56 Testing ideas in the innovation ecosystem. Interpretative innovation (small arrows) in relation to future vision (large arrow)

Local – global scope of innovation ecosystem

The discussion about the importance of a holistic vision highlighted international and global opportunities and challenges. The global scope embraced *international exchange of ideas and knowhow, international co-creation of knowledge, global market opportunities, and access to the knowledgeable labour-forces, investments and innovations*. Informants additionally referred to

the “contradictions related to the fragile global economical and ecological system which we do not up till now fully understand” (ÄLÄ2). The “risk of admiring so much the fast growth of the big multinationals that we simultaneously destroy the ‘undergrowth’ from which the new growth companies are supposed to be based on”, was furthermore stressed.

Most of the respondents had themselves invested to the international collaboration among the world top class regions, companies and universities. Moreover, the informants stressed also the wider aspects of globalisation. For example, the informants from Sophia Antipolis, in Southern France, stressed the importance of collaboration not only among the words leading innovation hubs, but also among the European and African countries around the Mediterranean. Likewise, the stakeholders in Tagus Park and Madan Park in capital area of Portugal encompassed apart from the leading innovation hubs the interaction with the worldwide Portuguese speaking areas. Finnish informants referred to the Baltic region in terms of environmental and cultural issues together with the business opportunities grounded on the logistic location next to Russia and the fast connections to the Asia.

In spite of the prolific incidences related to patriotism and concerns about national competitiveness, the responses denoted a tendency to convene the *global innovation ecosystem as the primary surrounding for their innovation related actions and business operations*. As cosmopolitans, they expressed a moral and perspective to the innovation and businesses, which truly encompassed global colleagues, clients and potential partners in a wide sense.

It was furthermore highlighted that, the *trust building,* needed for the networking with the partners in remote countries, takes place in the face-to-face meetings and social situations. However during the intervals, technology based communication was used. The finding supports Hautamäki’s (2007) notion of ‘*Diaspora’* stressing the importance of face-to-face local collaboration in

remote areas and the notion of '*NetGora,* describing the collaboration over the net.

The global reality, together with the national and local realities was pressed to be managed parallel. Parallel management of all of the levels encompassed business opportunities, attracting knowledgeable labour force as well as the human and ecological aspects of life. As one manger from a high-tech company stated,

> "An individual whose awareness is wide, and who is a genuine world-citizen, will understand the value of pluralism. He also perceives and respects the fact that, the functional global ecosystem consists from a set of nations which all is all in different developmental phases. […]" (ELYINT)

Furthermore, the following citations epitomise how the respondents expounded the global-local scope of the world:

> "Paradoxically, internationalisation has increased the significance concerning individuals' awareness about their own national backgrounds, cultures and languages. In the global world our roots are prominent; [we need to know] who are we, where do we come from." (YLEINT)

> "Societies are not monolithic; internationalisation opens up opportunities for alternatives and increases our tolerance towards new ideas and ways of action. With zero budgets internationalisation can increase our creativity and make the 'breathing' easier."(ISS70)

> "Reconciliation of our own views with the views of other European nations is of great importance." (ELYINT2)

> "It is obviously of our own interest, to provide our brothers, south of the Mediterranean, all the possible knowledge and support for the development of their nations and economies." (PLAS)

Language is an important part of our identity and communication. In Finland where the average knowledge in English language is good, the respondents had somewhat diverging views about the language related to innovation and businesses.

For some of them, the opportunity to develop and utilize the richness of the Finnish language in professional contexts was stressed to be pivotal. Whereas for the others, the desire to develop ones skills in English took place in various different ways, e.g. in corporations' rendezvous, in corporation's informal pub-evenings (called "Practical English in Practice"), and in organisations' reciprocal meetings which were agreed to be held in English. Moreover some respondents reported that, all the paperwork in the corporation takes place in English, due to the globalisation.

Variation among the globalisation related incidences found among the Finnish respondents was remarkable. In one extreme, arbitrary incidence of the Finnish entrepreneurs and local politicians confined themselves to deal only with the national and regional aspects of the vision, while the others highlighted the high priority of internationalisation "for our remote and homogenous country (UKK70)"

Interestingly many of the *Finnish respondents mentioned of being descended from Russians, British, Swedes or Swiss*. The relatively high proportion of informants with foreign origin in the sample of this study supports Florida's (2007) findings about the role of the second and third generation immigrants in the so-called creative class and in the societies the entrepreneurial endeavours.

It was found that, underscoring the importance of the opening up to the international communities, was more common among those with a multicultural background or personal experience about living abroad, than those who did not introduce personal experiences related to internationalisation.

Following citations epitomised the frustration of those who wanted to accelerate the opening up of the Finnish innovation ecosystem for globalisation: A manager of a technology company (SME) stressed how “the lack of prospect and ignorance are the major deteriorating factors in diffusion of innovation.” (MY70) And that is why we have to keep on educating ourselves and providing access to knowledge to the rest of the world. Another manager in a pharmaceutical SME stressed the importance of the new economies by saying: “it is groundless to think that India and China would not themselves aim to solve the more knowledge-related challenges, or that they would leave the r&d related jobs solely for us. Hence, we have to work harder, and we have to work together, otherwise there will be no need for our knowledge workers in the western societies. Based on our experience, the salaries of the western knowledge workers are about 15 times higher than their colleagues’ in the new arising economies.” (OMS70)

Many of the respondents had experienced international collaboration as an effective means of inhibiting their communities from being locked with the old thinking patterns. Internationalisation, in the means of outsourcing, off-shoring and finding access to new markets and labour were referred as approved forms of managerial and business innovation. (Compare with the notion of Diaspora by Hautamäki (2007).) The informants discussed globalisation related business opportunities together with the deteriorating factors.

For example, the Finnish respondents claimed for new business innovations concerning the export of the Finnish welfare-services. It was however highlighted that, in a country with a strong network of public welfare service providers, the export endeavours should be based on the public-private-partnership. However, the public-private-partnership had been experienced as difficult to accomplish, on account of the strong monopoly of the municipalities as the biggest service provider. Business and managerial innovations were hence claimed for. (MIK71)

Internationalisation of local communities appeared as a crucial element of internationalisation and creativity. Problems related to the immigration were mentioned, but at the same time, the immigration was perceived as an opportunity for the internationalisation of local innovation ecosystems. It was referred to the European history, and the role of immigration was discussed as a source of creativity and entrepreneurship.

> "Throughout the European history, immigrants have provided new economical and cultural vitality to European cities. Immigrants have brought new ideas, knowhow and connections, thus they have widened the citizens' awareness. If we provide opportunities for the immigrants of our days, they will be in positions to help us to increase our creativity. However first, we have to help them to settle down, which imply that education, knowledge and practical guidance concerning the social values has to be provided for them. Immigrants throughout the European history have often been entrepreneurs, but in order to become an entrepreneur, one has to learn about the society, its values and what involves entrepreneurship."(Clark)

To sum up, found *connecting and complementing pipelines* between the micro and more macro levels are illustrated in figure 57. The found connecting pipelines between the local and global innovation ecosystems were many. Despite the fact that the pipelines had specific functions, they furthermore complemented each other and were said to make the innovation ecosystems more viable. Formal institutions, like governments were seen to be responsible for the general framework where the global development of innovation takes place. Academia seemed to have the best access to the global knowledge hubs, and the corporations stressed the connections to the global markets.

It is however, among the individuals, where the actual communication was stressed to take place, especially what comes to the exchange of tacit knowledge. Individuals, who trust each other, form the pipelines between the

global professional communities. As Friedman (2006) described, on account of the developed telecommunication, international communities among the ordinary citizens, are the modern drivers of globalisation.

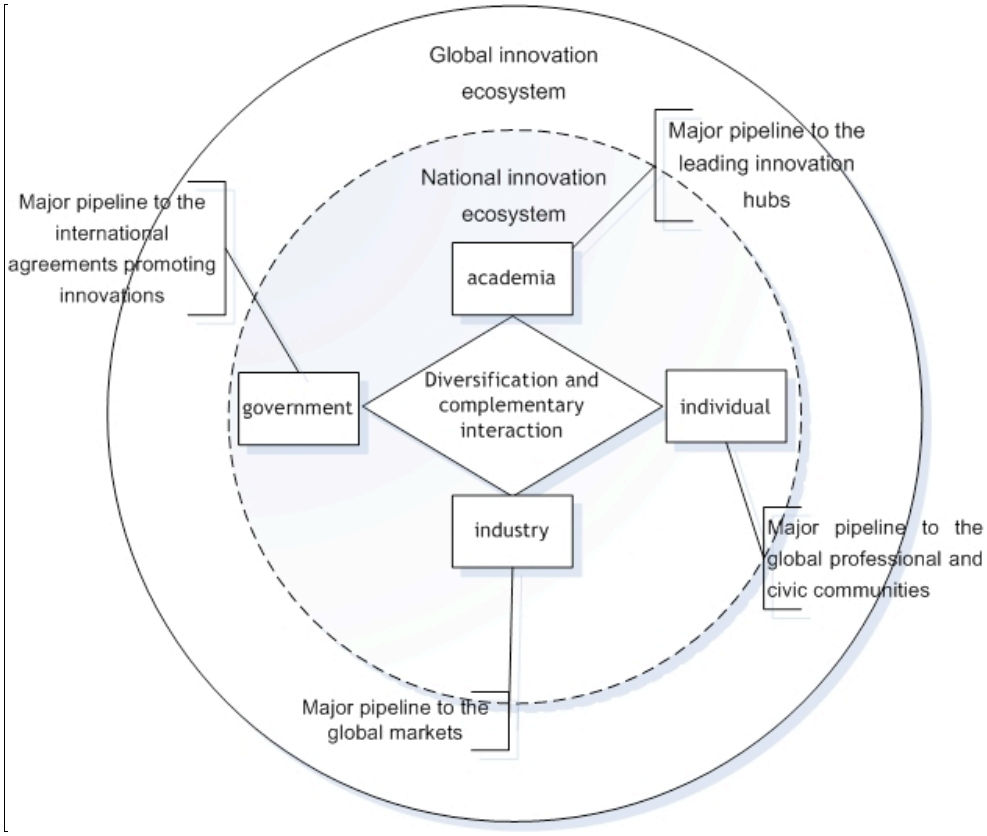

Figure 57 Pipelines connecting and complementing the micro and macro level innovation ecosystems.

Funding, growth orientation and the role of market

- "In Silicon Valley, there is a queue of investors for the good ideas, but in Finland, behind your door you will find one meter of snow"

Apart from the importance of the vision, questions like how to generate a positive relationship between the funding, innovation, market, and economical growth, were puzzled around in the interviews. Facilitating and deteriorating factors, related to the economical aspects of innovations and businesses, encompassed aspects like research and product development funding, experimentation, commercialisation and exportation.

Importantly, it was found that, the tangible financing problems were often explained together with various human related intangible aspects. The human aspects concerned e.g., how the financial aspects were communicated among the parties involved, and what kind of personal capabilities were needed, in order to transform or to cope with the uncertainties, related to the contradictions and deteriorating factors. Together with the financial aspects, it was also referred to the attitudes and social capabilities of the managers, innovators, and politicians as well as to the civil servants in concern.

In the data, particularly the following features were reiterated

- Funding "the old industrial innovations" (MY77) versus "reacting to the windows of opportunities and providing financial support for the new and emerging innovations which demand agile reactions" (HSC77)
- Access to venture capital and the fall of growth companies
- The importance of public-private-partnership for the commercialisation of innovations. Promoting innovation and generating markets where consumers and lead users' feedback enriches the innovation.
- Failures and survival of businesses (particularly during economical regression)

These aspects will next be discussed together with some examples of the "cohesion and tensions".

The tension between the funding of various types of innovation endeavours was the most apparent deteriorating factor both in organisational and societal contexts. Furthermore, as continually discussed in this study, the various phases of innovation had a tendency to cannibalise each other. Throughout the demonstrated and analysed experiences, it became evident that, the management of the funding in a rapidly changing and unforeseeable environment is extremely difficult. The difficulty is due to the agility dilemma; the continuously changing balance of allocating resources for incremental innovations, making profit in short term, and the radical innovations, which may

provide the access to the future market and the better future innovation ecosystem.

Respondents discussed the financing subsystem's vague capacity to capture and mediate the information about potential innovations and changes in the business environment. It was explained, how the modern policy papers, top managements' up to date ideas and advanced political decisions live independently at their own reality, at the same time, when at the practical level, where the day to day financial and resource allocation decisions were made, life continued based on the old established practises. This was a common aspect related to the most of the failed funding experiences. *It illustrated how easily the laborious visions and agility could be lost in the systems*. Especially, the top down visions seemed to disappear on their way from the top management to the middle management, or from the politicians to the civil servants. As a result, the implementation of the vision failed, and the decisions, concerning where and how to allocate the time, money and other resources intended for innovation, in the end did not at all support the agreed strategy.

Supporting Dos and Kosonen's findings (2007) about strategic agility, the result of this study highlights the importance of agility in the financing processes. *Agility was experienced to have disappeared*, if the system had not been able to transform the messages from the shop-floor level to the management or the political elite, or if, the leaders had been impervious to all suggestions concerning change. Politicians' deaf ear was said to be due to the lack of time to encompass the needed knowledge and understanding.

Related to the public funding, respondents furthermore discussed the tendency of "providing space for only one truth at the same time," or "putting all the eggs to the same basket."

As discussed earlier, Finland is one of the leading countries concerning the proportional amount of public and private investments in research and

development. However, the respondents' experiences allude to a *poor confrontation between the innovation and venture capital*. It was furthermore referred to an undeveloped business environment and the insufficient business experience in potential growth companies. According to the respondents, the relatively *small number of new growth companies* in Finland is due to the individuals' and investors' tendency to avoid the risks related to entrepreneurship. Respondents commented the opportunities to find investments for innovations and entrepreneurship in the following way.

Entrepreneurial activity was said to be a matter of attitude and education. However, the *equation between the entrepreneurship and education seemed to be a complicated one*. As a respondent from the banking sector said, "in Finland, you will not get rich with paid work, entrepreneurship is the only way to earn more money." (AHN78) Another respondent, with an academic background, regretted the fact that "universities educate people to become civil servants and to work for large corporations, not to become entrepreneurs" (NHE78). During the ongoing decade a change to better was assumed to have taken place, and consequently new growth companies were assumed to appear in the fields where "the knowledge of ICT, mobile technology and paper industry interacts," or "the new western-eastern welfare innovations will be developed due to the aging of societies," or "the desire of luxury creates new markets." (HSC78)

Those who had started their innovative companies had found it *frustrating to find investors*. "In Silicon Valley, there is a queue of investors for the good ideas, but in Finland, behind your door you will find one meter of snow (MY78)" said one of the CEOs. On account of the obviously long way of the growth companies, the problems related to financial support were related to the fact that, many promising companies have been sold after their first phase of success. "[For the growth company] it is a project for some 20 years […], and notwithstanding, the favourable development of the investment system in Finland, there is still a long way to go compared to the Silicon Valley […]. In

Finland governmental funding is available in the early growth phase, the problems appear later." (Tarjanne, Helsingin Sanomat 25.1.2009)

Another serial entrepreneur spoke about how "we should develop our country *more attractive for the business angels and for the direct investments* to the enterprises." He wondered, "Why don't we help people to learn how to invest directly to the innovative small and medium size companies? […] The reduction of possible losses should be included in the taxation in order to encourage people to investment directly to the growth companies." This respondent furthermore strongly criticized the fact, that public "taxpayers' money is allocated for the r&d of corporations which simultaneously pay dividends" (OMS79).

On the other hand, another entrepreneur, in an emerging welfare service market, had not been able utilize the available venture capital, because, "*the offered sum of money was too much for us*. We had to refuse, due to the fact that, there were no more companies which we could have bought. […] Later we found another investor, with minor expectations. In a good collaboration with him, our company has been growing rapidly." (MKI79)

It was furthermore reported, how a national *funding program had ignored a worldwide business opportunity related to the digitalisation of amusement industry,* e.g. computer games. In addition, *how later a group of investors and innovators had created a successful innovation ecosystem* for the entrepreneurs in the field. (HCSpp*1) Those SMEs had created more than 3 000 working places at short notice. It was furthermore said that, a lot more jobs had been possible, if earlier start up had been possible with the help of public-private-partnership. Similarly, the Nordic welfare-countries were said to lose their business opportunities in global market due to the undeveloped collaboration between public and private welfare-service providers. As an example it was mentioned how an awarded high-tech security innovation lost the momentum due to the lack of courage for an experiment in the domestic market dominated by the

public service providers: “we concurred a great deal of the European welfare gadget markets before the product was approved even for trial in a domestic public welfare organisation.” (MY79)

The example of the digitalisation of amusement industry and high-tech security innovation epitomise how the bottom up development of business innovation ecosystem works and can also be successful despite the formal financial and other support mechanisms.

A low adaptability of the financial services was said to reside due to the old management culture and an ineffective in-service training of professionals and civil servants. This assumption concerned equally governmental and European Union funding authorities as well as the banking sector.

An incidence of “*incomplete awareness*” was found to be a predominant deteriorating factor alluding to all innovation phases. Incomplete awareness in connection to management was explained to “close the windows of opportunities and kill innovativeness.” The middle managers and civil servants, confined to the principles of the current mainstream, were experienced to have blocked potential innovations and their funding. “Ignorance is our common enemy (MY81)” was explained to prevent the diffusion of any new innovation, and thus it was said to deteriorate the reinforcing relationship between the market and new innovations.

People were however optimistic. Signs of positive development were however seen, and it was explained how on account of the accelerating innovation processes people became aware of innovations and hence innovations become acknowledged and approved. In the diffusion of innovation, the *opinion leaders* were considered as crucial for corporations as well as for societies. A professional manager in the field of journalism gave an example how “the President of United States operates as an opinion leader, convincing the others about the selected policy.”

It was referred to the "old mental culture" and "civil servants' outdated professional skills and expertise" when the respondents described "the particular difficulties to match the radical innovations and business ideas with the industrial age funding regulations (MY82)". These difficulties were paradoxically explained be based on "the business researchers and public funding authorities tendency to predefine the innovation, and consequently, they became blind for true creativity and missed the change for the real innovations" (NHE82). Furthermore, the "lack of visionary and innovativeness of the civil servants" was seen as a problem.

As a result of the *laborious communication* with the funding authorities and the low productivity of the publicly funded projects, some of the innovative small and medium size enterprises highlighted the reasons why they no more utilized the public opportunities for funding. As one of the CEOs said,

> "Explaining our innovations in the myriad of languages used in the bureaucracy, and then marketing the idea, translated to the specific languages, separately to each of authorities, is simply too laborious. We would lose too much time from the actual development and experimentation work. And, if we got the funding, the possible benefits disappeared to the increased administration. […]"(MY82)

Interestingly, these entrepreneurs reported however, how they had found the public application periods useful. They had got new ideas how to improve their services and businesses for example from the EU's structural funding programmes. However, they said that, *it was easier and faster to implement the found ideas to the businesses without further involvement with the public authorities.*

While the innovators and entrepreneurs found it difficult to strive for funding, the *politicians and investors referred to other type of problems*. According to them, the difficulties had lied in finding "superior growth oriented business

ideas, and the right type of people ready for the great challenges embedded in growth oriented business." (HCS84) It was difficult to find "people who can create new innovations keeping the profit in one's mind. (AHN84)" Moreover, the business angels expressed a wish to make experiments with the higher education institutions, in order to develop methods and structures, to filter the adequate personalities, to be educated and supported to become managers into growth companies, or in order to find the great business ideas to be supported and funded.

Both the investors and entrepreneurs agreed that the *insufficient professional business knowledge and management skills* are the most significant reasons preventing the companies from growing. Sometimes the problem was to find a professional business manager, and sometimes the innovators' own readiness to reach an agreement and consensus with their business manger and/or investor was the obstacle.

The bitterest funding experiences related to the takeover of a science based high technology firm, the fast growing company had been take over by the bank, which has financed the company. The legal proceedings against the bank had lasted for almost twenty years. The entrepreneur can afford to continue the legal proceeding due to the profit from another successful company. For the serial entrepreneur "worst is that the good company was lost abroad."(OMS85)

Taxation and legislative framework of innovation and businesses

In addition to the financial problems, many of the innovation related conflicts concerned *taxation, patenting and intellectual property rights* or *other legislative issues*.

The cohesion between innovation and public competition policy and public regulation were highlighted, even as considered as complicated to be managed. For example, the contemporary regulations for public procurements had locked

the market situation for a high-tech security innovation. That was since the new high-tech product did not fit to the public tenders because there were no other bidders of similar products. Due to these difficulties, the CEO explained how exploring the legislation had become an established phase of innovation processes. (MYM490)

Many disagreements about the intellectual property rights had taken place among individuals and their employers. Furthermore, bitter lawsuits were told to have ensued between the companies about patent rights. *Lawsuits in the Market Court* had furthermore ensued between the municipalities and companies concerning public procurements, like in the following case.

> The "Three Musketeers" was used as a metaphor of the time-consuming lawsuits against the municipalities in welfare service market, which earlier had been dominated by public organisations. "On behalf of the other SMEs," the pioneering welfare service company had taken many cased to the Market Court. (MIK91) The legal proceedings and related publicity had hence accelerated the transformation of the management culture related to the new public procurement. The CEO claimed, "not only the legislation, but also *Managerial innovations* are needed to correct the culture." (717, 546)

Simple and innovation rewarding taxation was preferred to the complex and ineffective project support system and hence, the development of the taxation system was highlighted as an important challenge. An innovator and specialist in taxation said moreover, "The human contact between the entrepreneur and taxation authorities will always be needed, since the in person contact facilitates a better understanding among both parties, and thus decreases unnecessary tensions." (ILU91)

Apart from the question concerning the citizen's direct investments to innovative SMEs and possible losses to be treated as tax deductions, the most often discussed taxation problems related to the entrepreneur's inheritance

taxes, multiple taxation of the apport property for one's own firm, and the tax deductions related to the immaterial innovations' costs.

Taxation and legislation can be considered to form a tangible frame for the reconciliation of the many controversial and simultaneous realities of innovation ecosystems. Inside that frame, as it was highlighted there is a connection to the human attitude and behaviour. In addition to theoretical and professional discussions about the development of innovation and competition policy and legislation, a more popular discussion is needed to increase the intelligibility of the legislation and general acceptability of the competition and innovation policies.

The frustration and inconveniences related to innovation were widely analysed in the previous section of this study. The most painful human tragedies found in the data were premised to the economical and legislative problems of innovation and innovative businesses. The smaller inconveniences based on these problems diminished the emotional energy of the people, which was said to be fatal for the innovations.

Innovation and business services, innovation hubs

As said, innovative people and innovative ideas are not sufficient alone, but innovation supporting structures and the service processes have to be well organised. Innovation and business services and various constructed innovation arenas and hubs are what most regions provide for the innovators and innovative enterprises.

Interestingly, the overall attitudes towards these services and innovation hubs were however, quite neutral compared to the emphasis they have reserved in various national and regional innovation strategies. That can be due to the fact that the respondents or their firms had, by all means, passed the phase in their

carriers when they might have been dependent on those services. On the contrary, many of them had given their contribution for the development of those services as affiliated board members of various service organisations or as professional advisors and political players all the way to the national or European parliament and national research, technology and innovation councils.

Hence, rather than speaking about the detailed quality of the services, informants dealt more *strategic and conceptual matters*. Like, how to apply the various universal innovation principles to the macro level innovation ecosystem? As an example, the importance of national and international think tanks and future committees was mentioned and experimentation of macro level new structures or services were discussed.

Would it be better to transform societies' innovation structures and services radically or to improve them incrementally, was not explicitly discussed during the interviews. However, when exploring and reiterating the data from Finland, and comparing it with the answers from other countries and regions, where the public sector had considerably minor role, an implicit answer was found. That is to say, in spite of the prising reports and statistics concerning the Finnish innovation ecosystem's successful history (see for details chapter 2.3.2.3.), the findings inferred to the need of a radical systemic managerial innovation concerning the macro level innovation ecosystems structures, processes and services. This conclusion is expounded by a concern about the unproductive and complex structure, myriad of services, and finally by asking whether the laborious public innovation service and funding systems could be partially replaced with a taxation system. "The pervious system worked well during the industrial era, now it is time to create a new one" (UKKES).

Hence, it can be said that the national innovation system, which incrementally developed during the past decades, is based on the demands of the industrial era. The ongoing (2009) economical crises will show if system is still valid, or

equally, the economical crises may operate as a 'bifurcation zone' providing the free choice for the development of a radically different system.

The tangible remarks on the innovation and business services were mainly related to the lack of coordination among the different services and service providers. In addition, the role of higher education institutions was reiterated from various perspectives. In every country, the informants experienced the higher education institutions as pivotal part of the wider innovation ecosystem. However, research and development project funding was said, "To steer the content of research and development too much." (MIKT) The actual benefits or services for the SME was experienced to remain minimal, partially due to their own scarce resources. The importance of the fundamental research and the quality of education was repetitive, hence, the content of the discussion will be discussed more in detail together with the category of "self-organising innovation system."

Both negative and positive feedback was provided for the innovation service bodies (like Tekes in Finland or Vinnova in Sweden). Negative comments were more or less related to two things; firstly, to the balance between the large corporations and SMEs, and secondly, to the civil servants' attitudes, expertise and even behaviour when providing services for innovators, researchers or entrepreneurs. Moreover, some organisations (like the Foundation for Finnish Inventions) received a significant amount of positive feedback for its contribution for innovators and companies.

In order to improve the interaction between the innovators, service providers and the markets, an *idea of an intermediary or a front office* was considered particularly important. The idea was introduced due to the difficulties in coping with the multifaceted nature of the service systems. The intermediaries would hence facilitate the SMEs, when approaching various service bodies (like Tekes, Vinnova, HEIs, European Union) and international markets and networks. The experience was that lobbying and interpretation of bureaucracy had occupied

too much energy from the SMEs. It was stressed how, with the help of the trustworthy intermediaries also the governmental bodies would get valuable information about the most resent innovation trajectories. Another innovator supported the idea by saying that in the vast public sector the intermediaries would also accelerate the diffusion of innovations. Since, in the numerous municipalities, there is necessarily not enough knowhow to assess the possible benefits of the innovations, the intermediaries would hence be a safe pair of hands for various stakeholders in the innovation ecosystem.

Some of the entrepreneurs referred to their personal experiences of the innovation hubs', like science parks, environments and services. For them the cross-fertilization of ideas and knowledge had been most useful in those innovation hubs. They particularly praised the smooth exchange of experiences among the peer groups. An entrepreneur from high tech sector said, "What I found most useful for us was that through the science park's contacts we were networked to the global markets and sources of knowledge". (MY91) Those in multinational companies explained, how the obligation of professional secrecy made it difficult to share any ideas related to their work.

There was criticism towards the too homogenous innovation clusters. One respondent put it in the following was, "No real business opportunities will arise in the clusters where all of the companies are competing with each others, and the confidentiality clauses prevent the people from speaking. It is like trying to win a football match by putting eleven goalkeepers at the same time to the field. (NHE91)"

5.4.2.2 Features of self-production and self-organisation in innovation ecosystem

This section will discuss the categories defining the innovation-circumstance experiences together with the "Features of the autopoiesis and self-organising

innovation ecosystem," which describes another relation between the categories. While illustrating the features of self-production, self-renewal and self-organisation, the section concentrates on innovations' preconditions related to the non-linear and linear development of the systems. Hence, it reiterates the notions of the figure 58 introduced in the beginning of the chapter 5.1.3.2.

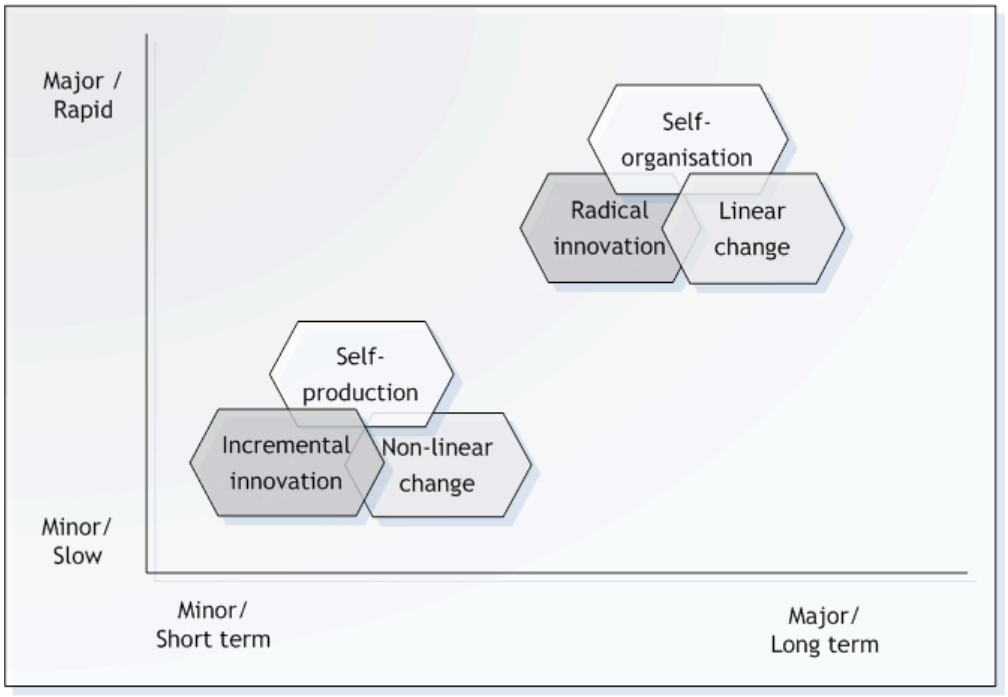

Figure 58 Relationship of the notions related to innovation and used in the emerging Grounded Theory.

In account of the integrative characteristic of innovation, it is evident that the innovation-circumstances experiences often dated back to the earlier described aspects of individuals. On that respect, the Grounded Theory building in *this section is cumulatively founded on the previous sections*. In order to make the relations clear some of the previously found results will be reiterated in this section.

The results will be discussed together with some examples of the experiences, keeping however in minds that the used method cannot provide an unambiguous and tangible process description of the autopoiesis or the discontinuation phase.

It rather provides a *relatively abstract and conceptual scheme about the self-organisation during the phase of discontinuation and of the phase of incremental development in innovation ecosystems*. In this section,

- the introduced findings provide some additional evidence about the existence of the relatively unknown phenomena of self-production and self-organisation, and secondly,
- the section develops further the idea about how the self-organising proceeds and thirdly,
- the section discusses the prerequisites related to self-organisation.

It was discovered that expressions like “self-organising individuals” and “self-direction capacity of their creative organisation” or “the self-renewal of the society”, were common when informants spoke about innovation. Other ways were less explicit, altogether persons referred in various different ways to organisations’ and regions’ strategic capacity to encompass the continuous transformation in their strategic thinking (discussed previously), or the individuals and teams’ prowess to carry out the responsibilities related to radical innovation.

Altogether, in the data, *there resided many features referring to the system’s capacity of self-production and self-organisation*. Hence, based on the empirical data, it can be claimed that self-production and self-organisation are interlinked to creative environments. However, without the help of the literature it had been difficult to distinguish the two phenomena form each other, the continuous self-production from the self-organisation related to the state of far-from-equilibrium. The core finding of the emerging theory was thus clearly a combination of induction and deduction.

Furthermore, this study portraits a human related prerequisite for both of the phenomenon. It was found that, from the point of view of the systems’ capacity for self-renewal and self-organising, that populations’ prowess, level of knowledge, general awareness as well as the emotional aspects have a central

role. Judged, based on the result, the human intellectual and emotional aspects are the prerequisites for the systems general innovation capacity and to the speed of innovation diffusion.

The results and the emerging theory will be discussed throughout the following categories, the key empirical findings related to self-productivity and self-organisation

- autonomous individuals as the heart of self-production and self-organising,
- energizing leadership, innovative media and educational institutions as driving forces,
- circumstances increasing the psychological energy
- self-organising systems relying on the responsible teams and individuals,
- differentiation and complementary interaction of universities and industry,
- the emerging Grounded Theory – towards an idea about management in self-productive and self-organising systems

Autonomous Individuals as the heart of self-production and self-organising

Based on the explored innovation experiences, it can be claimed that the citizens' and/or employees' general level of knowledge and awareness, as well as their prowess, and capacity for critical thinking and capability to make adequate decisions are pivotal for innovation and systemic transformation. Premised on that, this study furthermore claims that *innovations as well as systems' capacity for self-production and self-organisation are, to a great deal, based on autonomous individuals who act collectively*.

Previous outcome supports Varela and Maturana's (in Maula (2006)) idea of autopoietic systems. Maula writes: "Self-organisation may take the form of 'self-organising teams' but may also include management in which empowered

individuals make decisions." ((2006), 42) Moreover, for Luhmann (1983) a social system consists of an ongoing stream of communication among the individuals.

Systems' self-productive and self-organising capacity, embedded in individuals, was furthermore explored separately with the linear and non-linear changes and incremental and radical innovations, which emerged in the data. Figure 59 illustrates the relationship of the concepts and the role of the autonomous individuals during the linear and nonlinear change.

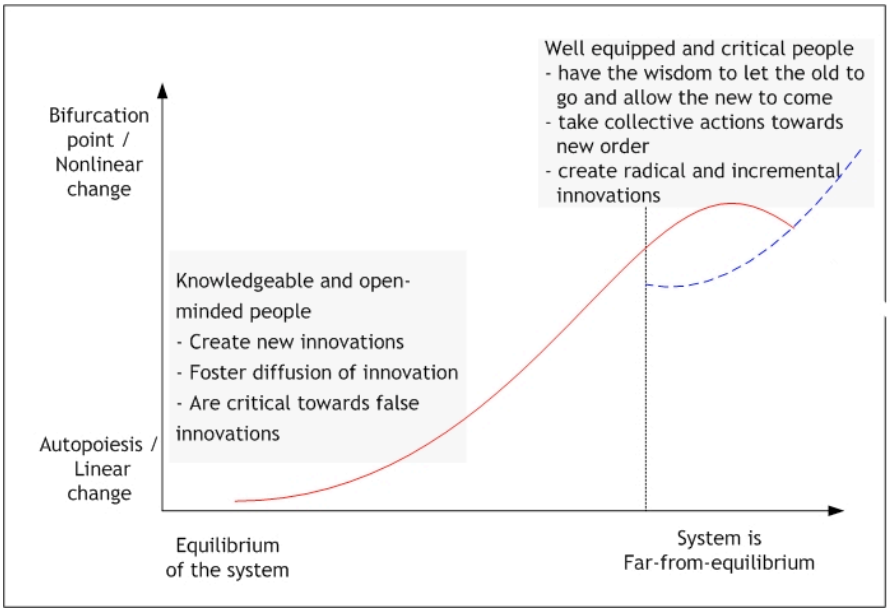

Figure 59 High level of knowledge, prowess and critical thinking facilitate linear and nonlinear systemic change

It was stressed throughout the empirical data that, if the individuals' knowledge is up-to-date, they will apparently be more *pro innovation*, which will furthermore boost the speed of innovation diffusion or the development of innovation friendly market. At the same time, the conscious citizens, professionals and politicians become more critical towards *false innovation*. Paradoxically, it was discovered that criticism and avoidance of groupthink are as important as innovation optimism. The sub-prime mortgage innovations, behind the financial crises in 2008, have drastically proved.

Consequently, when *close to the equilibrium*, the linear transformation will continue both in the micro and macro level innovation ecosystems. This type of self-renewal in social systems refers to autopoiesis (self-production) as Luhmann has explained it (Maula (1999)).

Systems have however, at intervals, a tendency to shift towards *the state of far-from-equilibrium*. The transition can be due to different reasons, like the discontinuation between two eras (e.g. the transition from the industrial age to knowledge era), or due to the radical changes in a field or in the market (e.g. a new radical innovation changing the rules of businesses or a phenomenon like the global economical regression in 2009). A system can shift towards the far-from-equilibrium also because of internal reasons, e.g. when an emerging radical innovation starts to change the corporation's business concepts, processes, structures and all the related operational logics and principals. Apart from the inflicting hard times, the state of far-from-equilibrium is an unavoidable phase in nonlinear transformations leading eventually to a new era and new order in the system, or to the decline of the system.

On the grounds of the data in concern, it is evident that, the *well-equipped and critical citizens and employees can better survive in those changes, but more than that, they are the foundation of the linear and nonlinear changes*. It is the people, who at the end of the day, have the power to change the structures, processes, operation logics and principals which used to work during the old era, but which have to be disallowed in order to allow the new order to emerge. The knowledgeable and open-minded people will have the capacity to react accordingly, and fast enough, when the system reaches the bifurcation zone (Ståhle (1998)), and the true opportunity for a new choice is possible. Alternatively, as Scharmer (2007) puts it, the wisdom of knowing when to let the old to go and allow the new to come is embedded in individuals, furthermore, the transformation during the discontinuation demands collective action, which is in accordance to that wisdom.

The true challenge resides however, if systems like people, boards or other collectives suffer from the groupthink. That is if, too many people remain blind for the changing conditions, and still believe that the old system can be maintained. That is what happened, when during the past decades, the legislators, bank inspection and people failed to question the grounds of the sub-prime mortgage and other financial false innovations, which gradually derailed the global financial systems to the state of far-from-equilibrium. Hence, the general level of knowledge and prowess to question the exciting paradigms is mandatory in any organisation or society going throughout the linear or nonlinear change.

It is the culture, atmosphere and societal values, which can support the people to see the painful truths, but at the end of the day, the people have to make up their minds and act accordingly. That is when the self-organisation can take palace and the system can remove towards the next level of its life cycle. The more knowledge, prowess and critical thinking, the better capacity the system will have to create innovation that will help to reach the new order in the system.

Energizing leadership, innovative media and educational institutions as driving forces

The findings of this study, together with the system-intelligence scholars (Saarinen and Hämäläinen (2004, 2006, 2007a and 2007b)), claim that individuals who are energized and empowered increase the system's capacity (from capacity one to capacity two in figure 60) to innovate during all innovation phases as illustrated in the schematic and conceptual figure 60. Leadership, media and educational institutions were most often mentioned as sources of individual and collective empowerment, and they therefore had an effect on innovation ecosystems viability.

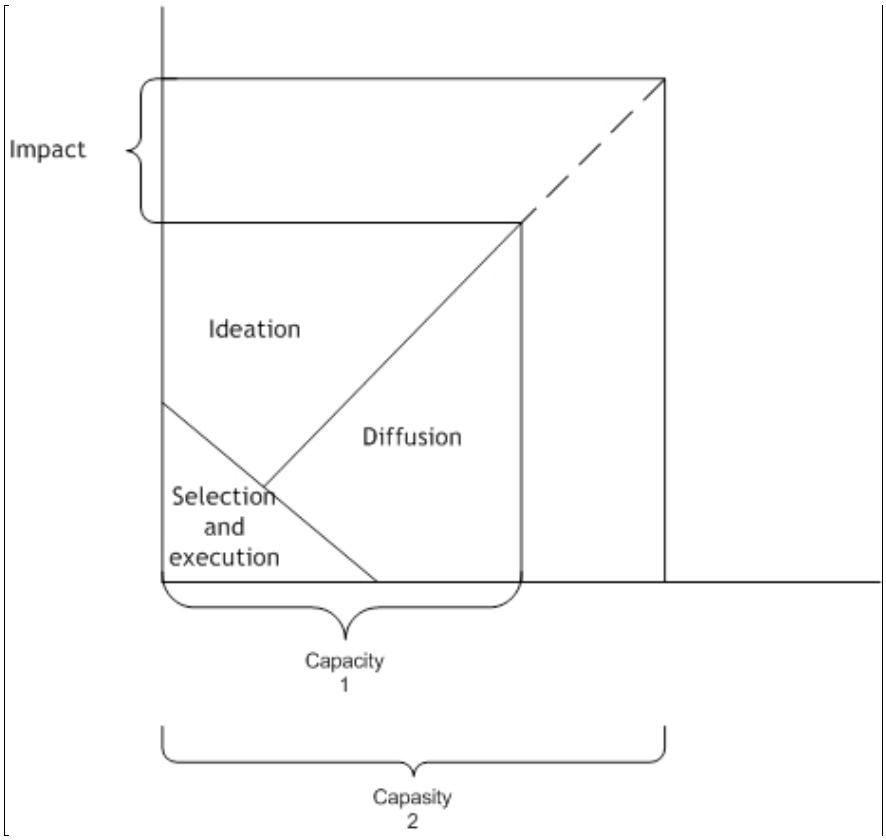

Figure 60 Energized individuals' relative impact (difference between capacity 1 and 2) on an innovation ecosystems' capacity to innovate.

The figure 60 illustrates the empowered individuals greater impact on all of the innovation phases (ideation, selection and execution, innovation diffusion).

In the empirical data it was the energizing leadership together with the holistic and visionary future oriented strategic thinking, which were found to increase individuals' autonomy, and had hence grounded the self-production and self-organization of the system. That finding was based on both the managers as well as the innovators experiences and views on what is crucial in innovation ecosystems. As the empowering leadership was very much wanted and needed, it was also was experienced by many innovators.

Consequently, it can be claimed that, *rather than concentrating on the management of the innovation ecosystem, the management should take place in the innovation ecosystems by the autonomous individuals in their empowered units. The leadership should then foster the complementary and enriching*

interaction between the signals, ideas, knowledge, and most of all, the communication among the individuals and various units or subsystems.

Energizing leadership was found to be pivotal due to the fact that, that it is the individuals who at the end of the day find the innovative ideas and make them to bloom. *Adequate leadership works hence like the earlier described "mobile stepladders," making the soft and the hard side of the innovation system to operate together* so that the innovation rapidly finds its way to the goal. Hence, "Management in innovation systems" refers to the "vision based interpretative innovation and development" (figure 56), which has the capacity to integrate the tangible and intangible subsystems. That is to say, the management integrates the tangible input-process-output systems (e.g. the time, money and other resources needed for innovation) to the autonomy of the empowered individuals. Consequently, as an informant put it, "if staff is empowered the innovation ecosystem turns a million time more productive" (IKKES). Based on the explored data, however, it can be claimed that currently the leadership seems however, not to provide as much opportunities for this type of integration as needed or wanted.

Luck and trust building in informal networks. Interestingly, informants explained that the interaction between those in need of help (with their innovations, business ideas or carriers) and those being in position to help them had been mainly a matter of pure luck. Even the business angels, whose main interest is to network resources and potential innovations, highlighted the *role of luck as a dominating factor of the interaction*.

Despite (or maybe because of) the focal role of luck, determined attempts for networking took place mainly in *informal forums*. *Trust* was underscores as pivotal for the exchange of knowledge, support or interaction in general. Both the sponsors as well as the innovators relied on trust building, and trust was experienced to be based solely on shared actions. A business angel said,

> "After having identified the possible individuals with common interests, and if the reciprocal discussions develop well, the investment will be considered. Time will show out, if something comes up. Trust can be built only throughout co-operative actions. Trust can occur after acquired experiences from doing things together and changed tacit knowledge, which deepens one's own knowhow. " (HCS97)

Another respondent with a long experience of macro level innovation ecosystems emphasized the importance of the amount and *quality of personal contacts in international collaboration*. These networks were explained to operate as global pipelines to the international knowledge forums.

> "There are many international top-professionals with whom we have good contacts in our networks. From the point of view of the national innovation ecosystem, the problem is that we do not invest enough profound time to these contacts." (UKK98)

Another important pipeline to the global knowledge and market takes place by *putting the young professionals into contact with world's leading knowledge hubs*. Coincidence and financer's good contacts abroad, together with the identification of the right youth, were explained as an "[…] opportunity generation. Young people should learn from life and the experiences in the world leading innovation hubs." An innovator explained how the offer to go abroad might be available only for a short while. "I was provided myself an opportunity like that, and I knew that, I had to make up my mind in fifteen minutes. I seized the opportunity, and since then, I have created opportunities for the others." (HCS99)

It was found, how in a multinational corporation, all its procedures, including continuous changes in the organisation structure aimed at the collision of different type of ideas and people. Interaction and openness were said to lay ground for the innovation, which covers the entire corporation and all of its employees.

> "Those, who find the way to integrate innovation to the entire organisation before the others, will be the leaders of their fields. On that respect, innovation management is currently in the same phase as quality management was for 20 years ago. At that time, quality management was decentralized from the quality teams and quality became everybody's concern. The same is happening now with innovation." (NIKK99)

Innovative media and education empowering people. Apart from the energizing leadership, also innovative media and education were found as crucial for the innovation ecosystems. They were mentioned to have the capacity and responsibility to generate a societal atmosphere where passion flourishes and sustains the development of 'an enriching community' as Himanen (2004) has called it. Premising on the idea of innovation as a concern of everybody, the macro level innovation ecosystems need an atmosphere motivating people to foster their prowess, knowledge and attitudes.

Some of the respondents even posited a connection between the extent of creativity in society and the level of physical and mental wellbeing. In account of the positive consequences of creativity, the origins of innovations were discussed. In conjunction with innovative media, also, education was underscored as the origin of the prowess and the attitudes needed in the future oriented and self-renewing organizations and societies. Media and education were considered to have a central role in developing people's attitudes and abilities to understand the changing world and to exploit and interpret the unforeseen. Those qualifications were associated with society's capacity to renew itself, when finding its way to the new emerging time-horizon throughout innovations or underpinning creative resolutions for societal problems and fostering its societal values and cohesion.

Due to the exponential increase of knowledge and rapidly changing global environment, respondents had put forward ideas about "nonlinear learning environments utilizing digital tools" (HCS111). Furthermore, supporting

Friedman's (2006) idea of individuals as the drivers of globalisation in "the flat world", social media was seen as an arena for self-renewal and self-organisation, or as a forum where the management in innovation ecosystem takes place.

Alongside with the comments related to the good scores in OECD (Pisa) school evaluation, the ethics and moral of society and education triggered a great deal of criticism amongst the Finnish respondents. Most of the respondents' life and working experiences deviated from the present Pisa evaluations' idea of the formal education as an institution dedicating for knowledge transformation.

> "It is education's function to develop critical, reasoning individuals who tolerate pluralism and are capable of taking risks. The ethical, genuine and empathizing person, who has dedicated himself or herself for life, is what I expect from education. […] A person, who has individual thoughts, will always find a job," (ISS111) stated a technology firm's manager.

Most of the respondents discussed the importance of individuals' personal growth during the childhood and youth, and it was called the "undergrowth of the future innovation ecosystem". Many of respondents agreed about putting more emphasis on arts and practical school subjects during the entire school time. The classical rhetoric and argumentation skills were contrasted with the importance of subjects like,

> "[…] literature or music education. I see them as a compulsory part of the curriculum, due to the fact that, music is an effective method to increase creativity, openness, and emancipation. Music, for example, stimulates and provides an experience of making incredible things together. That is what we need for the group innovation" was explained by a manager in a multinational corporation (IKK112).

Notwithstanding the advocacy of the deep and multifaceted knowledge, it can be summed up that, the *empirical data underscored the balance between theoretical knowledge, logical thinking, practical skills and the emotional, physical and social development*. Consequently, an educational system should

not be managed and evaluated based on the principles followed in the business life, or the logics followed at the stock market. Instead, on account of the corporations expressed needs, *education should be conceived as a long-term investment and a prerequisite bases for the future success of any innovation ecosystem.* Some of the respondents regretted their experiences of

> "recruiting knowledge workers with too narrow doctoral theses, whilst the corporation could not provide challenges matching to that narrow scope of knowledge. It is painful to see, how these people are not able to use their creativity, and how they are getting frustrated because they do not understand the wider matters and context of the innovations. Painfully, I have not found any way to support them. There is no other way for them than, to get aware of the situation, and to reset themselves, and then to take a new start from another level of their capability."

However, in order to be to renew itself, the educational institutions needs the support from the innovative media and from the citizens. Furthermore, media was seen as a school for those who already graduated. Hence, "the innovative media" has all the means to participate in the discussions about the future of the societies, it can and it should increase our awareness, and empower the societal discussions.

The respondents considered that media together with the formal and informal educational system have a central role when citizens increase their awareness. Free access to the flow of knowledge and the public arenas and forums where the debates can take place were considered as important. Since, they provide critical tools for the citizens to approach provided information and knowledge, which consequently will increase the quality of decision-making, starting from our everyday life decisions, all the way to our behaviour in elections or as political decision makers.

A positive amplifying loop between the media, educators and the public-attitudes towards development was found as a crucial element of the innovation

ecosystem. One of the respondents, with a long and impressive carrier in media and politics, referred to the spirit of Plato and to the importance of societal values by saying that,

> ”A consequence, which can be considered as morally and ethically sustainable, is always worth the effort, regardless the ultimate outcome of the endeavour.” The respondent highlighted the media-citizen-innovation relationship as following,
>
> “The aim of media and education is to provide people with the needed knowledge or raw material, so that they can develop their own world views. The ideal is a critical citizen who can manage with the continuous change, and who is prepared to obtain the radical innovations and to perceive them critically and with accountability. Moral and emotional aspects are included as well.
>
> […] The better constituents are equipped with knowledge, the greater is their capacity to receive new information and regard it critically. Citizens’ capacity to understand both the opportunities and the restrictions related to the new is a prerequisite for innovation. […] It is natural that people are suspicious about unforeseeable innovations, but when they learn about the innovation, they change their attitudes. […] It is an enormous challenge to help people to keep on track of the change [and all the crucial information and knowledge related to it].”

To support this argumentation, some innovation processes from the last decades will be put forward. The innovation examples from the field of media paradoxically illustrated, how even the development of media has been dependent on its own capacity to provide realistic information for the citizens.

It was first described how the early debates and decisions concerning the European media had made the diffusion of the contemporary television broadcast possible. At the time, when radio was still a central means for

communication, the acute question was, “whether the TV as an innovation could ever be a functional media for Europe.”

Another example illustrated the relationship between the diffusion of consumer innovations and the citizens’ level of awareness. The colour TV, which was first considered as needless, but later, when the diffusion of the innovation was almost completed, “the last users of the black-and-white TVs were forced to accept the transformation to colour TV by simply stopping the black-and-white telecast. This one-sided decision became possible due to the support of the public opinion.” At that time, since the great majority had adopted the innovation, the hard decision was possible. That was how the laggards, who opposed the colour TVs, were finally forced to yield up the old technology; hence, the service was simply stopped with a public decision.

The transformation from the analogical to digital TV was a third and a more resent example. Nevertheless, the same pattern of diffusion could be found in it. All of these innovations had first been opposed by specialists or by the public opinion, and finally the laggard users of the services were alone, they were forced to approve the change. Hence, there is an interrelation between consumers’ decisions and public political decisions, which makes the actual diffusion of the innovation possible. It is important to consider this interrelation when orchestrating the innovation ecosystem and concerning the collectively important innovations, which affect all of us, specifically the ecological innovations as paramount.

To epitomise the global effects of the media, the period *a prior* the collapse of the Berlin Wall and the independency of Estonia were provided as examples. Both of these resent historical incidences grounded on the *empowered individuals’ increased collective awareness and their wish to act together*. Comparing these two social innovations (related to the transformation of the political systems) to the conventional product innovation, the process seems to

start similarly. Altogether, the free flow of information and exchange of ideas make the things to happen. The informant explained,

> "The mechanisms were similar [in both cases]. [.. at that time] nothing could stop the world's media from communicating among the citizens of DDR and GDR [*a prior* the collapse of the Berlin Wall]. The same happened between Finland and Estonia [*a prior* Estonia's independency].
>
> That connection gradually increased people's awareness, and finally there was enough critical mass, which changed the political situations both in Germany and in Estonia. […] President Lennart Meri said that, from the point of view of the societal change [*a prior* the independency] of Estonia, it was crucial for the people in Tallinn to have the opportunity to follow the Finnish TV programmes. Hence, that connection and the increased awareness created the social change, which was the prerequisite for the flexible transition [independency from Soviet Union]."

The attempt to account for the innovation ecosystems as autonomous, self-productive and self-organising systems can be concluded as following. The individuals are considered as the foundation of the autonomous process of any system. Individuals, who have been provided with pivotal characteristics and proficiency to create innovations together with the individuals making the decisions to adopt those innovations, are the key of self-production and self-organisation. Knowledge and learning lead to better awareness and facilitate hence the creation and diffusion of innovations in wider innovation ecosystems. That is the reason why informal and formal education and public arenas like media are so important in macro level innovation ecosystems. Empowering leadership together with the access to knowledge make the social systems more innovative and hence also self-organising.

The circumstances increasing the psychological energy

Apart from the human intellect, also emotions were narrated when the core aspects of the systemic capacity of self-production and self-organization was dealt. How to perceive and handle the associated emotions, like courage, fear or passion, were widely discussed as an innovation-circumstances related issue. Scholars like Csikszentmihalyi (1991) or Losada (1999) have considered emotions as elements of psychological energy, pivotal for innovative thinking. In this study emotions implication were discovered in association to organizational and communal values, as well as in various conscious measures residing in innovation favourable circumstances.

The respondents stressed the importance of *organizational and societal values as a source of constancy and sensation of security*, both pivotal for creativity. An informant in a managerial position in a multinational technology firm explained,

> "On account of the rapid change of the circumstances, *written regulations seldom fit the current situations, and that is why leadership by values and trust is so important. We have to show our trust, and the subordinates will make the right decisions based on our common values.*" (IJK407)

Our capability to make good questions and to listen to the subconscious were considered as imperative for better observation, deeper awareness, and understanding when the time to change has arrived. "But, if the confidence is poor, these things do not happen and the creative thinking will be blocked," the narrative continued.

Both mangers and innovators spoke about their worry concerning, that so many organizations and the societies in general often miss those prerequisites. Because the empowering common values are often missing, "most of the people do not have courage to make the needed questions, nor do they dare to listen to their own subconscious." (IKK112)

Yearning for the need to be esteemed or recognized resided at the heart of the creativity related emotions. To epitomize the finding, a publicly told narrative (by professor Pekka Himanen, at the University of Helsinki, on the 13th of January 2009) will be given as an example. This story epitomizes furthermore Himanen's (2007) notion of the "enriching community", which was introduced in the literature review.

Philosopher Georg Henrik von Wright, the leading scientist of analytic philosophy and philosophical logic, was at his seventies, when he had met one of his students at the university. The young student was Pekka Himanen, who is himself nowadays a well-known philosopher, but at that time, he was only 18 years old. Himanen, who had proceeded well at his studies, had approached the elderly scientist of high repute, in order to introduce his own deduction about the very same research topic, which von Wright was famous about. The distinguished professor had leaned forward and listened carefully what it was that the young student could tell him about the subject, he himself had studied for decades. Pekka Himanen told how he had found great wisdom and empowering energy in von Wright's words, which were as following,

> *"I want to help you to fulfil your own potential, and to be at your best in your own mission - at your mission, not mine."*

Esa Saarinen, another professor and later also a colleague of Himanen, was given as another example of empowering communication. Saarinen often expressed himself with words like "exhilarating", when commenting others ideas and what they were doing. That was experienced as emotionally empowering and energising.

These examples were explained to demonstrate *the capacity of these people to perceive others and the emotion in-between their conation and its fulfilment*. Being attuned to others' world was referred as a curial capability and asset for those who want to support others in their creative endeavours. At the same

time, they demonstrated how people could provide psychological energy for others.

However, since the managerial and cultural empowerment often fails, *innovator's capacity to empower themselves* was considered as an essential competence in innovation ecosystems. As it was discussed earlier in connection with results related to innovative individuals, the *capacity to cope and utilize both of the bipolar extremes of emotions like fear and courage, was related to the capability to innovate*.

Sensation of fear and shame reside at one extreme of the continuum. Fear was mentioned to be "the counterforce of courage, which has been considered as an imperative of creativity. Courage is scaring, but those, who have themselves the courage to give up to the needed action, signify the overcome of the fear of shame." In the other extreme of conundrum resides the creatively passionate relationship with what one is doing, and it was considered to be one of the important reinforces of the creativity. As an example of how the university can increase the students' awareness about these emotions, professor Pekka Himanen introduced some of the questions he usually explore with his students:

> "How does fear control my actions? What is the wound of my love? How can I help others to fulfil their own potential? How do they locate at me? What is my creative passion, what are the situations like, when I am most alive? What is the dream, which empowered my action? What are the values bigger than me, those which I am adhered to?"

Self-organising systems relying on the responsible teams and individuals

To epitomise how the self-organisation relies on individual, a respondent, from a multinational technology corporation, reminded about the multifaceted and holistic nature of the micro level innovation ecosystems. He illustrated how the

current technology innovations encompass the comprehensive innovation process and how the creative organisations encompass every person and all the aspects of the system. In his description of the orchestration of the systemic entity, he emphasised the self-organising nature of the responsible teams and individuals:

> "[…] a technology innovation is mainly about timing and reorganising the elements related to the innovation, so that the innovation meets the clients' basic needs. Due to that fact, in the company that I represent, the vision about innovation, needed technology, and product development methods, as well as the understanding about the logistics and markets must be completed and agreed before the innovation will be exploited.
>
> […] The top management has to be in close interaction with all the elements in order to be able to provide support and mandate for the teams. Because of the fact that, innovations are not created by the management, but by the teams, the success relies on addressing the adequate mandate together with the responsibility for the teams.
>
> […] By supporting the 'desk drawer innovations', they become part of the formal organisational innovation system, and the aim of this is to integrate the entire corporation with innovation. For us, the open innovation goes with everyone's responsibility to generate innovations.
>
> […] I would say that, it is the responsibility of management to create conditions and opportunities for different type of people to communicate without criticism, that is how the different ideas can be mixed, and the nonlinear innovation process can take place." (NIKK113)

During the interviews, the respondents said that *in the turbulent environment, national competitiveness calls also for nonlinear solutions, however they stressed that, those solutions are often lost, due to the constricted awareness and the tendency for low tolerance of uncertainty in public institutions*. That

relied on the assumption that, the so-called "nonlinear" individuals tend to work in the public sector. One of the informants put it forward as following:

> "[…] the nonlinear individuals can be found mainly from the SMEs, since SME provides an ideal environment for creative, autonomous people. As a result, and from the point of view of our national competitiveness, it is a pity that, primarily the nonlinear people have found their way to the politics, schools and in general to the public sector. That is why the societal change is possible only in long cycles. Unfortunately, in the global environment, the long reaction time is however no longer adequate.
>
> […]I was once asked in the national parliament, whether politicians can be creative. That question is a tricky one. My answer was, yes, politicians can be creative, however only in long cycles, due to the fact that, the nonlinear creativity and related actions will easily be labelled as a disturbance [ruining ones opportunity to collect votes]." (NKKI114)

Differentiation and complementary interaction of the universities and industry

Interestingly, and deviating from the general believes, the respondents with industrial background advocated the importance of Universities' independent basic research. The independent basic research was seen as an investment to the long-term development of societies and corporations. Some of those respondents heavily disagreed with the current Finnish strategies based on customised research. Respondents referred to the development as a serious mistake, leading to a situation when, "the tail is wagging the dog, and the Finnish Universities will lose their attractiveness among the outstanding researchers and talented students" (SOMS113).

It is furthermore evident that, apart from the fundamental research, the need to guarantee the established interaction between the universities, corporations and societies is highlighted by this study. Moreover, the respondents underscored the

universities business understanding. It was e.g., suggested that, a “business plan” should be include at universities’ research plans. (“So, what is the business plan based on your thesis,” was asked from the investigator of this study.)

The business plan would communicate the ideas about how the research results might be utilized by companies or be benefitted at the society in the long-term, within ten to fifteen years. It was said, “the long term impacts of the universities should be evaluated based on the amount and quality of generated businesses, working places and other factors reflecting the more general development of the societies.” (IKK116) Furthermore, the importance of multidisciplinary research was discussed, and the need of research on the new emerging business areas, was stressed. It was again reiterated that, *there can be neither proper applied research, nor product development, without the solid basic research, and there always should be a link between them.*

Many of the respondents with a company background claimed, that the research work at the universities should be funded by the societies. The research, contingent on taxation, was said to be the best solution, on account of several reasons like,

- the role of universities is to keep the world’s intellectual heritage alive,
- the risks related to the expensive fundamental research has to carried by the public sector,
- the importance of independent and curiosity-driven research for radical innovations,
- universities and companies r&d should be funded from different sources, and ultimately because of
- the need of open access to the research results.

As respondent from a multinational technology corporation said:

> "Knowing that 50-70% of research will not lead to any innovation, the risk of funding research has to be taken by the governments, or otherwise innovation will come to standstill." (AMSIKK119)

A serial entrepreneur expressed his frustration concerning the present situation, by putting it in the following way:

> "It is real pathetic to receive the university researchers, who try to attract us [corporations] to their research endeavours. Rather than concentrating on the fundamental research, funded by taxpayers, they are inventing projects to attract companies' time and money. It is wrong that universities are using the one and the same Tekes funding, which, as I suppose, should be utilized for the companies' product development." (OMS119)

These respondents by no means did advocate for a university as 'an ivory tower,' they rather argued on behalf of new structures, which would guarantee the rapid flow of knowledge, expertise and ideas between the corporations, civic society and universities. The dense relationships could be conceived as innovation ecosystems' local learning networks. Universities were furthermore considered as important connecting points or pipelines to the global learning and knowledge networks. The idea of the learning networks encompassed the multidisciplinary collaboration between the various knowledge domains. Recognition of the varying intrinsic values of various research domains was considered as a prerequisite. It was furthermore seen how; linking those values would be an enriching opportunity for both research and innovation. Funding was considered as an effective means to encourage the open communication between research, industry and citizens.

Especially from the point of view of "a small nation, in the global virtual world, the fast exchange of ideas and knowledge" was considered fundamental. Coming across with the different specialist knowledge adds value fast enough. For that purpose, it was argued that, the universities should change their structures in

order to better promote the cross-fertilization of knowledge. “If the defensive forces can reorganize its structure to correspond with the changing circumstances, why couldn’t the universities do it?”

5.4.2.3 The emerging Grounded Theory – towards the idea about management in self-productive and self-organising systems

The content of the innovation ecosystem category has been summed up to two mains suggestions from the point of view of the systems thinking and the emerging Grounded Theory.

- Firstly, concerning the macro level innovation ecosystems, the emerging theory suggests that, since the individual has a key role in innovation, models like Triple Helix by Etzkowitz (2002) should be completed by together with the individual as an independent element. Hence, the *Triple Helix would consist from traditional elements of academia, government and industry, and individuals as the fourth element*.

- Secondly, it suggests that, *the notion of management, concerning both micro and macro level innovation ecosystems, should be explored together with the innovation related situation in concern*. It hence proposes *different managerial patters together with different type of innovation*.

Complementary interaction between differentiated academia, industry, government, and individuals is a bases of self-productive and self-organising innovation ecosystem

The first suggestion highlights the individual as a fundamental element of the self-producing and self-organising innovation ecosystem. It additionally considers the strategic paradox of the controversial realities (like simultaneous creativity

and efficiency, or radical innovation vs. mainstream). The suggestion is based on an interpretation of the empirical data and it has been considered together with the earlier discussed literature. Figure 61 illustrates the connection between the used notions.

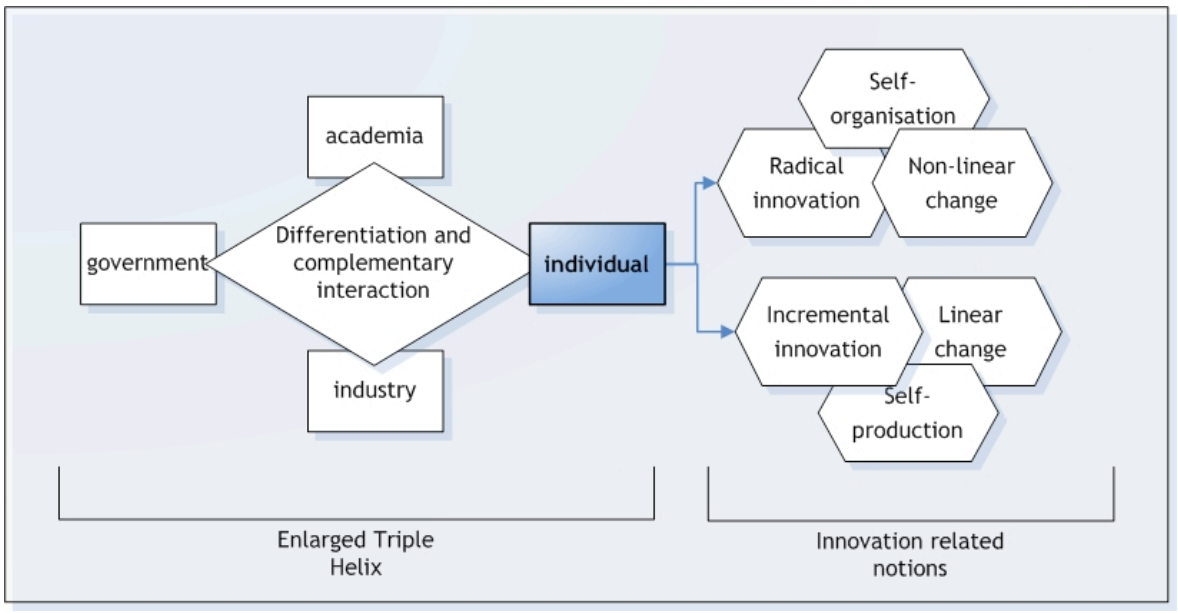

Figure 61 Triple Helix model enlarged with individual and notions related to innovation in self-organising and self-productive systems.

Regarding to the nonlinear development and the simultaneous demands of creativity and efficiency, Maula's (2006) *interpretation of autopoietic systems relies at the core of the following theory building*. Maula's study is based on professional organisations and communities, which could be regarded as innovation ecosystems; in the same sense as this study defines them.

Referring to Mingers (1995, 1997), Maula ((2006), 48) writes: *"Non-physical autopoietic systems include human organisations, societies, and systems of laws or ideas that belong to abstract systems."* She furthermore reminds about the relational nature of the autopoiesis theory and refers to the interaction of the elements: "*The control and autonomous approaches complement each others*. A given system may be seen as an autonomous whole; while simultaneously its components may be seen as input-process-output systems from the control

perspective (Varela, 1979). Thus, *it is possible for an organisation to be regarded simultaneously as an autonomous, autopoietic system capable of self-production and as a controlled system."*

Another scientific assumption, on which the theory building in this study is based on, states that *viable societies and organisations cope with the complex environment throughout differentiation and integration* (Maula (2007), Csikszentmihalyi (1994)). Furthermore, it is claimed that from the point of view of viable macro level innovation ecosystems, universities and industry should both specialise to their own fields: universities on the fundamental research and industries on commercialisation of the innovation. As Miettinen (2002) claimed, the *quality of research and businesses can best be guaranteed throughout specialisation and evaluation, which takes place in one's own arena.*

Based on the results related to the macro level innovation ecosystems, this study conceives that, *apart from differentiation, complementary interaction among universities and industry is important*. The combination of differentiation and complementary interaction provides feedback from the business innovation ecosystem to the research and from research to the businesses. Consequently, the emerging and evolving innovation ecosystem is based on the complementary and enriching interaction, providing agile environment for the incremental innovations and at the same time generating potential for the long-term radical innovations.

Based on the previous, and highlighting the cross-fertilisation and feedback among the various practical and theoretical knowledge and innovation systems, it can be claimed that, the *complementary interaction between differentiated universities, civic society and industry has a capacity to boost the innovation ecosystems' self-production and self-organisation*. However, based on the results of this study, the role of individual can be considered as a fundamental prerequisite in an innovation ecosystem. *Since, only individuals carry the pivotal*

characteristics and capacity needed at the self-production and self-organisation of the systems.

The claim of this study that the Triple Helix model, by Etzkowitz (2002), should be complemented with the fourth element, namely the individual, relies on the central role of the employees and citizens in the innovation as well as in systems' self-productive and self-organising processes. *This study thus suggested that, individual should be seen as an autonomous but integrated element of the innovation ecosystem* together with the other elements; the government, industry and academia. In addition, from the point of view of management this study suggests that *the intellectual and emotional capacity of people and citizens should be supported by all possible means, like with education, innovative media and enriching leadership.*

In accordance to the open systems approach and the idea of innovation ecosystems, this study conceives that, *the university, industry, and society produce raw material and 'energy' for each other*. That is energy in the forms of ideas, feedback, knowledge, or e.g., psychological energy in the individual level. In the ecosystem, the produced *energy can be utilized only if the interaction (established relationship) in the innovation ecosystem is dense enough, and moreover, it is based on trust*. The reiteration of knowledge, ideas and feedback provides the innovation ecosystems' actors the needed potential for better awareness, which makes the holistic approach, pivotal for innovation, achievable. The idea of independent universities and corporations in close collaboration, as well as societies funding the fundamental research and carrying the risks related to it, is parallel with the idea of a self-productive and self-organising innovation ecosystem, encompassing both the short- and long-time horizons as well as the incremental and radical innovations.

The above suggestion, stressing the diversification and complementary interaction, can be considered as congruent with Wessner's (2005) non-linear model of innovation, and Miettinen's (2002) idea of the problem oriented

collaboration networks among the universities and working life. However, they do not, encompass the individual as an independent element, nor do they highlight the importance of psychological energy, in the same way as this study has been doing.

Different managerial patters

The second suggestion proposes different managerial patters together with simultaneous and consecutive innovation situations. To deepen the understanding, the found managerial experiences were reiterated with the comments concerning the cyclic alteration and simultaneous existence of the status quo and the linear and nonlinear changes of the self-productive and self-organising systems (introduced in table 33).

Consequently, various managerial patterns and managerial situations, related to the innovations and innovation ecosystems were found whilst the iteration of the data. *These managerial elements, patterns and situations can be reduced*, in accordance to the classifications discussed in the literature review, as following:

1) managerial innovation,
2) management <u>of innovation</u>,
3) management <u>of</u> innovation ecosystem,
4) management <u>in</u> innovation ecosystem, and
5) laissez fair or permissive leadership.

Based on the above discussed systemic features and the earlier described theories (Luhmann (1983) and Prigogino (1999) in Ståhle (1998) and Maula (1999)), explaining the autopoiesis and the bifurcation zones related to self-organisation, this study furthermore suggests that, *system's capacity for self-organising is related to the following two notions: "management in innovation ecosystems" and "laissez fair or permissive leadership"*.

As described alongside with the status quo, there reside both linear and nonlinear changes in the systems. Furthermore, based on the findings of this study and the previous finding of March (1999) who claims that exploration and exploitation can take place simultaneously and Maula (2006) who explains that, the organisations as living compositions can manage both creativity and efficiency at the same time, it is conceived that,

> *the "management in innovation ecosystems" refers to the societies and organisations where there resides many social and economical subsystems in which innovation and change arise in their different developmental phases.* Consequently, Hamel's (2002) idea of the *management in systems is understood throughout the autonomous subsystems.* Individual and often controversial subsystems hence, have a capacity to self-produce and self-organise themselves in accordance with the external conditions. The role of the wider systems is hence to support and empower the subsystems rather than to manage them.

Based on these assumptions, the found categories were reanalysed together with the various phases of the system's lifecycle. Consequently, table (35) and figure (62) were drawn based on the discovered managerial elements and patterns, and the phases of the self-producing and self-organising systems' lifecycle (introduced on 33).

Table 35 Managerial patterns and situations related to self-producing and self-organising innovation ecosystems and to the phases of status quo, linear change, and nonlinear change.

Management of innovation ecosystem	Management in Innovation ecosystems		Laissez fair	..New status quo evolves in the innovation ecosystem, the old IES expires
Management of innovation when innovation ecosystem is in the phase of..				
..status quo	..linear change	..nonlinear change..	..chaos and the tipping point	
Managerial innovations & leadership empowering creativity and people in order to..				

- cope with the paradox of success	- increase productivity,	- generate new rules to the field/market	- know when to let go

The allusive table (35) and figure (62) are relative and rough reductions, illustrating the relationship between the concepts of innovation, management and innovation management. Figure 62 is modified and developed based on Ståhle (1998).

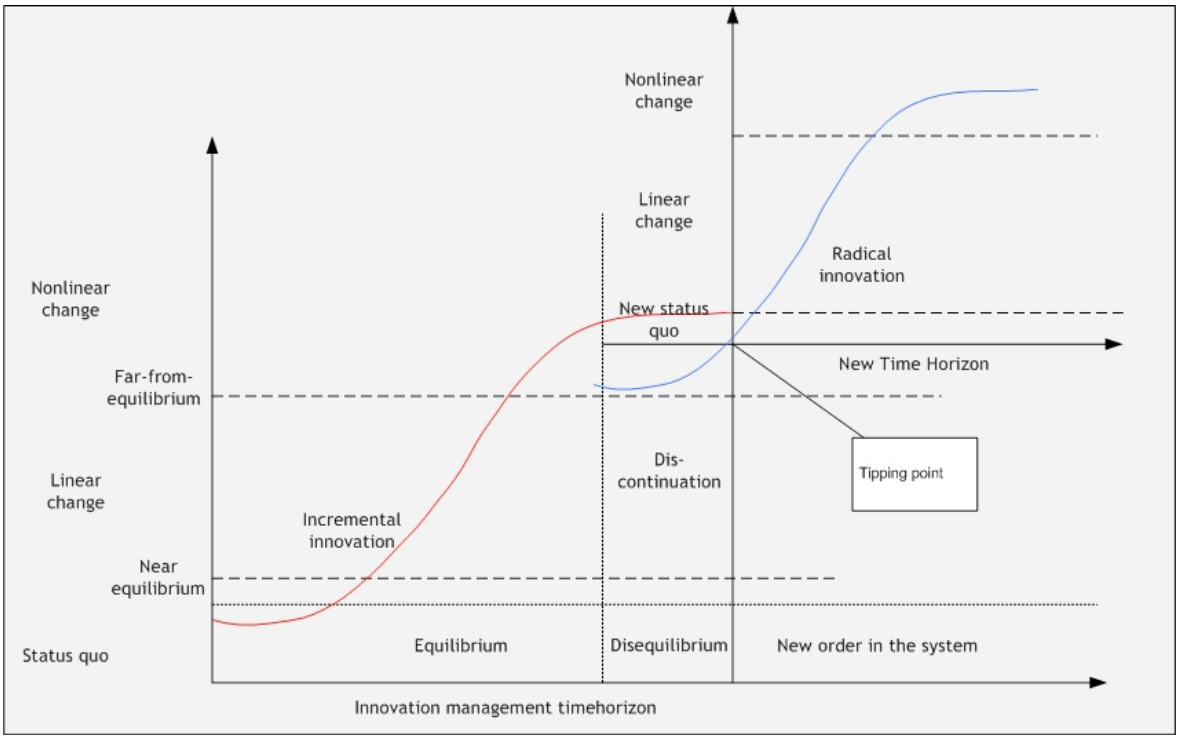

Figure 62 A schematic illustration of system's life-cycles encompassing the phases of status quo, linear change and non-linear change. The s-curves illustrate the change of the managerial time horizon when the new order emerges.

The table demonstrates how the "Management of innovation" takes place during the various phases of innovation ecosystem, from status quo, to the phases of linear and nonlinear changes, as well as during the bifurcation zone and the tipping point. The tipping point in the bifurcation zone resides *a prior* the actual moment before the radical transformation takes place. Envisioning that some type of innovation related activities always reside in organisations and societies,

it can be deduced that the management of innovation continues, to some extent, also during the status quo.

Furthermore, it was found that, the managerial innovations occurred during all of the previous mentioned phases. This study furthermore claims that, as an important type of managerial innovation, namely the energizing leadership, which empowers individuals and fosters creativity and innovation, is vital all the way through the innovation ecosystem's entire lifecycle. The found managerial innovations were related to the visionary and conceptual management and shared leadership mobilizing people or they had created and used the "winning teams." The energizing leadership made the most of the intrinsic motivation, mentorship and delegation of power and responsibilities. The found managerial innovations employed networking to complement the subsystem's existing resources and energy.

> To epitomize energizing leadership an informant gave an example of energizing leadership by referring to Kurt Wikstedt. He was the head of the electronics department in the 1960s at the Finnish Cable Works, which in 1967 became a part of the Nokia Group. Wikstedt was told to have had a clear vision of the future of electronic communication and the discontinuities that resulted in transformation. "Kurt Wikstedt was at the 1960s and 1970s like an evangelist who encouraged us and made us to trust to the future of Nokia. Future is a matter of faith; with that faith, you will work to fulfil your mission. It can take years, let us say, twenty years is a normal time needed." (BACH)

> It was furthermore referred to the energizing effect of the management throughout values. President John F. Kennedy for example was told to have appealed to persons' desire to do good, when he invited America's young generation to ask themselves 'not what their country can do for them but what they can do for their country'.

The above mentioned aspects of energizing leadership were considered as a contrast to the experienced tragedies related to *"the management by the culture of shame"*, or to the unsure, incapable and unfair leadership which was described as the following:

> "Those who express their ideas and visions which are not in accordance with the formal strategy will easily be excluded from the inner circle. It can happen throughout social exclusion or simply by public humiliation, attacking against all the weakness in your vision. I would call it management by shame." (SOMISH)

> "The head did not even confess that he had been wrong when he hadn't approved our idea, the very same idea, which later turned out as a success factor for our business rival."(ATT97)

> "it is a dangerous combination "[for a radical innovation],if a person who is not an innovator and furthermore happens to have poor self-esteem as a manger, but who, due to his or her social skills has been elected to a managerial position."(ASI97)

> "There are similar pressures [like social exclusion] for the managers themselves. It happens all the time, also visionary managers stand aside or they are transferred. They can simply leave the organisation, in spite of their high rank in the corporation due to the management of shame is expressing too radical ideas." (ASI98)

Findings concerning the Finnish innovation ecosystems from the past decades, illustrated how *the managerial innovation fluctuated in accordance to the variation in the circumstances*. Managerial experiences, related to the period after the economical regression turning point (in 1990s), alluded to an occurrence of a phase of new status quo in the innovation ecosystem. During that phase, the development of managerial innovations seemed to be in

standstill, for it was highlighted that, the implementation of the agreed strategy was considered pivotal for the new managerial innovations. Whereas, after the enormous structural transformation of the entire society had been accomplished, the managerial innovations concentrated on how to avoid the risks related to 'the paradox of successes'. Increasing the contemporary productivity with incremental innovations was described to be at the core of the managerial innovations, related to the linear changes of that phase. Additionally, it was found that, at the same time with the linear change, the managerial time horizon encompassed the next emerging new era and the related status quo, hence the system had prepared itself for the possible new nonlinear changes. Interestingly, the future oriented managerial innovations of the data manifested in descriptions involved both the macro and micro level aspects at the same time. It was for example explained how

> "in Finland an effective understating of the national strategic picture encompassed a wide range of specialists from various organisations. They further covered large networks abroad. [Already in the 1970s] the university was an excellent breeding ground for the societal changes and for the progress of our industries. At the university, they provided us a free hand in building the networks and developing the multidimensional operations breaking the organisational boarders. The university management of the time told for us: 'as long as you earn the funding, fire away!'" (TUKK112)

Moreover, related to the nonlinear change, managerial innovation was focused on, how to set the new rules to the market or to the field in concern. Finally, the managerial innovation demonstrated *the correct timing concerning the moment, when the management had to let the system to go and allow it to reorganise itself*. That result is parallel with (Ståhle (1998) and Scharmer (2006)). The informants of this study referred to the moment when the system was allowed to reorganise as *laissez fair or permissive leadership*.

A manager of a technology firm, who had explained, how the leadership had been sheared among the employees, and how the people in the organisation knew that the manager's support would be available whenever needed, continued her narrative as following,

> "[that was how] our self-organising corporation was created. They liked me as a CEO. […] *It was at the twilight area of chaos and order, where the pursuit of action took place, and the passion and equality dominated.* [...] Internationalisation brought up the pluralism, which kept our guards up. There was a mentality of excitement, which made people to proceed. It evoked the passion for creating something new and for being different from the others, being equal and acting in line with the clients. All those elements were present there." (NAL111)

Several examples were told about how the *sheltering of radical innovation and isolation of radical innovation* had taken place during the linear phase.

> "The development operation [of radical innovation] was taken away from the line organisation, and since then its progress was reported directly to top management, passing by the traditional organisation. That was the only way to make it happen." (AHN111)

At the first line of the table (35), the notion of the 'management of innovation ecosystem' alludes to a situation when, the management is incontestable, and the system is under the control of managerial procedures. It applies to the situations when, for example, the mainstream production of a corporation is following the established patterns. Based on earlier described results, the consensus driven management of the Finnish national innovation system epitomises the management of macro level innovation ecosystem.

The notion of the "management in innovation ecosystem" alludes to the simultaneous managerial activities in various autonomous subsystems. Some of the subsystems may reside in status quo, whereas others go through a linear or nonlinear change. Some are more controlled and others emphasise freedom or

creative chaos. Each subsystem is managed independently since an innovation ecosystem is considered as an autopoietic social and economical system, which is initiated, developed and modified throughout the actions of its various subsystems. As an example of how the macro level innovation ecosystem was managed while far-from-equilibrium, a respondent explained the importance of intelligent individuals, who were empowered with shared leadership as in the following,

> "[…] a better general view and the systems thinking are needed when the complexity increases. What is needed is some type of systems intelligence in order to get deeper inside to the systems and to the mental aspects related to the systems. [...] Shared leadership is needed, but it will not happen without trust and collaboration. During the era of fast changes, we need [in the macro level innovation ecosystem] change agents, people who understand what the real circumstances are, and what processes are needed for radical innovations. Those people have the capacity to outline difficult matters and communicate about them." (UKKREF1)

'*Laissez fair', 'permissive', and 'inclusive*' were words used to describe the successful management, or better *the lack of management*, during the moment when the collision between the old and new rules and principles was at its worst, and when the old regulations had to be abandoned. Finally, throughout the bifurcation point, if lucky, the new order or entirely new innovation ecosystem evolved. In the data, there were both examples of autopoietic (self-productive) and self-organising changes of innovation ecosystem's. Permissive management was found to be interconnected to both of them. The following examples epitomise this phase of transition.

Some examples were discussed more in detail, and will be just mentioned here. Due to the permissive leadership, new order was explained to have emerged for example in the banking sector. Likewise, people themselves created an innovation ecosystem for the digitalisation of amusement when the governmental top down management was missing. Furthermore, the

development of mobile phones and SMS had generated a new industrial and business innovation ecosystem for telecommunication. The transition phase epitomises how the old analogical telephone businesses and innovation ecosystem expired at the same time as the new order and system emerged. Likewise, it can be assumed that, the negative financial innovations together with the insufficient societal control, which caused the financial crises in 2008-2009, might later lead up to some radical changes. Time will show out, if an entirely new global order and economical innovation ecosystem may evolve due to that.

Eventually, since the features indicating the 'management in innovation' and the moments of 'laissez fair and permissive leadership' were the same as those, found as facilitating factors for innovation in the autopoietic and self-organising systems, they were furthermore reduced to another schematic figure (63). The figure illustrates the relationship between the discovered main features, namely the "holistic and integrative strategic approach" and the "energizing leadership providing psychological energy", which is a prerequisite for the innovative people, and hence, also for the systems having the capacity to "tolerate all the innovation and change related inconveniences". These features represent together the intellectual and emotional capacity embedded in the innovative individuals as well as in the management in innovation ecosystems. Furthermore, the figure encompasses the key notions related to innovation, and change in self-productive and self-organising systems.

To sum up, in innovative systems, based on a holistic and future oriented strategic picture, the complementary interaction among subsystems and the environment was encouraged by leadership. The continuous development of the system's intellectual capacity, embedded and enhancing in its individuals, was a requirement for the holistic, strategic and integrative approaches used in the system. Emotional capacity was needed to face the frustration and inconveniences embedded in the transitions, as well as in the tensions and paradoxes among the contradictory principles of the subsystems (their different

aims and various stages of innovation). Capacity for the tolerance of frustration and inconveniences is the more significant, the more tension in the system. Tolerance was hence required from the individuals, regardless of their position concerning the innovation. It was found that, individuals had a capacity to empower themselves and others, and hence the emotionally energized, aware individuals were the carriers and facilitators of innovation and the self-renewal of the systems.

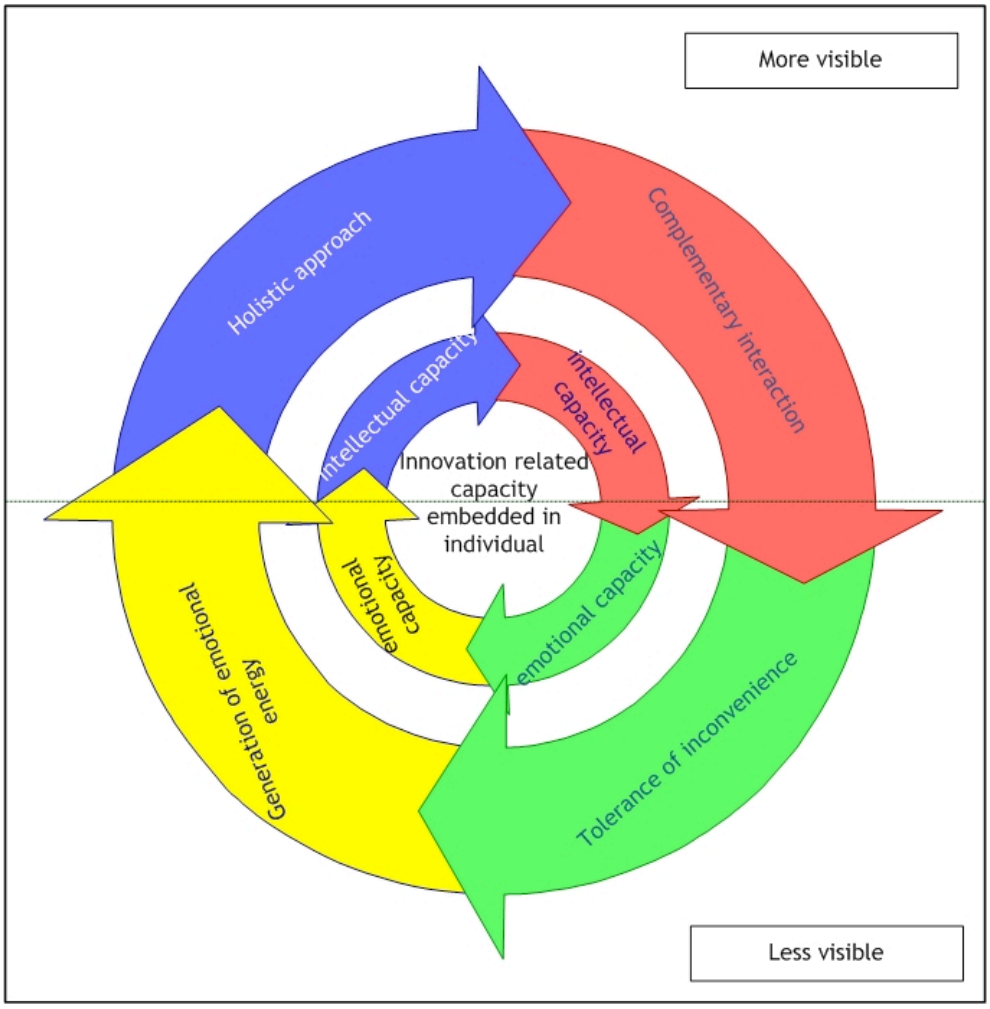

Figure 63 System's intellectual and emotional capacity embedded in person is required for the action/interaction related to the innovation process

An other schematic figure (64) illustrates the 'management in innovation' as an enabler of self-production and self-organisation, which subsequently form the

context where the capacity embedded in individuals actualises as an innovation process and generates incremental or radical innovation.

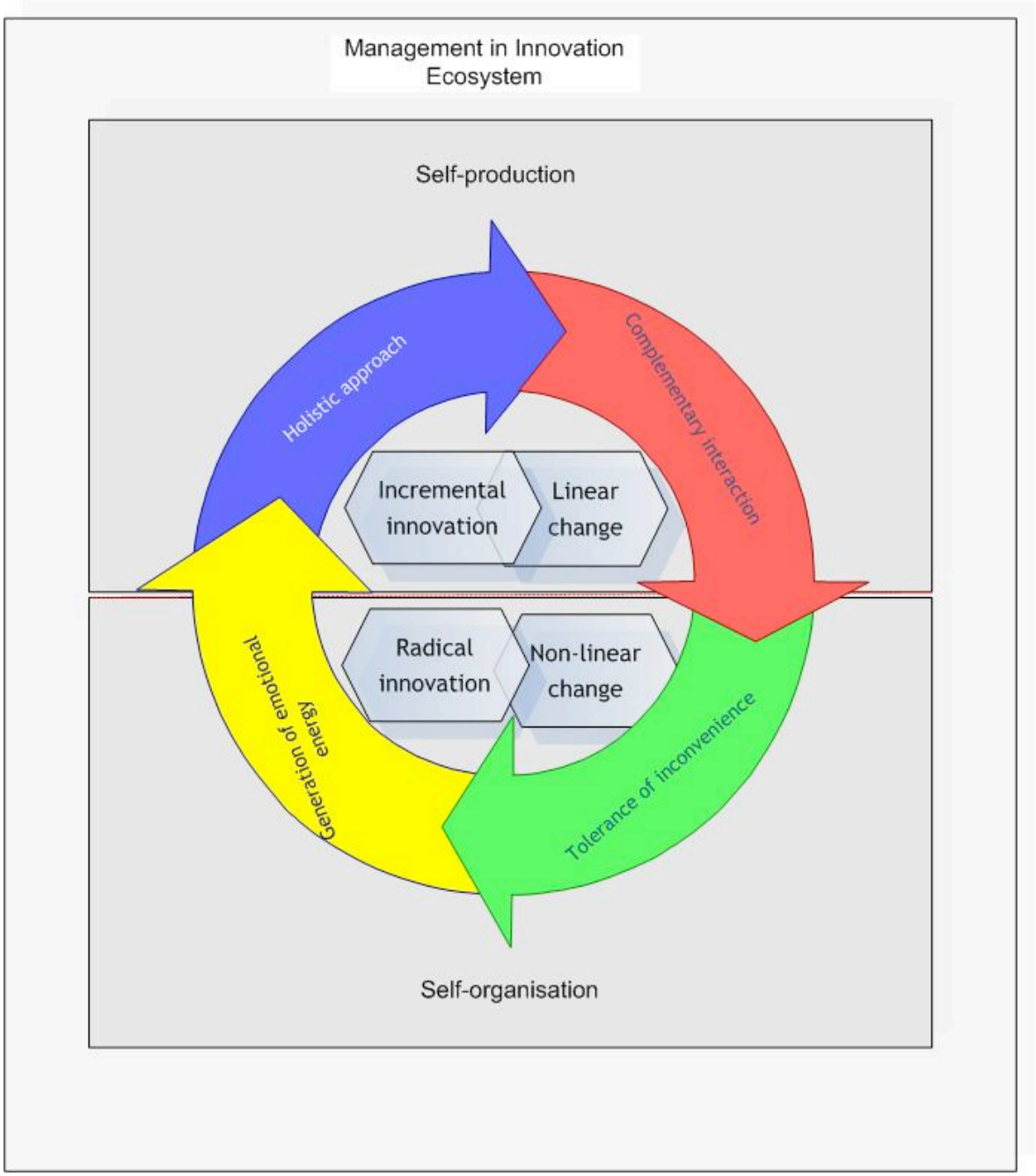

Figure 64 Management in innovation ecosystem as the enabler of self-organisation and self-production

5.5 Theory describing the innovation-individual-context related experiences

In this chapter, the previous discussed essence of the innovation-individual-context related experiences and relationships are repositioned together with the systems theory. While in the earlier chapters, the results have been diverged, and the essences of phenomena have been carefully examined, the aim of this section is to converge the results into a clear analytical story incorporating all the earlier introduced innovation components.

Here, in this section, a middle-range Grounded Theory is proposed and the definitions of the key concepts are introduced. The theory together with definitions is presented as a *conceptual ideal model for management in innovation ecosystem where the circumstances are contradictory*. As a consequence, the story about how the *virtuous circle* may emerge in reality, if all of the innovation related parts will fall into their right place.

The theoretical model has been converged in a highly abstract level and it describes how the virtuous innovation circle may emerge as a consequence of the reconciliation of the many controversial realities at the same time. It should be kept in minds that firstly, the theorisation has taken place in terms of specific or ideal conditions of innovation and secondly, that the model focuses specifically on the immaterial aspects of innovation ecosystems, since based on this study, it is the soft or invisible side of the system-of-innovation which distinguishes the best ones from the good ones in the most challenging conditions. This does not mean that the hard side of system could be ignored.

5.5.1 Virtuous Innovation Circle; an ideal model for management in innovation ecosystem in contradictory circumstances

In this section, the previous discussion is developed into a conceptual *middle range theory*, presented in figure 66. The theory has been generated by

following the Grounded Theory principle of axial coding (Strauss and Corbin (1991)) and utilizing a tool called *paradigm,* providing perspective for the research (Corbin and Strauss (2008)). With the paradigm, all the elements, namely the conditions, context, action/ interactional/emotional strategies and consequences are all brought forth. In other words, all the found categories and relations are integrated to form an overall picture. In next section, a story has been put forward about how the reconciliation of many controversial realities may turn into a virtuous innovation circle in an innovation ecosystem which is self-organising and self-productive.

The found innovation-individual-context related experiences have been illustrated as a theory (figure 66), encompassing the *(1) phenomenon and (2) process of reconciliation of the many controversial*, innovation related realities at the same time, as well as *the (3) contextual conditions from the most macro to the micro level and (4) the consequence, namely the virtuous innovation circle.*

Reconciliation, according to this theory, is pivotal in conditions where *innovation is regard as a comprehensive, complex, paradoxical and controversial phenomenon* and it *relies on the human side of the system*, namely on individual's characteristics and actions (the immanence of individual). Innovation takes place in *structural conditions (context) where both cohesion and tension resides in self-organising and self-productive systems.* Management of cohesion, tensions and paradoxes takes place in a pluralistic environment which allows the antagonisms of the reality, like creativity versus efficiency, exploration versus exploitation, or generation of innovation versus maintenance of the mainstream as mentioned in figure 65.

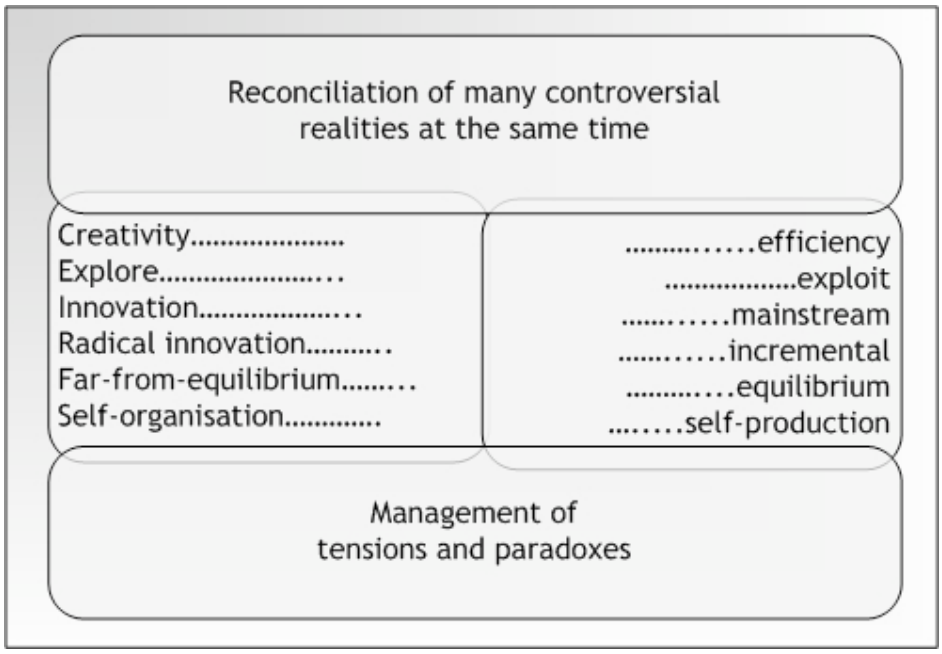

Figure 65 Management of tensions and paradoxes related to the antagonisms of reality.

The *reconciliation process* takes place both in micro and macro levels. It is based on the trajectory of (1) *holistic approach, (2) complementary interaction, (3) tolerance of inconveniences, and (4) generation of energy*. They all refer to the interrelated strategies, to the flow of action, interaction and emotions of individuals and groups of people dealing with the paradoxes, cohesions and tensions embedded in the innovation process. As a consequence of the inter/actions and emotional responses, there emerges and evolves an innovation related phenomenon, which is called *Virtuous Innovation Circle* and describes the management in self-organising and self-productive innovation ecosystem. The notion of the "management in system" refers to the innovation related autonomous subsystems and their permissive management, which has been found to promote both incremental and radical innovation. Management in system keeps the creativity and productivity of innovation ecosystem in balance during incremental innovation, and allows the old to go and the new to emerge, whenever the time will be mature for the more radical innovation.

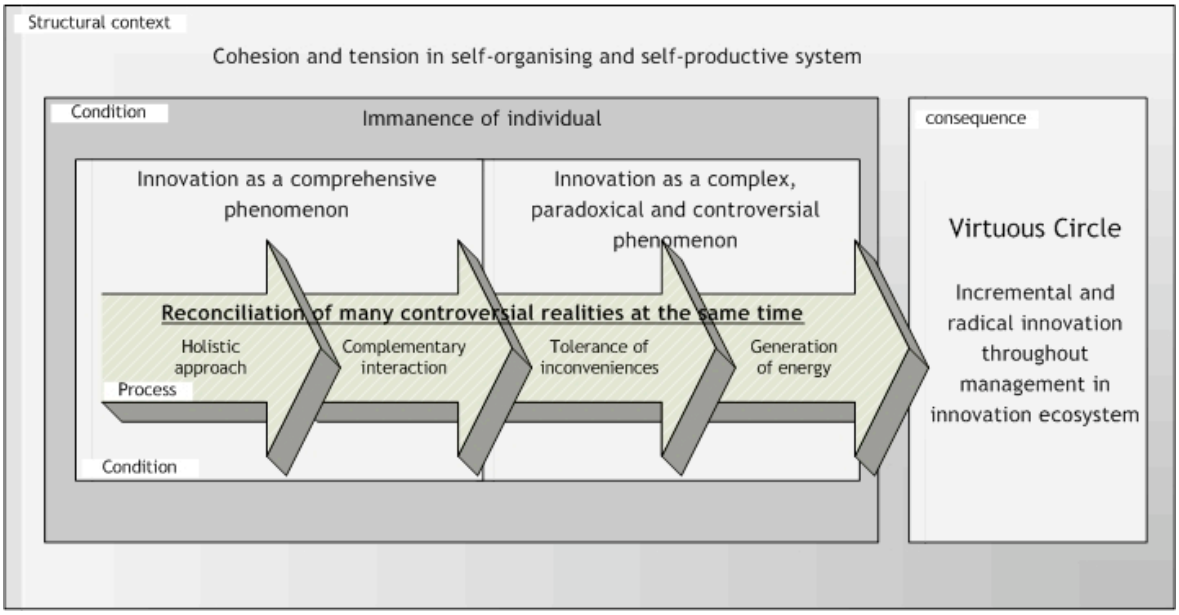

Figure 66 A Virtuous Innovation Circle, an ideal model for management in self-organising and self-productive innovation ecosystem.

How does the ideal model then work and what are the related definitions? In the ideal model all the innovation related parts (circumstances and process) fall into their places, and as a consequence, the virtuous circle, called management in innovation ecosystem, emerges and accelerates both radical and incremental innovation. The model claims for creative use of different management approaches for different circumstances and phases of the innovation ecosystem.

Simultaneous and controversial innovation related realities refer to the variety of incidences and contradictions among the various subsystems of the innovation ecosystems. They refer to the cohesion, paradoxes and tensions related to the innovations, individuals and to the contextual aspects.

Reconciliation of simultaneous controversial realities, as a phenomenon, refers to the conflicting forces like stability and change, or radical and incremental innovation, as well as the competing goals or other controversial aspects, which simultaneously appear in individuals, societies, organisations and in the innovation itself.

Systems, like individuals, organisations, regions or nations, operating in complex and quickly changing circumstances, have to manage different types of incongruities, like productivity and creativity, short and long-term time horizons, or contradictory rules and principles related to the old recessive and new emerging paradigm. This, at first glance, may look suspicious, due to the logical differences.

A long-recognised dilemma of corporate strategists is whether, to go for the radical innovation and the big change, or to shuffle along with incremental innovations and business as usual. There are many risks. Firstly, radical innovations are risky, since they are expensive and they are often born prematurely, and those who pioneer them may see their performance deteriorate at first. Likewise, business as usual may incorporate a risk, if the rivals hit first by generating a radical innovation, transforming the entire business innovation ecosystem, and all of its principles, rules and logics.

The conditions, where the reconciliation of many simultaneous and controversial realities takes place, refer to the combination of the complex properties of the (1) innovation, (2) individual, and (3) the structural context, which appears as a self-organising and self-productive system due to the actualisation of the intellectual and emotional capacity embedded within individuals.

The essence of innovation refers into innovation as a phenomenon, which is holistic, comprehensive, complex, paradoxical and controversial in nature. This type of phenomenon was discovered both in economically and socially successful innovations. Innovations were analysed in terms of *innovation type and stage of radicalism and maturity*. The found innovation types, based on which the theory is based, were as following: (1) innovation for innovation ecosystem, (2) social innovation, (3) industrial innovation, (4) business innovation, (5) managerial

innovation, (6) product and service innovation, (7) operative innovation, and (8) meta-innovation.

Innovation is all over, however, it was found that a solitude innovation per se, is rare, because innovation is a *systemic and an intertwining phenomenon* and it generates and demands other innovations or creative use of innovation alongside it. Due to the interactive and supplementary characteristic, innovation operate like the "*parallel stepladders*" (illustrated in figure 54), generating a rapid economical or social success provided the timing is correct. The most wanted is a managerial innovation, because it has a specific power to make all the other innovations to flourish.

Innovation is *like a chameleon or a hybrid*, it can be recognised when seen, but it is difficult, if not impossible to define, because the essence of innovation is creative, and it changes whiles travelling through time and space. The sources of innovation are multiform and multifaceted, and the stages of innovation are many. Innovation travels and transforms back and forth, inside out, and upside down. It transforms throughout research, development, prototyping, marketing, testing, and commercialisation. Innovation furthermore travels extensively across the ethical and social cycles from start ups to the incumbents. The essence of innovation discovered by this study expands the conventional horizon from technology, towards the more philosophical and psychological aspects.

There are many *paradoxes related to innovation*; innovation cannibalism and success traps are not among the most apparent, but altogether, with the all other paradoxes, they create both positive and negative tensions around the innovation. Innovation, in general, claims for visibility and holistic efforts in the systems. That is pivotal for the innovation in order to be able to serve the system alongside the principle of reciprocity. Radical innovation, moreover, claims for systemic capacity to perceive and learn from the emerging future.

Another central discovery, **namely the immanence of individual** gives voice for the individuals. It refers to the human capacity, that is, the pivotal role of the characteristics, competences, knowledge, values, emotions, feelings and actions of human beings in their different innovation related functions and during the various phases of innovation. *Proactive innovation intellects* are the creative professionals in various different innovation related roles; they can be the creative thinkers, inventors, innovators, creative managers, innovation protectors, opinion leaders, or activists, but they can as well adapt to the role of the creative users.

Proactive innovation intellects are the forerunners of various sectors and the leading lights of societies. They have the capacity see what is coming next and why, and they fight for the better, long before the big majority knows or understands the inescapability of transform. They, despite the discomfort and frustration, find the satisfaction from what they are doing, because they perceive themselves as part of something bigger than merely themselves. They consider that there is no monopoly for innovation and creativity, but innovation belongs for the humankind. Hence, wide awareness, pluralistic values, open mind, critical thinking, capability to make adequate decisions and the related emotions are the imperatives to be supported in societies with the aim of innovation generation and diffusion. The wisdom of knowing when to let the old go and to allow the new to come is sine qua non for the radical innovation and non-linear changes. That wisdom does not reside in the structures but is embedded in human minds, both individually and collectively.

“All roads lead to Rome”, even regarding to innovators’ backgrounds. Informants’ backgrounds were manifold; their lives had encompassed both harmonious and turbulent phases. Personal growth as a human being throughout the whole lifespan was associated together with learning and the sense of self-control and self-growth.

Extreme experiences were found in both ends of the innovation related conundrum of emotions; from the rewarding sensation of flow, affiliated to the work which is considered valuable, to the distracted feelings concerning the losses, shame, or loneliness related to the heretical. Due to this alteration of positive and negative emotions, the self-realization and self-esteem gradually has developed and individual's solid value system, possessing both the hard and soft values, has matured, and the embryonic and flourishing complex self has taken place in the form of differentiation and integration of mind. Creative individuals were found to live in cyclic and altering periods of solitude work and enriching interaction with others; they were networking, due to the need of complementary ideas and wisdom, and indulged themselves solitude moments pivotal for the knowledge incubation and personal growth.

Apart from utilizing multidimensional knowledge sources and holistic approaches to learn from the emerging future and to crystallize the core essence of the innovation, also less noticeable capacity was found embedded in proactive innovation intellect. Namely, the resistance to uncertainties, discomfort, inconveniences and frustration related to the internal and external innovation deteriorating factors. It was discovered that alongside with the tolerance of inconveniences comes individuals' ability to generate emotional and cognitive energy.

Altogether, these characteristics founded upon individual, lay ground for the management of the unavoidable innovation related deteriorating factors, some of which are external and some of which, paradoxically, originate in the proactive innovation intelligent himself or herself.

Innovation ecosystem, as a self-productive and self-organising system, refers to organisations, regions and nations, and outlines structural context for the reconciliation of the many controversial realities at the same time. Systems evolve, flourish and expire in cycles of recurring equilibrium and far-from-equilibrium. During the chaos related bifurcation zone the iteration of

contradictory signals makes free choice and commitment to the decisions possible. That is what makes radical innovation achievable.

The cyclic alteration of the system facilitates the conundrum of innovation. Paradoxically, both cohesion and tension were found in innovation ecosystem's linear and nonlinear changes. It seems that self-productive systems can continually learn and incrementally renew them, whereas the complex, self-organising systems have the capacity to create energy and order from chaos in a decentralised process. It was found that discovering unexpected opportunities became easier during a temporary disorder, and a downturn acted as a arctic and refreshing shower for the economic system, releasing creative labour and capital from the vanishing corporations and sectors. That was when the management in system rather than management of system took place.

Awareness of the immanence of individual was discovered in the competitive innovation ecosystems. The invisible and intangible, soft and human related subsystems were discovered to separate out the best innovation environments from the good ones. Hence, the continuously learning individuals generated the needed intellectual and emotional capacity for the systems' holistic and integrative strategic approaches. Individuals, capable for energizing leadership, provide psychological energy, which increases systems' capacity to resist all innovation and change related inconveniences. The developed awareness of the human immanence lays ground for the self-productive and self-organising innovation ecosystems, since the emotionally energized and aware individuals operate as the carriers and facilitators of innovation and hence improve the self-renewal of the systems. Some of the recent Systems Approaches have discussed the hard side of the self-organising and self-productive systems, whilst this study adds a human related explanation into these mechanisms.

On account of the complexity of environment and increasing transformation, *systems differentiate*. For differentiation systems rely upon innovation, which

furthermore accelerates the speed of transformation and the need for further innovation.

Educational subsystem exists at the most heart of the macro level innovation ecosystem; therefore, it is education's mission to support individual's growth to his or her fullest potential. Whereby, the critical, reasoning citizens will have a capacity to tolerate pluralism, and to take risks related to innovation. Formal education was claimed to foster ethical, genuine and empathizing personal development, so that he or she would have the wisdom to dedicate the life for living. *The enriching communities, which have the capacity to support the proactive innovation intellects, who wholeheartedly dedicate themselves on something they consider as significant for the humankind*, were discovered, at the same time, to be grounded on human activity. Media was furthermore considered to have an important role in this endeavour.

Strategies and process refer to the individuals' responses in various innovation related roles and functions. Individuals and groups of people respond to the contextual circumstances from micro to the most macro level. Whereas, the process consists of the flow of actions, interactions and emotions. Here, the process can be considered as an abstract deduction of the utilized strategies, which were discovered to have the power to distinct the best performance from the good one and to manage the internal and external tensions. Consequently, the process gives rise to the virtuous circle, and at the same time prevents it from turning into a vicious circle.

It was discovered that the intellectual actions, together with the emotional responses go hand in hand, two by two; consisting from the holistic approach and complementary interaction, jointly with the tolerance of inconveniences and generation of energy.

Holistic approach and complementary interaction were discovered both in macro and micro levels and they were related to the innovation management

together with the permissive leadership. Holistic approach and complementary interaction are needed due to the complex and multifaceted problems. Macro level innovation ecosystems were discovered to generate systemic innovations, anchored in the integration, and preventing failures of partial or solitude innovations.

In the macro level, the holistic approach refers to the societal and collective actions, like education, innovative media, or data fusion and the collective swarming around a problem. These actions reduce ignorance and overtake the lack of perspective, ideology and constructive criticism, whenever collective and individual decisions, concerning the selection of the right idea or innovation (dissemination) takes place. Complementary interaction calls for the integrating pipelines among the proactive innovation intellects, corporations, governments, innovation hubs and the markets in various countries. Continuous feedback among theoretical, practical, explicit and tacit knowledge complements the holistic approach and consequently empowers the innovation process in all of its phases.

In successful innovation organisations, there resides a holistic view of everything, from the vision to the market. Individuals know something about many things, which makes it easier to make connections among the week and strong signals. Individuals and groups have a capability “to see the forest for the trees” when identifying relevant phenomenon and all the needed fundamentals, or when generating the pivotal myriad of ideas from where the most potential ideas and related feedback can be selected.

Holistic approach covers the time and space dimensions. The breath of perspective encompasses both the apparent and hidden knowledge of past and future. Holistic time dimension refers to the entire lifecycle of the innovation, from *pre to post* innovation.

Proactive innovation intellect utilizes both tangible and intangible innovation working methods, as he or she explores the innovation phenomenon together with its context both vertically and horizontally. The systemic and multidimensional way of operating can be compared with the Magnetic Resonance Imaging technology (MRI), visualising the systemic composition of all the fundamentals of innovation and its connectedness to the circumstance.

The holistic approach goes alongside with the incremental innovation, grounded on the existing explicit knowledge and traditional learning, as well as the radical innovation corresponding to the new and tacit knowledge as well as the deep learning related to the emerging future. It furthermore encompasses the deeper levels of cognition and the process of becoming aware. What comes to the non-linear changes, the holistic approach encompasses furthermore critical questioning, capability to go behind the phenomenon and then to prove the essence of the belief of the old paradigm wrong.

Typically, the proactive innovation intellectuals exchange their ideas in respectful, natural and permissive communities, exploiting dynamic informal contacts and allowing free flow of knowledge. As a result, attributable Flow-sensation occurs collectively.

Resistance to pressures and discomfort, specified as *tolerance of inconveniences*, is the sine qua non for the radical innovation and non-linear changes. Proactive innovation intellect has a capacity to resist uncertainty, discomfort, inconvenience and frustration which go together with the internal and external challenges of innovation, paradoxically, including also innovators themselves. Numerous external challenges originate from economical, juridical, social, ethical and political aspects, as well as from company policy, power struggles and professional discrepancies. Internal discomfort alludes to the mental, cognitive and emotional inconveniences of being a heretic and having the needed capability and courage to point the right problems. Resistance is furthermore needed to cope with social discomfort, shame, jealousy or envy.

Reversed experiences, both setbacks, as well as supportive environments during the pre-carrier phase, had made the true radical innovators capable of sustaining such unfairness as being hurt, publically humiliated, or abandoned and debarred by others. Good self-esteem, balance and tranquillity in one's life as well as networking with likeminded sustained the proactive innovation intellects resistance to these inconveniences.

Tolerance is based on attentiveness to internal and external conditions, and to the control of one's awareness, since an individual, who becomes aware of one's thoughts, is able to think freely about the future. Tolerance of inconveniences pertains to psychological energy and control of consciousness in association with the sensation of Flow.

Generation of energy. According to the systems thinking, all systems need different types of energy to be converted during the throughput processes into outputs and impacts. Innovation calls firstly for tangible energy, like financial resources, juridical support and capital goods. However, the most successful systems have a capacity to produce cognitive and emotional energy. Cognitive energy is based on the holistic and interactive approaches and it provided the rationale to understand the requisite inconveniences and their temporary role in the progress of innovation. It is characteristics for the proactive innovation intellects to empower themselves as well as the others; they also indulge in empowerment by the others.

Innovation intellect knows how to sponsor, support, or protect him or her and how alone carry the pain or joy pertaining to the emerging innovation. Being open to wisdom, knowledge, ideas, or positive and negative feedback, as well as sharing emotional feelings, like compassion, joy and happiness at other peoples' success, are the innovator's trademarks.

It was discovered how, throughout the managerial innovations, empowering leadership and companionship it is possible to create enriching communities

(from micro to macro levels). Awareness about the innovation related tensions and the ways to deal with them consequently make the innovation to flourish in the enriching communities. Due to the common values, trust and empowerment, even the most stupid questions can be asked and the deviating comments will be expressed in the respectful and permissive communities. In companies vertical and horizontal organisational solutions together with the authorization of organisational units had guaranteed the holistic responsibility among the staff and had laid the ground for the development of the more intangible empowerment.

Enriching communities can emerge also in societal level. Affecting the public opinion takes place for example throughout culture, internet and media, and as a result, the collective memory of the society will be empowered.

As a consequence of all the previous mentioned, that is to say, if all the innovation related circumstances and corresponding actions and emotions fall into their places, a virtuous circle emerges in an innovation ecosystem, accelerating both radical and incremental innovation.

It was discovered how the virtuous circle claims for the creative use of different management approaches in association with various innovation circumstances. Different innovation related managerial patterns and situations were specified as following: (1) managerial innovation, (2) management of innovation, (3) management of innovation ecosystem, (4) management in innovation ecosystem, and (5) laissez fair/permissive leadership.

“Management in innovation ecosystems” forms the basis for virtuous circle. It takes place in the societies and organisations where various autonomous social and economical subcategories reside side by side and innovation arises in its different developmental phases. Management in systems can be considered as a combination of simultaneous and often controversial management activities in various subsystems. Throughout the empowerment of individuals, the

management in innovation ecosystem boosts innovation. Relying on the human capacity management in innovation ecosystems is decentralised and resides in its different subsystems, rather than being a centralised, top down management of the entire system. Permissive, human centric and bottom up **management in** innovation ecosystem triggers both radical and incremental innovations which are both needed in our complex era with uncertain terrain and fast knowledge transformation.

6 DISCUSSION

6.1 Evaluation of the quality of the research – methodological considerations

Discussing the evaluation of the quality in qualitative research is a challenge, as Corbin (2008), 311) puts it, "I still think that the findings "speak" for themselves and when we see quality we will know it." However, to make the evaluation transparent and systematic Corbin ((2008), 302) writes, "each method deserves it own set of judgement criteria". In order to evaluate whether the generated Ground Theory on Virtuous Innovation Circle fulfils the criteria, there are two principal questions to be discussed first. Namely, what should the evaluation consist from, and secondly, what is quality in qualitative research?

Based on the literature on qualitative research, Corbin (2008) stresses that in spite of the fact that scholars agree that evaluation is necessary, there is little consensus about what the evaluation should consist of. "Are we judging for "validity" or would it be better to use the terms like "rigor" (Mays and Pope (1995)), "truthfulness," or "goodness" (Emden and Sandelowski (1999)), or something called "integrity" (Watson and Girad (2004)) when referring to qualitative evaluation?." (Corbin (2008) 297) And, she continues, "[…] I still believe that qualitative research is both a "scientific" (Morse , (1999)) as well as a "creative" and "artistic" endeavour, and that "quality of the final product (findings) will reflect both these aspects, a point made by Seale (1999, 2002)" (Corbin (2008), 298).

What is quality then in qualitative Grounded Theory research? Related to Grounded theory, Glaser and Strauss (1967) discussed both *credibility and applicability* of the findings. "Credibility indicates that findings are trustworthy and believable in that they reflect participants', researchers', and readers' experiences with a phenomenon but at the same time the explanation is only

one of the many possible "plausible" interpretations possible from the data." (Corbin (2008), 302)

For Corbin (Ibid., 301), quality and validity are not synonyms, for her, quality finding has an innovative, thoughtful and creative component, she furthermore claims that thinking and creativity should be built into the analytic process. Consequently Corbin recommends Charmaz' (2006) criteria as most comprehensive, addressing both the scientific and creative aspects of doing qualitative research.

Credibility, originality, resonance and usefulness are Charmaz' criteria for evaluating constructionist Grounded Theory. *Credibility* answers to the following questions; do the categories cover a wide range of empirical observations, and are there strong links between the gathered data and argument and analysis. *Originality* answers to the question if the categories are fresh, providing new insights. *Resonance* referees to the way the categories portray the fullness of the studied experiences, and *usefulness* answers the question, does the analysis provide interpretation that people can use in their everyday work. (Corbin (2008), 299-230)

This study follows Corbin's ((2008), 302) interpretation, as she writes that "quality qualitative research resonate with readers and participants life experience", meaning that research is interesting, clear, logical, and makes the reader think and want to read more. Research has substance, gives insight, shows sensitivity and it blends conceptualisation with sufficient descriptive detail. It is creative in its conceptualisation but grounded in data and finally it stimulates discussion and further research on a topic.

Specific criteria for evaluating research based on grounded theory can be divided into two elements: the research process and the research product. In this thesis, the *quality of research process* has been sought by the careful documentation. In order to prove the correspondence between the data and

formulated innovation theory, data collection and data analysis have been discussed detailed throughout the thesis. The situation and conditions of this study has been composed and described based on Corbin and Strauss' (1990) criteria, that is to say, the following information has been provided throughout the theses: detail about sampling, events leading to emerging categories, identification of major categories, relationships between categories, theoretical sampling, negative cases, and the emergence of the core category.

The theoretical sampling of this study, covering various types of stakeholders, made it possible, together with the confidential in-depth discussions, to acquire a relatively reliable data of the multidimensional and holistic innovation-individual-context phenomenon. The reliability of the data analysis has been pursued by demonstrating the excerpts from the original interview data and their connections to the constructed categories. Reliability of the analysis is deemed fulfilled in this study by processing the data with the three simultaneous approaches (innovation, individual and context). This way, the found categories and the relations among them, have been triple checked from three different perspectives. Hence, based on constant and iterative examination of the data and comparisons of the incidences and categories, it can be claimed that the theory on Virtuous Innovation Circle is grounded on the data.

From now, it is the objective of this chapter to discuss the *quality of the research product*. Obviously, at the end of the day, it is the reader, whose evaluation will be decisive. Researcher's arguments on the quality of the research product will be discussed based on Corbin's ((2008) 305-309) criteria, which are as following: *fit, applicability, concepts (properties and dimensions), contextualisation, logic, depth, variation, creativity, sensitivity, and evidence of memos.*

Do the findings then **fit or resonate** with the experience of both the professionals and the participants who took part in the study? Fulfilment of the criterion of *fit with the participant experience* was sought in various ways,

namely firstly, throughout the multi-approach examination of the wide range of data, and secondly, by building variation into the theory by examining the innovation-individual-context related concepts under a series of different conditions and across a range of dimensions. *Fit with the professionals* who might utilize the result has been sought throughout a process in which the development of the categories was continuously tested in two ways. Firstly, by systematically comparing the categories with the rich technical literature and with the daily perceived incidences in investigator's professional life, and secondly by testing the emerging categories with the help of a research assistant, colleagues, and students.

The idea was to execute a second round of discussions based on the conducted theory, to test how well the findings actually resonate with the experience of the professionals. That was however not possible during the available timeframe.

The requisite of findings **applicability** is deemed fulfilled as the study makes the obvious but still avoided question of innovation related tensions and paradoxes more tangible, and secondly, as the theory offers a new human based explanation for how the self-organisation and self-productivity operates in systems, and how they make both incremental and radical innovation possible.

The findings concerning the innovation specificity, and human embedded capacity to generate self-organising and self-productive systems can be used to develop the management of innovation, innovation policy and change practice in organisations and in wider innovation ecosystems. Most importantly, the theory adds an idea of permissive leadership and management in system to the leader's knowledge base when orchestrating the organisational life, full of challenges, paradoxes, cohesion and tension related to innovation.

For the macro level strategic work, this study recommends the idea to use the supplementing notion of innovation ecosystem, to highlighting the importance of

putting the individual to the centre, whenever system-of-innovations are developed.

The requirement of **concepts** has been fulfilled as a wide range of properties and dimensions related to the concepts concerning innovation, individual and innovation ecosystem has been discussed and developed further. Moreover, a set of notions and their relationships has been introduces concerning the reconciliation of the many controversial innovation related realities. Together with the literature, the concepts provide substance for the findings and deepen the understanding concerning the complexity and richness of the innovation phenomenon. Exploring the three main concepts at the same time generated a multilayer and multi-perspective framework around the innovation related concepts.

To fulfil the criterion of the **contextualisation**, an effort has been taken to present the relationship between the concepts and contexts in detail. In the early phase of the reporting the results, conceptualisation was made in tangible, descriptive level and then, in the final theory, in a more abstract level, defining the structural context and conditions for the virtuous innovation circle. That is to say, it was first discussed in detail the context of innovation and innovative individual in order to understand the innovation reinforcing and deteriorating factors. Then, the finding of the reconciliation of controversial realities in innovation ecosystems was contextualized in self-organising and self-productive systems in order to understand the mechanisms related to the human capacities.

What comes to the criterion of the **logic** of the findings, an attempt has been made, as far as possible in the frame of the paradoxical nature of the phenomena, to cover all the gabs of the final theory. Considering the abstract level of phenomena, like the invisible side of the systems, or the autopoiesis and self-organisation, potential logical gaps has been discussed together with earlier literature.

Depth of descriptive details is deemed to have been fulfilled in this study. With the richness and variation of the descriptive details it has been provided the depth of substance for the reader. Due to the intangible nature, and the difficulties of becoming aware of the simultaneous controversial realities, descriptive details has been used to motivate and promote the potential to make some difference in the policy and practices related to innovation. Multilanguage usage generated some difficulties to capturing the nuance of meaning when translating the citations.

Fulfilment of the next criterion, **variation** along dimension and patterns, can be evaluated as following: The paradoxical nature of the phenomena under inspection was illustrated throughout the theoretical sampling and the richness of the data as well as the variation of the related categories. The myriad of different types of innovation, and individuals in various different roles related to innovation as well as different type of contextual factors facilitating and deteriorating innovation demonstrates the complexity of innovation life. It can be said, if possible, that this criterion has been fulfilled excessively, and the length of the study, due to the large amount of variation and material may be considered as a weakness of this study. Being aware of this problem, and to make the report more reader friendly, it has been written so, that the different perspectives (innovation, individual, context and the relationship of the aspects) can be explored independently.

Creativity is another GT quality criterion by Corbin (2008), she strives that the research procedures have been used consistently, creatively, and flexibly, in order to bring creative and new aspects to the topic. On that regard, this study first analysed the previous knowledge of innovation, the recently very popular research topic, and then integrated, in a new way, the previous knowledge with the findings of the data. That is, it explained the reconciliation of the contradictions related to incremental and radical innovation in a new way, namely by putting forward an idea that the human capacity is a crucial part of the mechanism behind the self-organising and self-productive systems.

The main methodological choices were based on the holistic and multilayer approach to the topic and to the way how the inductive knowledge related to innovation, individual and context has been put together with the systems thinking. Those choices provided some new perspective to the immanence of individual particularly concerning the complex challenges related to simultaneous controversial realities, like transformation and continuation, or creativity and efficiency.

Fulfilment of the criterion of **sensitivity** to the data and to the participants was sought in various phases of the research process. Interviewees' anonymity was protected, in order to create an atmosphere of trust and openness. Trust together with the in-depth and open interviews allowed the interviewees to speak freely and analytically about all the issues that they perceived as important. Similarly, the continuous and tireless analysis of the data throughout the entire process helped the investigator to hear what actually was said and what the true meanings behind the words were.

Consequently, the sensitivity to the participants and to data created furthermore a relative painful and time-consuming process, since it transformed both the investigator's original pre-understanding of the system-of-innovation and furthermore changed the flow of the research. The original idea to analyse the visible and formal side of the regional and national innovation system with the help of statistics and interviews of business unit leaders turned first to the interviews of the successful pioneers and their stories of the innovation victories and setbacks. Secondly, the analysis of the logic behind the innovation context gave the voice for other stakeholders, like the creative and proactive managers, politicians, or opinion leaders. Consequently, the study turned to an investigation of the innumerable paradoxes, cohesions, tensions, difficulties and successes of various natures, and they finally widened the understanding of the sensitive and hidden, even rejected aspects of innovation.

Without the hundreds of written memos, mind maps and clarifying figures it had not been possible to compress and keep the data under control all the way from the exploration of tangible incidences towards the abstraction. In order to fulfil the criterion of the **evidence of memos** an attempt was made to **write the** actual research report so that if grows in depths and degree of abstraction mirroring the content of the memos and the development of the insights and depth of thinking that went on during the analysis.

6.2 Further research

The present study acquired information on innovation, innovative knowledge workers, and systems-of-innovation and on their relation. It examined and exemplified different innovation stakeholders' experiences and professional opinions related to the ensemble of innovation, individual and context. As a result, innovation reinforcing and deteriorating factors were presented. The reconciliation and management of the simultaneous controversial realities emerged as the core process of the innovation-individual-context phenomenon. A conceptual ideal model of how the reconciliation of controversial realities turns into a virtuous innovation circle was put forward. The study recognised the key strategies used in the system-of-innovation in all of its levels, from the micro to the most macro. The intellectual and emotional capabilities embedded in proactive innovation intellects manifested as prerequisites for both the linear and nonlinear development phases of the system-of-innovation. The discoveries of the present study bring forth some possible avenues for further research as suggested in following paragraphs:

Most importantly comes the require of testing the Virtuous Innovation Circle theory and further strengthening of its capacity to explain and predict both the linear and nonlinear development of systems-of-innovation and how the

management of antagonisms and controversial realities turns into a virtuous circle empowering both radical and incremental innovation.

Due to conceptual nature of the Virtuous Innovation Circle, it would be interesting to examine systematically in a well-defined and controlled research setting whether, and if so, how does the ideal model operate in a specific system-of-innovation (an organisation, region, or nation). A further question would be whether the phenomenon appears also in less developed and less competitive systems and in less demanding environments. Would, for example in less developed systems-of-innovation, the tangible side of the system be more central, and if so, which elements (like legislations, taxation, knowledge transfer from research to businesses) would be more important than others?

Furthermore, it would be interesting to investigate, more in detail, how the used strategies affect the origin and evolvement of the Virtuous Innovation Circle. For example, how does the connection between the operative logics of the self-organizing and self-productive systems and the discovered reconciliation strategies operate in practice in some high-performance organisation? Apart from the system's capability to allow the self-organisation to take place when approaching the discontinuation phases, are there other factors affecting the fact that sometimes the viscous circle turns easier to the virtuous circle, and sometimes the reverse happens? To epitomize the research idea; the time before and after the Lehman Brothers bankrupt would provide a tangible test bed to investigate the ideal model in macro level. The investigation would discuss questions like:

> Can the ideal model be perceived into the ongoing macro level economical transformation, does it reflect any of self-organising mechanisms described in this study? If the subprime lone is considered as a (negative) innovation, how did the system actually fail in coping with it? How did the far-from-equilibrium state turn possible and lead to the devastating situation in front of everybody's eyes? In addition, does the

> radical decision making actually turn possible at the ongoing bifurcation zone? Does it lead, and if so, how does it lead into a new balance? Will the system's new balance be advanced compared to the precious one? Will the ongoing phase increase the system's capability to cope with the different time horizons at the same time? Does the system generate series of new incremental and radical innovation and if so, can any self-organising and self-productive mechanisms be perceived? Finally, what was the role of human aspect in all this? Can any human related intellectual and emotional capacities be found in it? If so, how does the human intellectual and emotional factors appear in the viscous versus virtuous circle? How could the system and its actors benefit from being aware of the prerequisite of the intellectual and emotional capabilities?

In this study some indication of differences among the innovation hubs were found, hence a more detailed and systematic examination of how the conceptualizations of the innovation-individual-context phenomenon and process differ between countries might be useful. That is to say, to examine what are the differences between innovation ecosystems driven by government and those where the enterprises or citizens are in a more central role?

Due to the immanence of individual, taking the examination to the most micro level, namely to the analysis of the operational logic of human mind, is obviously an important direction where this type of fining is pointing at. That is to say, to the further psychological examination and philosophical research on the mechanisms of human creativity, particularly the function of the complex self, how it evolves and lays ground for innovation in paradoxical circumstances.

Examination of group innovation experience was excluded from this study. Therefore, and hence the collective and systemic nature of innovation was found crucial, it would be interesting to repeat the study in a team of people who have together created a remarkable innovation. The question would then be how the

results might diverge from those found when investigating individual informants. Variation of methods, like observation of an innovation team while working, might provide additional understanding of the collective nature of innovation-individual-context phenomenon.

The richness of the found properties and dimensions of innovation, proactive innovation intellects, and innovation context, were considered as a reason to recommend conceptual specificity in innovation management and research. Hence, it would be interesting to investigate and compare those differences more in detail, e.g., between small and big enterprises, or private and public organisations. Moreover, it would be important to investigate whether the people in general are aware of those differences and if the awareness decreases innovation related negative tensions.

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APPENDIX 1

Dear sir/madam

REQUEST FOR INQUIRY (Radical Innovators & Innovation Ecosystem)

All over the world, innovations and the circumstances leading to the development of innovations have been under significant amount of interest. The terms innovation system and innovation ecosystem refer to those circumstances and interactive environments where people work together, ideas are born and developed into innovations. For my part I want to add understanding about how creative people, who have developed the expertise in their field or who changed the paradigm of the domain, have acted and how they have felt about the interaction between their own actions and the circumstances around them.

It is my intention to increase understanding about innovation ecosystems by interviewing people behind radical ideas and innovations and people who created opportunity for changes in their field. I strongly believe that we can develop innovation ecosystems by letting the true innovators to tell their story and opinion about their innovation ecosystem.

Please find attached the themes of the inquiry. While requesting you to answer the following questions, I greatly appreciate your time, and your valuable knowledge and expertise about innovation.

Radical Innovators & Innovation Ecosystem -research group

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Themes

Background information

Radical Idea or Innovation, Description of radical idea or innovation

Radical Idea or Innovation / Description of the process

Radical Idea or Innovation/Collaboration

Radical Idea or Innovation/Personal Attributes and Background

Radical Idea or Innovation/Role of Own Organization

Radical Idea or Innovation/Innovation ecosystem: Quality of product development environment and the region where to raise your family

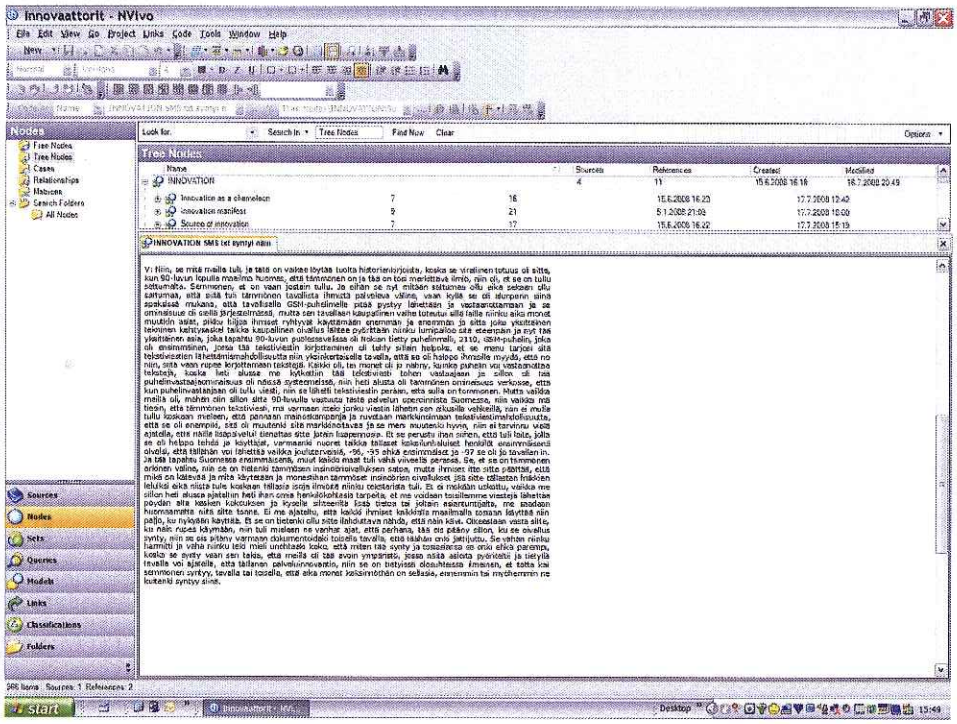
Your Working Habits/Insights

Your Attentional Structures and Dynamics

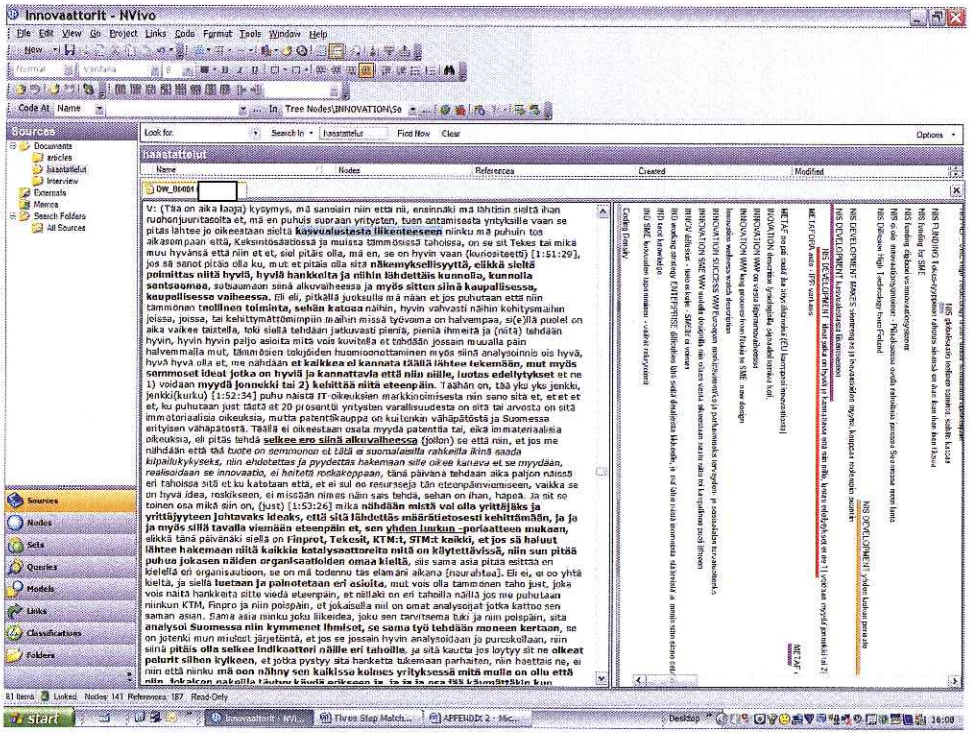
APPENDIX 2

EXAMPLE OF DATA ANALYSIS WITH NVIVO

NVivo Tree nodes connect the code to the transcribed text



Highlighted transcribed text in NVivo illustrating the related codes



APPENDIX 3

EXAMPLE OF THE USAGE OF THE MINDJET MINDMANGER PRO FOR THE ANALYSIS OF THE RELATION BETWEEN THE CONCEPTS