

MASTER

Optimizing culture for corporate entrepreneurship

what are the requirements for optimisation of an organizational culture in order to maximize the production of successful, radical innovations?

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Award date:
2008

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Optimizing culture for corporate entrepreneurship:

What are the requirements for optimisation of an organizational culture in order to maximize the production of successful, radical innovations?

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In partial fulfilment of the requirements for the degree of
Master of Science in Innovation Management

In cooperation with:



TUE. Department of Technology Management
Series Master Theses Innovation Management

ARW 2008 IMA

Subject headings: Corporate Entrepreneurship, Incubators, New Ventures, Organizational Culture, Innovation, Radical Innovation.

SUMMARY

Innovation is on top of the strategic agenda of many technology-driven firms around the globe. In this respect, innovation has now become a prerequisite for success, or indeed, even for survival, as already predicted by Schumpeter in the beginning of the previous century. For this reason many firms try to be innovative, yet few succeed.

Being innovative implies that firms have to understand and master the balancing act between radical and incremental innovations. One of the problems thereby is that radical and incremental innovations require different organizational capabilities, and therefore ask for a different Organizational Culture (OC). Often company's mature processes take over and create an OC which inhibits the development of radical innovations as it does not allow for the risk, ambiguity, and uncertainty arising from the development of products which are novel to the world.

It is for these reasons that the main subjects of our study are: (1) radical innovations, and (2) OC. The former is defined here as the iterative process initiated by the perception of a new market and/or service opportunity for an invention which leads development, production, and marketing tasks striving for the commercial success of the invention. The latter, OC, is defined as the collective programming of the mind in the form of 'best' practices, which distinguishes the members of one organization from another and is transmitted by human interaction. According to many scholars, innovation, whether radical or

incremental, is the result of an OC that supports innovation. However, not many scholars describe the details of this relationship. The research question was therefore formulated as: *"What are the requirements for the optimisation of an organizational culture in order to maximise the production of successful, radical innovations?"*

A good example of an OC that does supports radical innovations is one that nurtures corporate entrepreneurship, operationalized by business incubators (BI). Corporate entrepreneurship essentially involves starting businesses in a business, usually emanating from the core competency or process. Business incubation is a business support process that accelerates the successful development of start-ups and fledgling companies by providing entrepreneurs with an array of targeted resources and services. Corporate entrepreneurship allows for the creation of a different OC within the BIs (an organizational subculture), deviating from the OC of the nurturing company. Its main purpose is to combat the lethargy and bureaucracy that comes with company size. The implementation of corporate entrepreneurship, BIs, and related OCs is thus an important activity for growth-oriented business. However, little empirical research exists that attempts to measure the effectiveness of an OC for the implementation of entrepreneurial ideas.

As BIs are used to commercialize an invention, they are positioned in a specific part of the innovation process. Ideas and inventions typically go through three phases before turning into an innovation: the front end, the

development phase, and the commercialization phase. The front end results in new ideas, whereas the development phase results in inventions. Finally, and in line with our definition of innovation, commercialization results in innovations. The innovation process of a BI starts in the development phase. The tested idea is selected, and the development of the business starts. The innovation process of a BI in its turn consists of three general steps, two under the development phase of the innovation process: (a) start-up, (b) business development. The last one, (c) maturity, categorizes under the next and last phase, commercialization.

So concluding, to investigate the OC needed for the successful development of radical innovations, the focus should be placed on the transition from the development phase to the commercialisation phase, implying the business development stage of the BI innovation process.

Regarding OC, this research adopted the six practice dimensions identified by Hofstede. Later ITIM, a company specialized in measuring OCs, and building upon the theories as developed by Hofstede, discovered two additional dimensions, implying a total of eight mutually exclusive dimensions to define an OC.

(1) Dimension one focuses on the differences between an orientation on means and an orientation on goals. (2) The second dimensions deals with an internally driven orientation versus an externally driven orientation. (3) The third dimension takes into consideration the amount of internal structuring of an organization and is about an easy-going attitude versus a strict work discipline. (4)

Dimension four, a local focus of interest versus a professional focus of interest, shows the distinction between OCs where employees derive their identity largely from their boss and/or organizational unit, and OCs where employees identify themselves with their job or content of their job. (5) Dimension five, focuses on the difference of a closed system and an open system approach and is about the accessibility of the organization to new members. (6) The sixth dimension, an employee orientation versus a work oriented management philosophy, explores the differences between a concern for people and a concern for getting the job done. (7) Dimension 7, low acceptance versus high acceptance of the leadership style, concerns whether or not the leadership style equals the style preferred by the employees. (8) The eight and last dimension, low identification with the company versus high identification with the company, is about the degree to which employees identify themselves with the organization as a whole.

Summarized and derived from the text above, the aim of this research was to develop a framework that enables companies to benchmark their OC and its entrepreneurial characteristics for radical innovations in the beginning of the BI innovation process. The general research question was subsequently divided into the following, more specific key research questions:

(a) *“How should a business incubator score on each of the dimensions of organizational culture?”*

(b) *“How are the dimensions ranked in order of importance for the development of*

radical innovations?”

(c) *“What are the implications for managing BIs in view of creating successful radical innovations?”*

The research strategy of this study was to compare findings from the literature, concerning the most optimal OC in the early phases of business incubation, with the findings from case companies. The results were twofold: (1) Theoretical propositions concerning the optimal OC to develop radical innovations were validated by the empirical research. (2) Recommendations for the case companies based on the developed propositions (Note that these results can be found in chapter 9, the managerial implications).

The domain of interest was the high-tech industry because this sector is known for their rapid rate of product innovations and thus also their dependence on innovations. The population of the research were therefore BIs in the high-tech industry. Two large Dutch multinationals, Philips and DSM, agreed to cooperate with this research. Both companies are reputed for their innovativeness and are both using BIs (corporate entrepreneurship) for their radical innovations.

ITIM cooperated in this research concerning the quantitative measurement of OC for the six BIs of our study. Besides their extended experience in measuring OCs, ITIM is based on Hofstede's theories, making it ideal for our study. Their valid and thus reliable questionnaire concerning OC was administered to the six selected BIs (three from Philips and three from DSM). The overall response rate was 77% from the sample of 79 respondents,

meaning 61 respondents.

For the qualitative part of the study, we interviewed, among others, the leaders of the BIs to verify whether the results of the quantitative research were a true representation of the OC in the BIs. Subsequently, the position of the BIs in the innovation process was determined by using the Bell-Mason Diagnostic as a guideline. The BMD is a rule-based tool used to plot the status of a high-technology venture at each stage of its growth. It enabled us to compare the BIs from the two case companies. Validating the theoretical propositions by the empirical research led to the following conclusions:

Because radical innovation brings along uncertainty and ambiguity, there is a need for a goal orientation in order to work towards results. Indeed, this allows for the development of creative ideas and solutions. On the other hand, our focus on BIs implies that, since the technology is readily available, the level of uncertainty and ambiguity is slightly lower and will further decrease as the project moves along the innovation process. This, together with the growing team size, which asks for more guidance, implies that during the innovation process, we expect a change from a goal orientation towards a means orientation. Nevertheless, our focus on the seed stage from the BMD implies that a goal orientation is the best way to stimulate the development of radical innovations. Therefore, our first conclusion concerning the first research question was:

Conclusion 1: a medium strong goal orientation will stimulate the development of radical innovations.

An organization stimulating innovation should be flexible and should not have too many procedures concerning the customer orientation. This will impede a focus on potential future markets and thus radical innovations. Besides this, a pragmatic attitude concerning ethics has been found to have a positive effect in the search for new innovations. Nevertheless, to be able to do the latter is greatly depended on the type of innovation in development. Indeed, some products are more bound to ethical considerations than others (i.e. products that are related to human health or food). However, also the ability to balance technology push and market pull is very important for the development of radical innovations. Therefore our conclusion was as follows:

Conclusion 2: a medium strong externally driven customer orientation stimulates the development of radical innovations.

For dimension 3 goes that there has to be a balance between control and freedom. Too much control is found as a major obstacle for innovation as people are not able to work in a creative manner because of the bureaucracy. But too less control could also inhibit the development of innovations as some business discipline is necessary in order to grow the business. According to this research though, it is still necessary to be on the 'easy going work discipline' side as this has a positive effect on the resource handling and the less-predictable

behaviour of the employees. Regarding the innovation process, this dimension is very likely to shift towards a more strict work discipline because of the decreasing levels of ambiguity and uncertainty and the growing team size. Indeed, these factors imply that responsibilities get clearer and therefore a stricter work discipline can be installed; this is especially applicable once customers get involved. Nevertheless, the focus of this study is on the seed stage of BIs and therefore we concluded that:

Conclusion 3: a medium easy going work discipline stimulates the development of radical innovations.

In order to achieve the required knowledge to develop radical innovations, knowledge workers are hired. This subsequently implies that this dimension will score towards a professional focus of interest. Besides that the in-depth knowledge in a particular field enhances the possibility of a new and deeper understanding, the other characteristics of a professional focus of interest also stimulate the development of radical innovations. These characteristics are a low social control and a future orientation. Indeed, they are about the ability for employees to go beyond what is normally accepted, what is needed for the development of something new to the world. Next to these findings, we argue that during the innovation process, this dimension will not change significantly. Although the team composition will change during the innovation process, knowledge workers will remain to form the largest part of

the team. Indeed, in that sense, this dimension is self-sustained. Therefore, we reached our fourth conclusion in line with earlier research by Weggeman:

Conclusion 4: a medium strong professional focus of interest stimulates the development of radical innovations.

Concerning the fifth dimension, when people feel accepted by the organization, they will not swap their jobs as easily as people working in a closed system. Next to this, an easy acceptance will allow for the creation of a diverse workforce, thus creating a diverse knowledge base. This has been positively associated with creative problem solving capabilities as the right balance of conflict will result in people behaving in a more mature manner with constructive debate. Furthermore, the open system approach is in line with the ideas of open innovation which allows for commercialization of external (as well as internal) ideas by deploying outside (as well as in-house) pathways to the market. Therefore, the following conclusion was reached:

Conclusion 5: a strong open system stimulates the development of radical innovations

We argue that firms which can find a balance between an employee and job orientation will be able to attract and keep key people for the innovation process, because of the facilities offered, modern equipment and good working conditions. Next to this, too much job orientation can lead to high work pressures and subsequent mistakes, too much employee orientation can take away the feeling

of challenge and effectiveness. Nevertheless, in the beginning ambiguity and uncertainty levels are higher, and therefore the BI is very depended on the efforts of it employees in order to survive. A somewhat more employee orientation during the seed stage could then lead to a higher intrinsic motivation among the employees and subsequent better chances of survival. Therefore the following conclusion is reached:

Conclusion 6: a moderate people orientation stimulates the development of radical innovations.

In literature not much could be found that connect the acceptance of leadership style to innovations. Nevertheless, several findings are presented in this study. (1) There is a very likely causal relationship between the actual leadership style and the acceptance of it. (2) The most suitable leadership style during the beginning of the innovation process of the BI has been identified. (3) During the course of the innovation process the leadership style will very likely shift. This has again to do with the growing team size and the involvement of customers. Indeed, to manage the growing team and the increased pressure on meeting the deadlines ask for a different leadership style and acceptance of it. As the content of this dimension is confidential, specific details are left out of this version. However, our focus on the seed stage implies that:

Conclusion 7: a medium high acceptance of the leadership style stimulates the development of radical innovations.

A high identification with the company can lead to intrinsic motivation which has been described to be positively related with innovations. Other authors further argued that a positive identification with the company could potentially increase the trust levels in the company. Nevertheless, when considering BIs, it can also be argued that this dimension can be used to assess the level of integration versus separation. A very low level of identification would imply too much separation. This can subsequently lead to products that are too unrelated to the core competencies or give resource problems. A too high identification could be associated with too much integration and implies lesser flexibility. Therefore a balance should be reached on this dimension:

Conclusion 8: a medium identification, implying a balance, with the company as a whole stimulates the development of radical innovations.

Concerning the second research question, based on the emphasis of the scholars and the results of the conducted interviews, we argued that the most important dimensions of an OC, for the successful development of radical innovations, are the dimensions 1, 2, 3, and 5.

To conclude, this study showed that all aspects of an OC could be linked to the development of radical innovations. Although all dimensions of an OC need to be taken into account, the most important dimensions for optimizing an OC are: (1) a medium strong goal orientation, (2) a medium strong externally driven orientation, (3) a medium easy going work discipline, and (4) a strong open system.

Although several research methods were used during this study, there are some limitations from which the most important one is the small sample size (only six BIs). However, as explained few (especially empirical) investigations has been conducted that related the concepts of OC, radical innovations, and the characteristics of corporate entrepreneurship. Therefore this study contains several valuable starting-points for further research. For instance, the appendix highlights the relationship between OC and innovative performance, and also our suggestions concerning the relationship between OC and the innovation process should be developed further with preferable longitudinal research. Finally, several relations between the dimensions have been identified which deserve further investigation.

ACKNOWLEDGEMENTS

This master thesis describes the graduation project we executed for the study Innovation Management at the Eindhoven University of Technology. It concerns the relationship between organizational culture and radical innovation. More specifically, it is aimed to understand how organizational culture can contribute to the successful development and commercialization of radical innovations.

During this project, we learned a lot; not only from the literature and theory consulted, but also from the conducted empirical investigation. Indeed the combination of working as a scientist for the university by conducting academic research and acting as a consultant for the case companies. For both disciplines, we gained a lot of respect during our thesis.

Nevertheless, we would like to thank our first academic supervisor, Victor Gilsing. Victor acted as an all-round supporter; next to his specialized knowledge, critics and comments, he acted as a motivator during our comprehensive literature review and the problems we ran into during the data gathering phase. The many discussions with him led to deeper insight in the situation and a critical look towards the project. Furthermore, we would like to thank our second academic supervisor, Geert Duijsters. He provided us with remarks and advices in the final stages of our study and took care that we did not limit ourselves to one perspective by having a more external position to the project.

A very special word of thanks goes to

Bob Waisfisz, director of ITIM. This study would not have been possible without his excellent support, not only by allowing us the use of his in-depth questionnaire, but also by answering our numerous questions. In this respect, we would also like to acknowledge the input from the side of Wanne Wiersinga, who provided us with very reliable and adequate operational support regarding the use of the questionnaire.

Furthermore, we would like to thank all the participants to this study. From DSM we would like to thank Erik Rutten for his decision to participate in our study, and Renate Litjens, Peter Dresschler, Volkert Claassen, Jan Hunik, and Steve Hartig for their cooperation and valuable insights. From Philips, we would like to thank John van den Elst for his enthusiasm and comments, and Corina Kuiper, Petra Doelman, Jan van Bekkum, Ton Rademaker for their participation and relevant remarks.

Besides them, we are very grateful towards all the employees of the new ventures at Philips and DSM who were so kind to fill out the questionnaire. Without them, this report would not have been the way it is now.

Finally, we would like to thank all our friends and family, who have supported us during our studies and offered us with nice distractions when needed. We would like to pay special thanks to our girlfriends, Mira and Agnieszka, who had to listen to all our theories and assumptions and motivated us when needed. Furthermore, we would like to pay special thanks to our parents for their never ending support and encouragement.

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LIST OF ABBREVIATIONS

BDM	Bell-Mason Diagnostic
BI	Business Incubator
BPEA	Business Plan Evaluation Aids
EBA	Emerging Business Area
EBO	Emerging Business Opportunity
FE	Front End
FFE	Fuzzy Front End
NV	New Venture
OC	Organizational Culture
OSC	Organizational Subculture
PARC	Palo Alto Research Centre
TLCC	Technology Life Cycle Curve

1 INTRODUCTION

Innovation has made it to the top of agendas of many post industrial organizations around the globe. And for good reason; in today's business environment, innovation has become a prerequisite for success, or indeed, even for survival, as already argued by Schumpeter (1942: 83) in the beginning of the previous century. For this reason many firms try to be innovative, but only few succeed (Ahmed, 1998; Chesbrough, 2003).

Nowadays, innovation has become more than just a mere output of the R&D lab; it has become a corporate priority that touches every facet of the organization (Jamrog et al., 2006). Variables such as external constituents to customers, academia, governments, vendors, and competitors, are influencing the innovation process of organizations. These facets in turn are all influenced by the Organizational Culture (OC) (Jamrog et al., 2006). OC grew beyond the fad status it acquired in the 1980s and has now become a basic concern in the study of organization and management, at the same level as strategy, structure, and control (Hofstede, 1998:a).

OC acts as the bases of communication and mutual understanding between employees, departments, and top management, because it offers a system of shared values and meanings (Jamrog et al., 2006). Indeed, according to many scholars, innovation, whether radical or incremental, is the result of an OC that supports creativity (Johnson, 1996; Judge et al., 1997; Pienaar, 1994; Shaughnessy, 1998; Tesluk et al., 1997; Martins and Terblanche, 2003). If the

OC is not sufficiently optimized for facilitating the development of successful innovations, it could hurt a firm's profitability and growth prospects.

Besides the development of innovations, organizations have to understand and master the balancing act between radical and incremental innovations. This is also known as an ambidextrous organization (Tushman and O'Reilly, 1996). As companies grow large, processes take over and create an OC that is often limited to incremental innovation (Christensen and Overdorf, 2000). For example, if all ideas are killed that promise little gross margins on the short term, it will not be possible to target small, new, emerging markets, the very place where radical innovations start. Indeed, new businesses often do not suit strategically with established divisions and/or with prevailing organizational values (IBM, 2005). This explains the focus of the research on radical innovations within large companies.

The problem is that radical and incremental innovations require different organizational capabilities (Henderson and Clark, 1990; Christensen and Overdorf, 2000), and therefore ask for a different OC. So, organizations need to create an OC that supports radical innovations. A good example is an OC that nurtures corporate entrepreneurship, operationalized by business incubators (Thornberry, 2003). Business incubation is a phenomena increasingly used by companies to support the creation of radical innovations.

There have been written abundant scientific papers about innovation, and also OC

has received its fair share of attention. To date, however, not many scholars describe the details of this relationship (McLean, 2005). Therefore, we decided to start a study that aims to explore this area and to deepen the understanding about the relationship between OC and innovation.

Our approach is to extend the research by Hofstede et al. (1990) and ITIM (2007), who empirically defined eight dimensions to characterise OCs, by theoretically optimizing each of the dimensions for radical innovations (through a comprehensive literature study) at the beginning of the innovation process (the transition from invention to innovation). Theories from the innovation, corporate entrepreneurship, and OC studies are applied to explore the optimisation of an OC in order to maximize the production of successful, radical innovations. The resulting theoretical framework is subsequently compared with the OC found at six business incubators at two Dutch multinationals, Philips and DSM, both using corporate entrepreneurship for the development of their radical innovation.

Summarized and derived from the text above, the aim of this research is to develop a framework that enables companies to benchmark their OC and its entrepreneurial characteristics for radical innovations in the beginning of the innovation process. The research question is therefore: (1) “What are the requirements for the optimisation of an organizational culture in order to maximise the production of successful, radical innovations?” These requirements are formulated using a framework consisting of several dimensions leading to the following three key questions:

(a) “How should a business incubator score on each of the dimensions of organizational culture?”

(b) “How are the dimensions ranked in order of importance for the development of radical innovations?”

(c) “What are the implications for managing BIs in view of creating successful radical innovations?”

To give answers to the research questions in a structured way, the study is divided in four distinctive parts:

Part I: Theory

Part II: Data Collection and Analysis

Part III: Findings

Part IV: Conclusions

In part I: Theory, we review the relevant literature for key theories necessary for building a comprehensive understanding of innovation, organizational culture, and their relationship. In chapter 2 innovation, a definition is given of innovation and a distinction is made between the different types of innovation. After a description of the different types, the focus shifts to radical innovations and the phenomena closely related to radical innovations. Concepts such as open innovation, corporate entrepreneurship, and business incubators are discussed. The chapter ends with a description of the innovation process and a way to determine the place of the BI in the innovation process. The following chapter (3) examines culture, from a national level to an organizational level. The similarities and differences are discussed, with a focus on how to measure organization culture. That analysis leads to our decision to adopt the well known model developed by Hofstede et al. (1990). In the last chapter of this part, the link is made between the two concepts, innovation and OC. Arguments and examples found in management literature are used to build propositions about the way the organizational culture should be composed for the development of successful radical innovation. The chapter, as this part of the study, will end with a theoretical framework

summarizing the found propositions.

In the second part: Data Collection and Analysis, we define the research strategy in order to test the developed model. A selection is made concerning the population of interest and two case companies are introduced, Philips and DSM. Next, we describe the operational definitions for OC and the positioning of the business incubators. Subsequently will be discussed how our data analysis is to be performed in terms of cross-case and within-case analyses. Finally, we show which threats could possible harm the research and the controls to increase the validity are introduced.

Part III: Findings, starts with the validation of the data. Subsequently, the results of the case studies and the survey are presented in both within-case and cross-case analyses. After a discussion on the results a conclusion is reached concerning the propositions as developed in chapter 4.

The fourth and last part: Conclusions, illustrates the conclusions of the study based on the literature review and the empirical research. Furthermore, the following sections are dedicated to the limitations and further research. The research then wraps up with managerial implications.

Part I: Theory

“What I dream of is an art of balance.”

Henri Matisse (1869 - 1954)

2 INNOVATION

Chapter two is a review about the concept of innovation in general and related subjects of concern for our study. Section 2.1 will start with the definition and classification of innovation. A two-by-two matrix is presented whereby a brief description is given of three types of innovation. The section will end with a focus and an elaboration on the fourth type, namely radical innovation. The subject of the second section, 2.2, is a concept used by many companies to manage their (radical) innovations, called corporate entrepreneurship. After explaining what the concept implies, two relating topics to radical innovations and corporate entrepreneurship are addressed: the business incubators (2.3) and the ideas of open innovation (2.4). The following section, 2.5, is dedicated to the innovation process of corporate entrepreneurship and its three stages: the (fuzzy) front end, development, and the last one, commercialization. Section 2.6 describes a method to position radical innovations on the innovation process, called the Bell Mason Diagnostic. The last section (2.7) is a conclusion and gives an overview of the findings of this chapter.

A technological innovation is an iterative process initiated by the perception of a new market and/or service opportunity for a (technology based) invention which leads development, production, and marketing tasks striving for the commercial success of the invention (OECD, 1991). Innovation can thus

be considered as the process of value creation by developing new knowledge or using existing knowledge in new ways (Jamrog et al., 2006).

The importance of innovation is emphasized by many authors in the literature of the last decades. Many reasons are given: (1) innovations are important for technological progress and overall economic and business growth, (2) innovations extend our technological capabilities and provide productivity improvements and also contribute to the wealth of the society and the high standards of living, (3) innovations increase market share and contribute towards the comparative and absolute advantages of a firm, and in addition, (4) firms can attain greater competitiveness and growth by developing innovative products and services (Souder, 1987; Cooper, 1993; Dodgson, 2000; Narayanan, 2001; Miller, 2001; Debruyne et al., 2002). Innovation plays a major role in structural change of industries, and as well in creating new industries. Indeed, many of today's leading firms grew out of technological changes they were able to exploit (Porter, 1985).

Schumpeter (1942: 82), the first author who wrote about the importance of innovation, is even more straightforward in his view. He stated that: "The process of Creative Destruction is the essential fact about capitalism... It is not [price] competition which counts but the competition from new combinations of technology. This competition strikes not at the margins of profits of existing firms but at their foundations and their very lives". Indeed, innovation is vital for firms wanting to survive (inter) national markets

(Porter, 1985), even if it destroys the current value of established products (Christensen and Overdorf, 2000). Combining their view with the paradoxical quote of Chesbrough (2003) who stated that most innovations fail, and most companies that do not innovate fail, and the difficulty becomes clear.

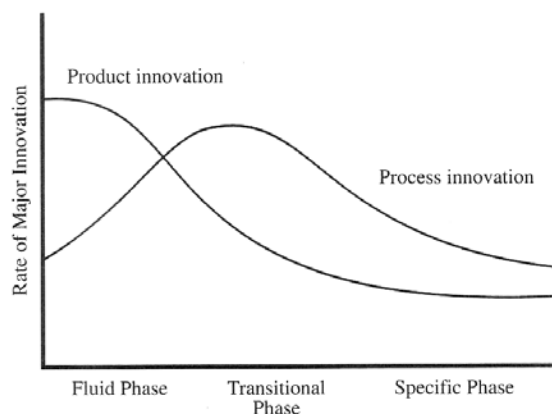


Figure 1: Process and Product Innovation Curves (Utterback, 1994: 91)

Regarding innovations a distinction can be made between process innovation and product innovation as can be seen in Figure 1, which shows the rate of product and process innovation over the life time of a product (Utterback, 1994: 91). The beginning of the innovation process shows a strong emphasis on product innovation. This study will focus on the start of a new innovation and therefore the study is limited to new product development.

Scholars have researched and developed a plethora of innovation type definitions, which has resulted in an ambiguity in the way the terms ‘innovation’ and ‘innovativeness’ are operationalized and utilized in the new product development literature (Garcia and Calatone, 2002). The innovation typology, found after a review of the relevant literature, are continuous and discontinuous innovation (Morone, 1993),

disruptive innovation (Christensen, 2003), open innovation (Chesbrough, 2003), revolutionary and evolutionary innovations (Abernathy and Clark, 1985; Fagerberg, 2003), application innovation, experiential innovation, marketing innovation, business model innovation (Moore, 2004), and even invisible innovation (Cooper, 2002).

2.1 CLASSIFICATION OF INNOVATION

To avoid ambiguity, the well known innovation classification by Henderson and Clark (1990) will be used as a starting point. These authors developed a two-by-two matrix as can be seen in Figure 2 below.

2.1.1 NON-RADICAL INNOVATIONS

Architectural innovations, as defined by Henderson and Clark (1990), are incrementally improved products that seem radical different from existing products. So, technically speaking, these products are incremental innovations, having the impact of radical innovations and in this way, undermining the usefulness of the current knowledge of established firms.

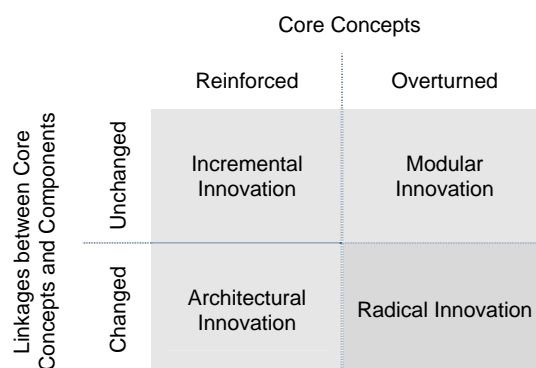


Figure 2: A framework for defining innovation (Henderson and Clack, 1990).

Modular innovations are changes to the core design concept of the product without changing the product’s architecture. An

example is the replacement of the analogue telephone with the digital telephone, to the degree that one can simply replace the newer one for the old one. It thus leaves the components and the embodied, core design concepts unchanged, although being a (technical) radical innovation, it does not have the impact of a radical innovation to the market.

Incremental innovations, like architectural innovations, are mostly add-on's to existing products or services, to make them perform better and thus merely add some value to the existing installed customer base (Christensen and Overdorf, 2000).

The three forms of innovations discussed so far are the most common and most pursued by large firms. They 'only' imply improving the core concepts of existing products, or the linkages between the core concepts and the components, meaning that they can all be seen as incremental innovations. These innovations have a greater chance of making money because less risk is involved (either the market or the technology are known, or even both). According to Anderson and Tushman (1990), it is for this reason that large firms prefer gradual incremental innovations and tend to delay radical innovations as long as possible, even though the returns may be lower than the returns associated with radical innovations. Note that taking an incremental approach, although less prone to risk, is not easy. As stated by Jamrog et al. (2006), mature products are often more complex in design, to produce, to market, and to distribute, because significant contributions have already been made, probably by the company itself and by the (abundant)

competitors.

The risk with following a strategy with incremental changes to existing products for too long is obvious; competitors might introduce a radical new, superior product which renders the current product useless. This phenomenon has been a problem for many large firms, which were unable to commercialize what they already technically could do (Christensen and Bower, 1996).

Leading company	1955 (Vacuum Tubes)	1960 (Transistors)	1965 (Semiconductors)	1975 (Integrated Circuits)	1982 (VLSI)	1995 (Sub-micron)
1	RCA	Hughes	TI	TI	Motorola	Intel
2	Sylvania	Transitron	Fairchild	Fairchild	TI	NEC
3	GE	Philco	Motorola	National	NEC	Toshiba
4	Raytheon	Sylvania	GI	Intel	Hitachi	Hitachi
5	Westing house	TI	GE	Motorola	National	Motorola
6	Amperex	GE	RCA	Rockwell	Toshiba	Samsung
7	National Video	RCA	Sprague	GI	Intel	TI
8	Rawland	Westing house	Philco	RCA	Philips	Fujitsu
9	Eimac	Motorola	Transitron	Philips	Fujitsu	Mitsubishi
10	Lansdale	Clevite	Raytheon	AMD	Fairchild	Philips

Table 1: Semiconductor industry 1955-1995 (Tushman and O'Reilly, 1997).

Proof for this is shown by Tushman and O'Reilly (1996), who researched the (history of the) semiconductor industry during the period of 1955 till 1995. They found that none of the big players on this market in 1955 were able to stay leader in this market for an extended period of time due to radical technological changes. Every time a radical change was observed in the industry, small companies succeeded better in adapting to these changes. As a result the top ten leading companies in the semiconductor industry changed many times as can be seen in Table 1. This example brings us to the topic of

radical innovations.

2.1.2 RADICAL INNOVATIONS

Radical innovations, also known as breakthrough innovations, are often associated with the discovery of radical new technologies. It must somehow influence the way current business is done (Amabile, 1998). The difference with the former discussed types of innovation and radical innovation is that the last has both overturned core concepts, and new linkages between the core concepts and components (Henderson and Clark, 1990). Jamrog et al. (2006) stated that, according to a study by the Harvard Business Review for the high tech sector, radical innovations only represents 14 percent of all product launches and 38 percent of the total revenue, but they bring 61 percent of the profits.

Once an invention turns into an innovation¹, it may bring substantial larger returns than incremental innovations and, maybe even more important, a competitive advantage (Porter, 1985). Radical innovations may also earn a return on investment by claiming ownership of intellectual property, through patents, and proprietary knowledge (Jamrog et al., 2006). The drawback is indeed, that this form is very risky and can be very expensive, which makes it hard for companies to justify the upfront investment needed (Christensen and Overdorf, 2000).

The involved risks can be illustrated in the Technology Life Cycle Curve (TLCC) of high tech products as described by Moore (1991) and depicted in Figure 3. After successfully generating, developing, and introducing an idea wherefore no market yet exists, the company reaches the first face of the TLCC where the early adopters will accept the product and a new market is created. Note the significant 'gap', the chasm, between the early adopters of an innovative product (the technology enthusiasts and visionaries) and the early majority (the pragmatists). Moore (1991) argues that this gap is visible because visionaries and pragmatists have very different expectations of a product. Indeed, visionaries recognize possibilities of new technologies in contrary to the majority of people, who are not aware of these new possibilities.

Furthermore, initially the new solution is usually not as good as the existing main stream solution (Christensen and Overdorf, 2000). But as a group of pragmatists is successfully made aware (by offering a complete product²), sales will rise and competitors will quickly develop new improved variants of the original product in order to set the standard, the dominant design³ (the bowling alley). After the dominant design has been chosen (by the pragmatists) the sales will rise exponentially (inside the tornado). Incremental innovations will be

¹ An innovation is the successful introduction of an invention to the market whereas an invention is a pure new scientific discovery (which thus may have the potential to become an innovation), some define it as: "innovation equals invention plus exploitation", (Roberts, 1988).

² The authors refer for more information to Moore (1991).

³ Note that the dominant design not necessarily has to be the best technical solution. An example here is the Video 2000 system of Philips, which lost the bowling alley to the technical inferior VHS system by JVC.

developed to rapidly address to the needs of the customers in the mainstream market as well (Christensen and Overdorf, 2000). When the main street is crossed, sales will decline again till the moment a successor is introduced that starts this process over again.

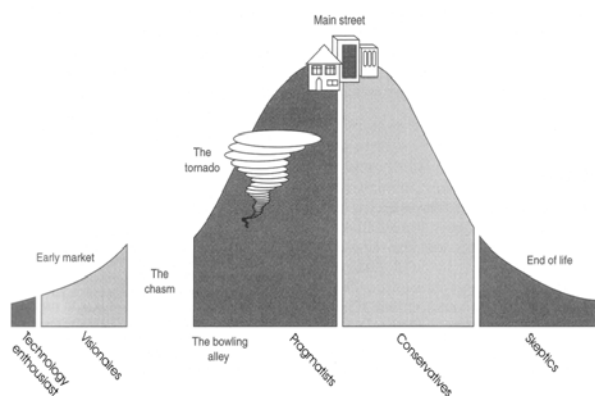


Figure 3: The Chasm (Moore, 1991), figure taken from Burgelman et al. (2004: 362).

The TLCC outlines two major problems with radical innovations opposed to incremental innovations. (1) Companies have to invest in something that has a very small chance of success, (2) and if successful, likely render their old product obsolete. But these problems imply that the incumbent organization has already identified the potential radical innovation. This is often not the case.

Once successful, firms sometimes become blind to opportunities other than those that sustain their current customers, as their main focus is on selling more technologically advanced and rich featured products to their installed consumer database (incremental innovation). This happens if the power in the organization adheres to those with resources, managers in charge, and/or the most profitable customers, implying that radical innovations will not be considered for the two reasons addressed above. Senior managers fail to see

and understand the promise of radical innovation. Henderson (2006) stated an additional reason concerning organizational routines. Henderson (2006) aims at market facing or customer competencies in particular. Because these are built through experience with the existing generation of the technology, they therefore generally lack the information necessary to make an appropriate decision.

For these reasons firms fail to see or exploit radical innovations that would lead to new customers (Christensen and Bower, 1996; Henderson, 2006). Christensen and Overdorf (2000) recommend that incumbents should set up a separate organization for venturing into disruptive technologies to get around the problems described above. A concept also known as corporate entrepreneurship, and comprises of a start-up company within the existing firm, financed and staffed with some of the firms own personnel. The need for separation is confirmed by O'Connor and Demartino (2006), who stated that for radical innovations, the organizational entity must be physically and culturally separated from the mainstream organization.

2.2 CORPORATE ENTREPRENEURSHIP

Entrepreneurship can be described as the process of creating value where none existed before (Thornberry, 1991). Corporate entrepreneurship, also referred to as corporate venturing, or intrapreneurship (Hornsby et al., 2002), essentially involves starting a business in a business, usually emanating from the core competency or process (Thornberry, 1991). Its

main purpose is to allow large organizations to overcome the difficulties of achieving radical innovation. In essence it is an attempt to create the mindset and behaviour that entrepreneurs have into a large organization. Indeed, small firms are less bureaucratic, and are able to flourish in smaller market niches which may be unattractive to larger firms (Bessant and Tidd, 2007: 265). IBM (2004), although first struggling with the balancing act between separation and integration, now clearly favours separation from their existing businesses for radical new product innovations. The main reasons are the inadequate systems, processes, and tools. At many large companies, systems, processes, and tools have not been designed to support business creation.

Corporate entrepreneurship is a way to combat the lethargy and bureaucracy that come with company size (Thornberry, 2003). It is well known that when companies grow large it becomes difficult to create radical innovations (Christensen and Overdorf, 2000). There is a fundamental conflict between new venture and mature company management requirements which focus on the current customer base due to the different life cycle stage which ask for different practices (Sykes and Block, 1989). Examples of these practices are rewards for minimizing risk, following rules strictly, and performing their functional roles to the best of their abilities. These values and processes are put in place to let employees work in consisted and predictable ways (Christensen and Overdorf, 2000), but will erode their entrepreneurial underpinnings (Thornberry, 1991).

IBM (2004) recognized that resource allocation (i.e. budgeting) systems are geared toward the steady predictable funding of already established businesses in stead of the staged, highly variable funding of emerging businesses. Human resource systems have usually been designed to identify leaders with the operational skills required to run mature businesses, not the strategic, conceptual, and organization building skills required of start-ups. Market research and financial tools assume the existence of hard, quantifiable data; they often flounder when faced with the soft, qualitative data found in ambiguous, poorly defined markets. Conversely, start-up entrepreneurs are generally more concerned about the results than following the proper processes in getting these results (Thornberry, 2003), and therefore able to see opportunities where other either miss or perceive them as impossible.

The concept known as corporate entrepreneurship helps to create an OC which will allow for radical innovation as it encompasses a set of practices believed to enable large companies to regain this ability (Thornberry, 1991). The correct implementation of this concept can lead to a behaviour change which fosters innovation, creative problem solving, and circumvention of the red tape, which can lead to complete new businesses through radical innovations.

Following from this reasoning, the implementation of corporate entrepreneurship is becoming an important activity for growth-oriented business. However, very little empirical research exists that attempts to

measure the effectiveness of an OC for the implementation of entrepreneurial ideas (Kuratko, et al., 1990). Here, this research could provide profound insight into the most appropriate OC for corporate entrepreneurship, resulting in the successful development and commercialization of radical innovations.

Corporate entrepreneurship can take different forms, of which one is incubative (Schollhammer, 1982: 209). The focus of this study is on this form and refers to the creation of semi-autonomous units within the existing organization (Kuratko et al., 1990).

2.3 BUSINESS INCUBATORS

BIs are a quite recent occurrence with one of the first publications about the subject in 1985 (Eshun, 2004). According to Sun et al. (2007), business incubation is a business support process that accelerates the successful development of start-up and fledgling companies by providing entrepreneurs with an array of targeted resources and services. Critical to the definition of an incubator is the provision of management guidance, technical assistance, and consulting tailored to young growing companies.

There are several types of business incubation models described in the literature. Hamdani (2006) described four: (1) the private-public model, (2) the institution-backed model, (3) the venture capital model, and (4) the corporate sponsored model. Indeed, nurturing can come from several sources although the focus of this research is on companies that nurture BI, meaning the corporate sponsored model. Panfu (2004) states that BIs must be

seen as part of a long term economic development strategy.

A BI might also fail. Note that it is not always clear when a BI has failed. Business might simply offer the wrong set of products, targeting the wrong customers or market segment, or using the wrong business model, all steps that might be corrected in the next in-market experiment (Garvin and Levesque, 2004). Without clearly specified exit criteria, businesses may be kept afloat for too long. A failure to implement exit strategies equals a lack of knowledge about client maturity and means failing to recover the (expected) returns from investment (Eshun, 2004).

In essence, a BI is a small group of people with different specialities necessary to build the product and the business. This is closely related to the notion of cross-functional teams. Creating cross-functional teams, which integrates people with diverse perspectives, can be especially suitable for creating new ideas that are both innovative and practical. This will allow for diversity (social and technical interaction) and individual talents that complement each other (Martins and Terblanche, 2003; McLean, 2005; Jamrog et al., 2006). Furthermore, teams can be used when a diversity of organizational values is needed that has no fit with the rest of the organization, as explained by Christensen and Overdorf (2000) and depicted in Figure 4 below.

The figure shows that when there is a poor fit with the organizational values (which is often the case with radical innovations) a heavyweight team should be put together. In this way it is possible to achieve a high

professional focus of interest, meaning a deep knowledge, combined with broad search heuristics from the different skills/ departments.

		Fit with organization's values	
		Good	Poor
Fit with organization's processes	Poor	Use a heavyweight team within the existing organization	Use a heavyweight team in a separate spinout organization
	Good	Use a lightweight or functional team within the existing organization	Development may occur in-house through a heavyweight team, but commercialization almost always requires a spinout

Figure 4: A framework for deciding upon team forms (Christensen and Overdorf, 2000).

2.4 OPEN INNOVATION

The concept of open innovation (Chesbrough, 2003), helps firms to focus more upon external sources of innovation and therefore salvage value from innovations, which were not possible to see with an inward look. In the past, internal R&D was a valuable strategic asset, even a formidable barrier to entry for competitors in many markets (Chesbrough, 2003). However, times have changed and the idea that companies must generate their own ideas, which they then develop, manufacture, market, distribute and service themselves is over. Chesbrough (2003) argues that this strategic asset is no longer valid because of a number of factors: (1) Most important, the dramatic rise in the number of knowledge workers making it increasingly difficult for companies to control their proprietary ideas and expertise. (2) Combined with this phenomena is the growing availability of private venture capital, which helps ideas spilled of the

corporate research lab to grow and to be commercialized in the form of new firms.

These two factors imply that ideas that are not pursued by the company that made the initial discovery in a timely fashion, the people involved in the discovery will pursue it on their own with private venture capital. A good example of this could be seen at Xerox's Palo Alto Research Centre (PARC). This lab was a paragon of inventive genius, and has created superior technologies like the Personal Computer, Ethernet, and the laser printer. The problem was that few of these ideas accrued to Xerox's benefit, as most of them found their way to the marketplace via new firms (Utterback, 1994: 230).

In the new model of open innovation, companies commercialize external (as well as internal) ideas by deploying outside (as well as in-house) pathways to the market (Chesbrough, 2003). Specifically, companies can commercialize internal ideas through channels outside of their current businesses in order to generate value for the organization.

2.5 THE INNOVATION PROCESS OF CORPORATE ENTREPRENEURSHIP

Innovations, in the end, are the result of a long, complex process. In this process, creativity can be seen as a very important starting point, as without, no (radical) innovations would be possible. The concept of creativity can be seen as the generation of new and useful/ valuable ideas for products, services, processes, and procedures by individuals or groups in a specific organizational context (Martins and Terblanche,

2003). So being creative is not only about highly original ideas. In business, the idea should also be appropriate, useful and actionable. This is in line with Carayannis and Chanaron (2007: 147), who state that creativity and innovation are regarded as overlapping constructs whereby the overlapping field is invention; shaping a creative idea into an applicable form. In this study, we take the position that creativity leads to inventions, which on its turn leads to innovations. The process can be seen in Figure 5.

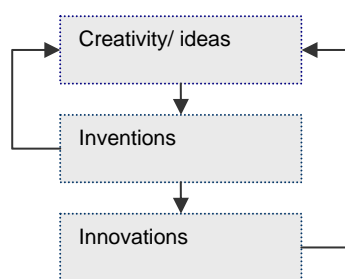


Figure 5: Creativity, Inventions, and Innovations.

So no innovation is possible without the creative front processes of the innovation process. Next, inventions and innovations could also lead to new ideas. This could be seen with new materials innovations, such as graphite or carbon, which led to new and improved products.

In order to remain competitive in the marketplace, organizations must thus pay careful attention to this creative flow. There must be a generation of new ideas to fuel the number of inventions and to realize the full potential of inventions by turning them into innovations. Formulating creativity in this way implies that it does not belong only to the R&D and marketing departments. It is something that takes place at the organization as a whole.

Activity Based Costing, for instance, was an accounting innovation and its impact on business has been positive and profound (Amabile, 1998). Innovation can be seen as an environment, indeed, a culture that exists in a company, and drives value creation (Ahmed, 1998).

Ideas and inventions typically go through three phases before becoming an innovation (and thus entering the TLCC): (1) the Front End (FE), (2) the development phase, and (3) the commercialization phase. Figure 6 gives a graphical representation of the ‘flow of ideas’ (Wheelwright and Clark, 1992).

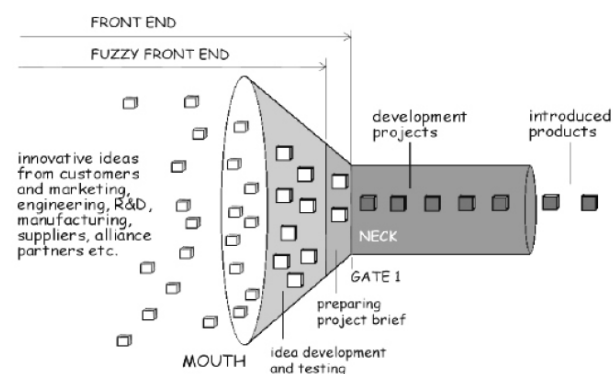


Figure 6: Innovation Funnel (Wheelwright and Clark, 1992).

The different stage gates consist of conditions and hoops which the new idea must pass in order to demonstrate its feasibility and compatibility with the organization’s objectives (Ahmed, 1998). Jobber and Fahy (2003: 146) are more specific and describe an eight stage new product development process: idea generation, screening, concept testing, business analysis, product development, market testing, and commercialization. For this research however, it is enough to focus on the three more general phases.

Figure 7 gives a representation of which

stage of innovation relates to which phase of the innovation process. It can be seen that the FE results in new ideas, whereas the development phase results in inventions. Finally, and in line with our definition of innovation, commercialization results in innovations.

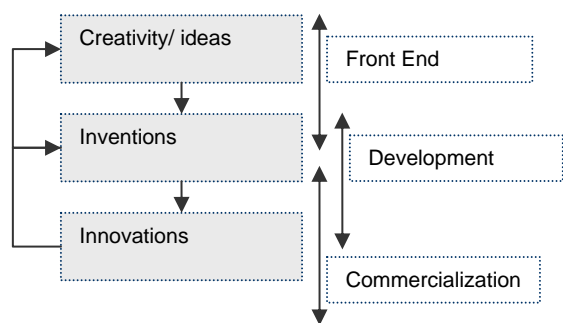


Figure 7: The innovation process, adapted from Carayannis and Chanaron (2007: 147).

Weggeman (2007: 195) explains that the phases in the innovation process of BIs will create some order in the complexity and subsequent enhance the controllability. That is why IBM has additional controls in place, separated into phases to instil some degree of business discipline (Garvin and Levesque, 2005). The opposite could be seen at Netscape, who was too late in introducing business discipline in its competition with Microsoft in the browser market and lost a huge amount of market share subsequently.

Our focus on BIs means that this research is mainly interested in the transition from development to commercialization, as this is the area where BIs are used. Nevertheless, all three phases of the complete innovation process will be discussed in the next paragraphs. An elaboration on the place of the BI in this innovation process will indeed commence from the second phase, development.

2.5.1 FRONT END

Before one can actually start developing or designing a new product, there has to be an idea about what kind of product actually has to be designed and what specifications the product has to meet. These specifications are verbalized in a concept definition. The concept definition is the output of the FE, which is the preliminary stage of the innovation process, and serves as the input for the development phase.

The required information for the concept definition is gathered in the first steps of the FE, the Fuzzy Front End (FFE); the earliest stage of the innovation process (Reid and Brentani, 2004). The FFE has no clear beginning because of its creative and explorative character. After all, you can come up with an idea or see an opportunity at every arbitrary moment; this cannot be strictly forced into a time frame. Input for the FFE could come via several ways, both inside and outside the company, as can be seen in the open innovation model where ideas that do not completely fit with the company's strategy are not put on the shelf, but sold to other companies and visa versa (Chesbrough, 2003). Top management should ensure that a structured methodology or systems are set in place so that each creative idea goes through a careful screening process prior to the actual execution of the design, and afterwards the result can be measured (Ahmed, 1998; Jamrog et al., 2006).

Cooper et al. (1997) argues that the goal of the FE is to come with sufficiently promising product ideas (feeding the pipeline) keeping in mind the company's option portfolio management. Indeed, running too much

projects at the same time will overload individuals, and spread effort too thinly, inhibiting innovation (Ahmed, 1998). A lot of ideas invented here typically do not make it to the development phase because, next to the selection process, numerous problems show up. One could think here of feasibility problems, or compatibility problems. Research by Stevens and Burley (2003) showed that of the 300 ideas submitted, only 9 ideas will reach the next phase, development, and only two of these nine ideas will eventually be launched into the market (the commercialization phase). Approval has to be given to enter the next phase, development, for reasons we will elaborate on later.

2.5.2 DEVELOPMENT

The development phase is a structured methodological phase. Although it depends on the methodology adopted by companies, this phase generally consist of two main steps namely: (1) product development and testing, and (2) market evaluation (Cooper and Kleinschmidt, 1991). As mentioned, the concept definition is defined and the technical feasibility of the radical invention is demonstrated during the FE. The first activity in this second phase consists of developing the disruptive technology and conducting internal testing. When these activities are performed successfully, the disruptive technology can move from the R&D lab to the BI⁴.

Indeed, the innovation process of a BI starts here. The tested idea is selected, and the development of the business starts. The innovation process of BIs generally consists of three steps, two under this phase of the innovation process: (a) start-up, and (b) business development. The last one, (c) maturity categorizes under the next and last phase, commercialization (Hamdani, 2006). According to Allen (1988), (a) the start-up stage is characterized as real estate driven; the emphasis is placed on preparing the space and locating initial tenants. (b) The business development stage occurs when the facility is on sound financial footings and attention shifts to managing up the tenant firm.

To complete this phase, the product and the market are tested externally and a preparation for scale-up and (national) introduction is made. Again, an approval has to be given to enter the last phase, commercialization.

2.5.3 COMMERCIALIZATION

The third and last stage of the product innovation process is called commercialization or launch (Crawford and Di Benedetto, 2003). The third and last step of the business incubation process, (c) business incubator maturation, is characterized by a sophisticated enterprise support network and demand for additional user space. This phase consists of actually making the idea operationally feasible. In other words, the product is produced to allow

⁴ Note that in case of incremental improvements of technologies or products the normal innovation process can be taken as can be seen in Figure 9, and there is no need

for the use of BIs as depicted in Figure 4.

extraction of value from all that has been created in the earlier phases (Ahmed, 1998), meaning that the invention will become an innovation. This phase is especially important due to financial commitments that are often the most costly part of the new product program.

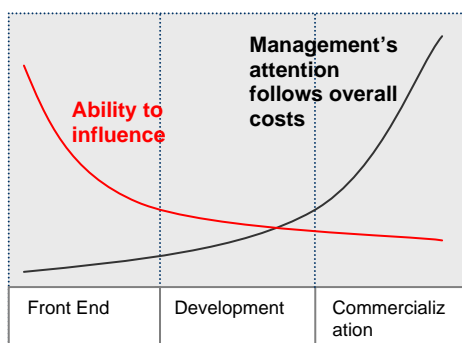


Figure 8: Innovation process related to overall costs, management's attention, and the ability to influence (Gilsing, 2005).

So BIs generally go through three phases, as described in this section, and decisions are made concerning the potential of a BI before allowing one to a next phase. This decision is important as allowing an incubator to the next phase implies a larger investment from the nurturing company (Di Benedetto, 1999). This is illustrated in Figure 8, which shows the relationship between costs and the phase of the innovation process. Note that the ability to influence the outcome of the BI decreases during the innovation process. Taking this into consideration one would expect more attention from management in the early phases; it is surprising to find that these are often the most poorly managed phases (Di Benedetto, 1999).

The TLCC, as shown in Figure 3, shows the commercialization phase of the innovation process of a product. In this figure, we can illustrate where the business incubation life cycle ends. Roughly could be said that the

innovation process of the BI targets the technology enthusiasts and the visionaries in the early market. Indeed, they target the pragmatics with the goal to cross the chasm. If the chasm is crossed, mass production will commence, which will happen within a new or existing business unit, and within a new or existing company. It is there that the life cycle of the BI ends (van den Elst, 2006).

The innovation process of the BI ends with its maturity during the commercialization. During this last step, organizations have to decide about the future of the BI. Indeed, BIs will stay incubators until they have grown large enough to: (1) integrate into a new business unit of the existing organization, (2) integrate into an existing business unit of the nurturing organization, (3) spin-off into an independent company, or create an (4) Initial Public Offering (IPO) (Bessant and Tidd, 2007: 283).

The steps which show the complete innovation process and the approval meetings are shown graphically in Figure 9 below. Note that BIs will start during step 2, and end in during step 4.

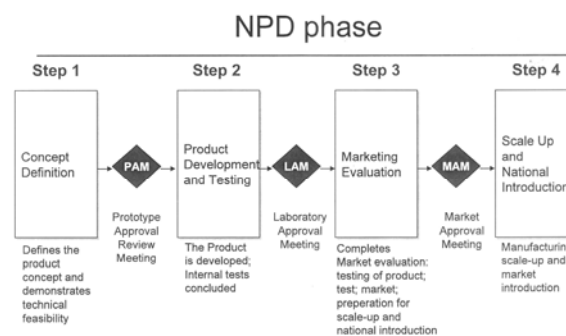


Figure 9: Formal process for managing new products (Cooper and Kleinschmidt, 1991).

In order to make valid judgements about the OCs of BIs, we need to know in which phase of the innovation process they are

located. Indeed, this allows us to control for extraneous variables, which threaten internal validity, as will be discussed later on. The next section will therefore describe the method commonly used to achieve this, the Bell-Mason Diagnostic.

2.6 BELL-MASON DIAGNOSTIC

BIs generally go through three phases, as described in chapter 2.5, and during the innovation process, decisions are made whether or not to allow a BI to the next phase. This is an important decision, as outlined before, because allowing a BI to the next phase implies a bigger investment from the nurturing company (Di Benedetto, 1999). This could also be seen in Figure 8, which demonstrates the relationship between costs and the phase of the innovation process.

Business Plan Evaluation Aids (BPEA) consist of a wide range of indicators and are set in place to assist companies to make the decisions about the future of incubators in a structured way. Several BPEA are found in the literature and include the: (1) Venture Opportunity Screening Guide, (2) Bell-Mason Diagnostic (BMD), (3) ProGrid Venture, (4) FVRI System, and the (5) New Venture Template. These tools are described in more detail in Appendix A: Business Plan Evaluation Aids.

Although all of the above described aids are suitable for measuring the start-up potential of new ventures (BIs), most are lacking the possibility to measure beyond the first screening. This limits the ability of the tools to assess the exact place of the BI in the

innovation process. This leaves us with only one suitable BPEA, the BMD, as it is the only BPEA making use of phases and subsequently allows us to make valid judgements concerning the place of the BI in the innovation process. This might explain why many large firms have adopted this method, among one of them Philips. The following text shall therefore describe this tool in more detail.

The Bell-Mason and Prescriptive Method, released in 1992, is a rule-based tool used to plot the status of a high-technology venture at each stage of its growth (Bell, 1991: 251). The BMD aims to evaluate companies seeking venture capital quantitatively (Mainprize and Hindle, 2005). It can be used to aid the planning and diagnostics of new ventures in established companies (Bell and Mason, 1991). The three most common used ways of applying the BMD are: (1) As a template, or reference, for planning a new high-tech venture, (2) as a tool for performing a diagnostic ‘outside review’ or ‘self-assessment’ of a new venture, (3) or as a means of developing a prescription for change to achieve a more ideal organization (Bell, 1991: 254).

The diagnostic is composed of four elements: (1) the stages of company growth, (2) the twelve dimensions that are measured to assess an BI, (3) the rules to evaluate each dimension, and (4) a relational graph plotted against the ideal model for success. These four elements will now be discussed.

The first element is based on the idea that all healthy BIs in the technology field must pass through the following four predictable, measurable, sequential growth stages in a

roughly identical fashion, namely Stage I: Concept; Stage II: Seed; Stage III: Product Development; Stage IV: Market Development. After these four stages, companies are expected to reach Stage V: the steady state; a mature but still growing stage at which they are considered to be stable, solidly established, and sustainable organizations. Note that this last stage is not covered by the BMD as it remains in the realm of traditional management science. An overview of the place of the stages in the innovation process can be seen in Figure 10.

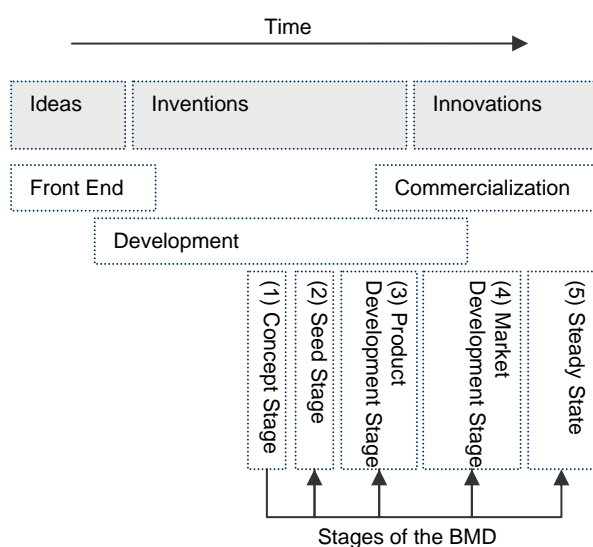


Figure 10: The innovation process and the Bell-Mason Diagnostic.

So to investigate the OC needed for the successful development of radical innovations, the focus should be placed on the transition from the seed/ product development stage to the commercialisation phase, implying the early phases of the BIs. Nevertheless, all stages will be discussed in the next sections.

2.6.1 STAGE I: THE CONCEPT STAGE

The concept stage can last from a few days to as long as a year, and is the new venture's starting point. It can be initiated from any viewpoint – such as a new market,

technology, or product – but requires the drive of an initial entrepreneurial group. It takes not much more than a good idea to enter this stage. The founding team, usually consisting of only a few people, should include a capable Chief Executive Officer (CEO) for carrying the team through to stage V, steady state.

The main aim of this stage is that the intent and the strategic fit with the nurturing organization of the incubator should become clear. From this stage a skeletal plan should be developed and the funding secured to move either to stage II, or directly to stage III.

Other important aspects from the twelve dimensions of this phase are Cash, Technology, and the Business Plan (vision). More information can be found in Figure 11 and in Table 2 below.

2.6.2 STAGE II: THE SEED STAGE

The second stage, the seed stage, typically lasts six months, but could last more than a year when the proposed company utilizes a particularly difficult technology. This stage is thus about proving the new technologies efficacy. As noted in the description of stage I, not all BIs go through this stage, although recommendable as it will allow for the formation of a first rate team, and the development of a detailed, high-quality plan for the company. During this stage a breadboard of the product should be developed together with a model of the corresponding market(s). This stage is ended by a sound business plan.

The purpose of this stage is threefold: (1) Ensure the critical technology is under control in order that stage III can be scheduled. (2) Develop a cursory product definition so that the

market can be assessed, and (3) produce a realistic business plan, which ties costs and revenues together.

Most developed of the twelve dimensions at the end of this phase should be the business plan, CEO, Cash, Financeability, and the Technology.

2.6.3 STAGE III: PRODUCT DEVELOPMENT

The third stage, product development, lasts around 2 years. The product should be tested for several months under actual operating conditions by a reasonable number of real users (beta-test users). Entry to this stage is marked by securing funds and exit from the stage is marked by the existence of a working and user-tested product. This stage consists of four sub-stages: (1) hiring and planning of a development team to generate a detailed plan and product specification, (2) designing and building the product, (3) alpha testing, meaning in-house testing, and (4) beta testing, actual end user testing in the end users environment.

The goals of this stage are to hire staff, specify and plan the product, and design and produce the actual working product. During this stage the product must be thoroughly tested by a reasonable number of real users and a detailed plan for producing and marketing the product. Also secured findings should be acquired.

Although there should be progress on all twelve dimensions, the furthest developed should be the business plan, marketing, CEO, Cash, Financeability, Technology, and Product.

2.6.4 STAGE IV: THE MARKET DEVELOPMENT STAGE

The market development stage, which typically lasts 2 to 4 years, is the culmination of

all the work done in the preceding stages. Entry into this stage is marked by first customer shipment, and exit usually by company acquisition or an IPO. This stage has three sub-stages: (1) market calibration is about the initial shipment to the customers and the phase where the business plan is tested in real life. The main focus should be to determine the product's average selling price and its cost of sales. (2) Market expansion should aim at first break-even quarter, which is the exit criterion for this sub-stage. (3) The steady-state operation, which is the final sub-stage of market development, should demonstrate that the BI can run profitably by sustaining a steady-state operation for at least six months. After testing in stage III, the new venture must start spending significantly more money (typically triples) to produce, market, and sell the product (as could be seen in Figure 8). From this phase on, it is possible to assess the success of the incubator by the profit and loss statements.

The main aim of this phase is to ensure a sustaining profitability. Afterwards there is the choice to continue building stature, or the new venture could be 'cashed out' in some form. Meaning the start of stage V, which as explained before, will not be discussed.

At the end of this stage, all twelve dimensions should have been thoroughly covered. A flowchart of these stages has been included in Appendix B: The stages of growth for a start-up.

2.6.5 THE TWELVE DIMENSIONS

Innumerable factors influence the course of a start-up. According to Bell (1991: 253), these can be distilled and categorized by the

twelve dimensions, as shown in Table 2, Figure 11, and summarized here: (1) Business plan, (2) Marketing, (3) Sales, (4) CEO, (5) Team, (6) Board of Directors, (7) Cash, (8) Financeability, (9) Operations/ Control, (10) Technology/ Engineering, (11) Product, (12) Manufacturing.

Technology/ Product		
1	Technology	The technology (knowledge) needed to develop the product (Bell, 1991: 85).
2	Product	The physical product coming from a production line, this is what customers ultimately buy (Bell, 1991: 152).
3	Manufacturing	Converting materials into products on a large scale as cost-effective as possible while remaining a high-quality, and timely fashion (Bell, 1991: 140).

Table 2: The twelve dimensions defined.

Marketing/ Sales		
4	Business Plan & Vision	The set of guidelines for operating the company. The standard of record against which the firm expects its results to be measured. A sales brochure directed at potential investors. The place where the founders can describe their vision for the firm (Bell, 1991: 34).
5	Marketing	Helps to define the product and create a wonderful image of the product in the minds of the potential buyers; also helps to sell the product (Bell, 1991: 201).
6	Sales	Sales must produce orders so that manufacturing can ship the company's products for revenue (Bell, 1991: 254).

Table 2: Continued - The twelve dimensions defined.

People		
7	CEO	Establishes the standards for the company and serves as team leader (Bell, 1991: 33).
8	Team	Formation of the team which consists of high-quality individuals with measurable experience and expertise (Bell, 1991: 33).
9	Board of Directors	The place where the CEO reports and where the ultimate fiduciary responsibility for the venture rests (Bell, 1991: 33).

Table 2: Continued - The twelve dimensions defined.

Finance/ Control		
10	Cash	The funds that the firm has on hand or can obtain rapidly (i.e. in less than three months) (Bell, 1991: 59).
11	Financeability	The company's ability to raise cash in the short term (i.e., in three months or longer) and in the long term (i.e., over the life of the firm) (Bell, 1991: 59).
12	Control	The company's ability to operate according to a plan that specifies income, spending, and overall results (going substantially beyond simple financial control) (Bell, 1991: 59).

Table 2: Continued - The twelve dimensions defined.

Bell and Mason (1991) built their understanding from working with hundreds of BIs and therefore claim that this method covers every aspect of a company in a complete, independent, and non-overlapping fashion, including input (people, cash, financeability, and technology), output (product and service, and the ability to produce and deliver products), its sheets, the organization and people who run the company, and finally, key processes.

Note that the OC is not directly considered by this approach, providing yet another reason why research into the relationship of OC and (radical) innovation is very important, as it could provide a better understanding of the innovation process for radical innovations.

2.6.6 EVALUATIONS RULES AND THE RELATIONAL GRAPH

As said, each of the twelve dimensions are evaluated at each of the four stages of growth by comparing the start-up with the 'ideal' situation for that stage of growth (see Figure 11 below) (Bell and Mason, 1991).

The comparison is performed by having key participants of the start-up answering a

series of questions which constitute a checklist. To these questions, yes or no answers can be given. The entire diagnostic consists of 700 rules and the evaluation of a stage or sub-stage of product or market development may embody around 70 questions⁵ (Bell and Mason, 1991). Bell (1991) states that by using the diagnostics rules, the strength of each dimension can be evaluated at each stage of growth of the BI. In this way, the BI's health can be assessed and its future outcome can be predicted and managed. The 'laws of good practice', which are embedded into a set of rules for a particular phase must be passed (answered by a yes) in order to make the transition from one phase to the next one. The results are then evaluated at a particular stage of its growth by plotting the answers on a twelve dimensional relational graph, which allows for an easy comparison with the 'ideal' situated company, and it highlights potential deficiencies and pinpoint areas, that are in or out of balance (Bell and Mason, 1991).



Figure 11: The ideal model for success in the different phases (Bell, 1991: 255).

There has been some critic on the Bell-Mason method for the following two reasons: (1) As the Bell-Mason Diagnostic works with a set of questions where only yes or no answers are possible there is no way to weight the importance of each cue to the overall viability, and therefore the decision maker will most likely use unsystematic judgementalism (Mainprize and Hindle, 2005). According to Mainprize and Hindle (2005), judgement criteria for ventures can take the values of actuarial modelling or unsystematic judgementalism. The main difference between the two is that actuarial models have a weighted decision criterion which remains consistent while screening different incubators, and is therefore preferred over unsystematic judgementalism, which allows for variation in results because of the decision makers (judgement criteria). (2) Furthermore, the rules to drive the decision aid are solely based on Bell and Mason's experience and understanding from working with (hundreds of) BIs (Bell, 1991: 271). They do not cite any literature, academic studies, or empirical research to

⁵ However, a general set of 25 rules can be used to evaluate a company broadly and easily at any time (Bell and Mason, 1991). Appendix B: The stages of growth for a start-up describe how the BMD should be applied.

justify the origin of the 700 rules. This is indeed the reason that Mainprize and Hindle (2005) label this method as individual cognition. Roughly speaking, individual cognition is used when the method is based on what the developer of the tool thinks that matters. It relies on surveys and questionnaires that provided 'decision clues' for the researcher to develop their model, but often no deeper justified foundations are given. Preferred would be to have 'researched venture attributes', which provide a more solid base compared to individual cognition.

Nevertheless, the focus of this research will be on the Bell-Mason Diagnostic (BDM) because, next to the arguments already described, the model is adopted by many large firms like Motorola, Mitsubishi, the Canadian Business Development, the Scottish Enterprise Board, and more importantly for this research, by Philips. In this way, we can follow the standing practice at Philips, enhancing the reliability of the findings.

2.7 CONCLUSIONS

Figure 12 gives an overview of the most important findings of this chapter. As outlined in chapter 2, creativity will lead to inventions which subsequently lead to innovations. In line with our definition of innovation, the commercialization phase results in innovations. This transition will subsequently be the phase where the focus of this report is aimed at. For radical innovations, several companies use corporate entrepreneurship and BIs to increase the probability of success. BIs fit in between inventions and radical innovation, hence the

name BI. To be able to draw valid conclusions about our chosen research topic, we need to determine the specific position of the BIs in the innovation process. To be able to do so in a structured manner, the BMD is adopted.

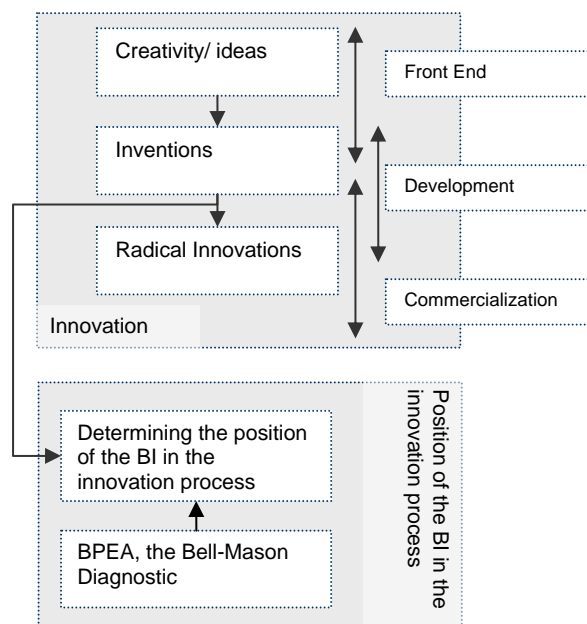


Figure 12: Position of the BI in the innovation process.

Although this chapter describes methods and techniques for a company to master innovation, simply deciding to be innovative in the future is not enough. This decision has to be backed by actions that create an environment, a culture, in which the employees are so comfortable with innovation that they create it themselves (Ahmed, 1998). The next chapter shall therefore give more insight into cultures and organizational cultures.

3 ORGANIZATIONAL CULTURE

Chapter three is about the second main topic of our study, organizational culture (OC). In section 3.1 an important distinction is made concerning two movements in the literature arguing what compiles an OC; is it about values or is it about perceived practices. After the decision is made which research stream to follow, a definition of OC is presented in section 3.2. There does not necessary have to be just one OC in an organization and therefore, in section 3.3, organizational subcultures are briefly discussed. Section 3.4 deals with the distinction between climate and culture, to have a clear view for section 3.5, which shortly outlines how an OC can be changed. Section 3.6 presents the framework used for this study and chapter 3 ends with section 3.7, where a model is shown summarizing our main findings concerning OC.

In general, the term culture refers to a whole product, group, or society. It is a characteristic of intelligent beings and refers to the human ability to classify, codify, and communicate. Different cultures reflect different theoretical bases for understanding and evaluating. The way people live in harmony with their history, belief, language, etcetera, can be defined as their culture. It says something about what makes that particular group stand out, or distinguish itself from other groups (Hofstede, 2000). Culture is thus an aspect of a group (Hofstede, 1991), whether this is a

society, organization, or a group of people (Pheysy, 1993). Although it is not an aspect of individuals, it is manifested within individuals, and can be measured from the verbal and non-verbal behaviour of individuals, aggregated to the level of their unit, whether this is a society, organization, or group (Hofstede, 1998:a). Schwartz (1999) gives a definition here: “Culture is a rich complex of meanings, beliefs, practices, symbols, norms, and values prevalent among people in a society.”

A research project into national cultures was executed and published by Hofstede (1980) in order to locate the value dimensions across which national cultures may vary. The results of this study, consisting of a sample of over 100,000 employees of IBM, was the identification of four dimensions that he labelled as individualism, masculinity, power distance, and uncertainty avoidance. Later, Bond et al. (1987) identified a fifth dimension, that is, long term orientation versus short term orientation to life. These five value dimensions, of course, can not exhaust all the differences between national cultures, but have been empirically demonstrated to be related to many aspects of national cultures (Kolman et al., 2003).

3.1 VALUES AND PRACTICES

National culture is being taught from the early infancy and for this reason, values are deeply imbedded into persons. Values can be defined as: “a broad tendency to prefer certain states of affairs over others”, (Hofstede, 1998:a).

But can these values, and belonging

dimensions, also be found as varying factor for OCs? Peters and Waterman (1982), and subsequent research, argued that shared values indeed also represent the core of an OC, just as is the case with national cultures. In contrast, Hofstede et al. (1990) empirically showed that shared perceptions of daily practices, and not values, are at the core of an OC. The research showed that the practice⁶ dimensions⁷ (on which is going to be elaborated later on), showed a much higher explanatory power for differentiating between organizational cultures, than the value dimensions⁸, which had differentiated so much across countries.

The difference between the two concepts is that values describe how employees feel it 'should be', and practices show what people feel 'is' (Hofstede et al., 1990). As values are acquired from family, school, and surroundings in our early youth, organizational practices are learned, through socialisation, at the workplace.

This conclusion can be understood in the way that researchers in line with Peters and Waterman (1982) almost always only surveyed top management (instead of the whole organization), and there is little disagreement about the fact that top management (or the founders of a company), put their own values

into the design of the practices for their company, simply because they have developed a theory how to succeed according to the roots of their own culture in which they grew up (Schein, 1983; Hofstede, 1998:a; Christensen and Overdorf, 2000).

An example of top management's values as performed by their employees through practices can be seen at Honda in the USA. Soichiro Honda, the founder of Honda brought the value: "Equality among colleagues is expressed in recognizing and respecting individual differences in each other, treating each other fairly and creating equal opportunity for everyone", (Honda, 2007). This applies for the whole workforce, from production floor employees till senior managers, and for this reason they must be able to listen, ask, and speak up with anyone in the organization in order to contribute to ideas resulting in improvements. This philosophy led to the successful introduction of many practices which stimulated the 'Honda behaviour' by American employees, who adopted them, in spite of the practices which would be expected of the most individualistic country measured till date (ITIM, 2007).

It follows that employees may work according to, and adapt to, the practices designed following the values of top management, but this does not mean that they have to confess to these values personally. Indeed, as outlined by Christensen and Overdorf (2000), within the highly successful company McKinsey & Company, top management's values have become so strong, that it almost does not matter which people get

⁶ Practices are defined here as conventions, customs, habits, traditions, usages, etcetera and reflect symbols, heroes, and rituals.

⁷ The six practice dimensions were labelled: (1) process oriented versus results oriented, (2) employee oriented versus job oriented, (3) parochial versus professional, (4) open system versus closed system, (5) loose versus tight control, and (6) normative versus pragmatic.

⁸ The three value dimensions were labelled: (1) need for security, (2) work centrality, and (3) need for authority.

assigned to which projects. In this way, people with different basic assumptions (values, which tend to be depending on demographics) can still cooperate in an organization without significantly affecting the OC (Hofstede, 2000). In that sense: “leaders’ values become followers’ practices” (Hofstede, 1998:a), which means that top management’s values are transcribed into practices for the employees, but they not necessarily have to adopt these practices.

If these values are flawed, the company will likely fail, but if they are sound, the employees will experience for themselves the validity of the founder’s values in problem solving and decision making (Christensen and Overdorf, 2000). These practices reflect the symbols, heroes and rituals⁹ of a specific organization and form the visible part; values form the invisible part of an OC. This is illustrated in Figure 13, which shows that OC is mainly formed by the perception of practices.

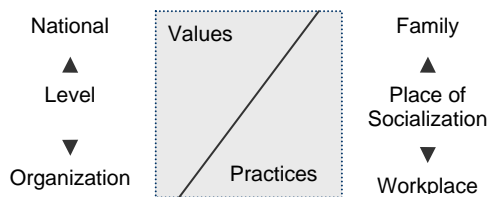


Figure 13: Organizational and national culture, adapted from Hofstede et al. (1990).

⁹ Symbols provide tangible evidence of the culture; they are manufactured by people to facilitate activities, e.g. company logo's which summarize what a company stands for. They can be words, gestures, pictures, or objects that carry a particular meaning. Rituals are standardized detailed sets of techniques and manage anxieties. They are collective activities that are socially essential within the culture. Heroes are persons who serve as a model. They can be dead or alive, real or imaginary, but posses the highly prized characteristic for the best behaviour (Hofstede et al., 1990; Reigle, 2001).

Schein (1990) also states that in observing OC differences, national culture is not a sufficient explanation. This conclusion is based on results found in studies trying to explain why U.S. companies do not perform as well as some of their counterpart companies in other societies (e.g. Japan). It could be concluded that national culture does not gives a sufficient explanation for the differences (Schein, 1990). Following this reasoning, the five (value) dimensions composing national culture should indeed not be applied on the OC level. This finding is confirmed by Hofstede (1980: 464) who stated that the dimensions for national culture should not be used for discriminating according to other cultural distinctions, such as organizations.

3.2 DEFINITION

The concept of OC has been used often without being properly defined (Hofstede, 2000). Although there are abundant definitions to be found in the literature, they remain mostly vague, formulated in the way like: “The way we do things around here.”

According to Martins and Terblanche (2003), OC is the result of basic assumptions that worked very well in the past and for this reason are accepted as truth, as valid practices within the organization. Employees will start to work according to these assumptions rather than by conscious choice (Christensen and Overdorf, 2000). Indeed, these practices are taken for granted (Lewis and Thornhill, 1994), a pattern of basic assumptions (Schein, 1990; Martins and Terblanche, 2003), and become less and less open to discussion, which obviously make

them difficult to change (Schein, 1990). The practices are maintained by the human interaction (socialization¹⁰ and social control) in the organization (Schein, 1990; Lewis and Thornhill, 1994; Martins and Terblanche, 2003; ITIM, 2007), and are reflected in the (collective) behaviour of the employees, meaning the right way how things should be understood or done within a specific unit or organization. For this reason, the processes may have deep roots in the organization's history, even to the values of the very founders of the organization.

Following this discussion the following list of characteristics can be created: (1) It is something found in the minds of people and is taken for granted, a pattern of basic assumptions formed by history. (2) It is shared among its members and it is held in a collective way. (3) It is extradited and reproduced by means of human interaction.

Derived from these findings, the following definition from Hofstede (1998:a) seems plausible: "The collective programming of the mind in the form of 'best' practices, which distinguishes the members of one organization from another", provided that the following is added: "and is transmitted by human interaction".

3.3 SUBCULTURES

A fact remains that an organization consists of different groups. An example could

be the cultural difference between people working in an R&D lab or the people working in the Marketing section of a company. Indeed, there has been much discussion about this subject (Griffin and Hauser, 1996).

As organizations grow, they tend to build different functional groups in order to divide the labour and responsibilities. One organization may include several culturally different departments, and these departments may consist of culturally different work groups (Hofstede, 1990). Scientists are hired for their expertise and have to maintain and develop new technologies, whereas marketing specialists are hired to sell the product, talk to (potential) customers, and communicate product benefits. Over time, these groups tend to grow apart and build their own Organizational Subcultures (OSC) (Schein, 1990; Griffen and Hauser, 1996; Hauser 1998).

A less often acknowledged kind of OSC is that of hierarchy (Schein, 1996). All hierarchical levels (e.g. middle and higher management) tend to develop their own ways of dealing with problems faced, and in that way building their own set of shared assumptions and preferred practices.

The differentiation inevitably occurs with the growing size of the company. Within all these OSCs, the relationships are either dialectic (OSCs are opposed), neutral (they do not interfere with each other), or complementary (OSCs enhance each other) (Schein, 1990). Indeed, the groups can be experts at their own functions, but less aware of each others contribution. Putting both hierarchical OSCs and functional OSCs into a

¹⁰ The socialisation of members is a matter of learning the practices, which consists of symbols, heroes, and rituals of a specific unit or organization.

matrix leads to Table 3¹¹.

		Functional OSC		
		A	B	C
Hierarchical OSC	Corporate level	A.1	B.1	C.1
	Hierarchy level 2	A.2	B.2	C.2
	Hierarchy level 3	A.3	B.3	C.3

Table 3: Functional OSC and hierarchical OSC.

3.3.1 PROBLEMS WITH SUBCULTURES

The development of OSCs is a process that can often justify itself historically (Schein, 1996). Some practices that have worked well enough in the past, are now considered valid and taught to new members, even if they are in contrast with other OSCs. To create alignment among the different groups is not a matter of deciding who is right, because all the different OSCs will make valid statements from their professional viewpoint, but enough mutual understanding should be created among the groups to let solutions evolve that will be understood and implemented (Schein, 1996).

Problems occur when technologies and environmental conditions change; the OSCs will collide, and the result could be low productivity, frustrations among the groups, and failure of innovations to survive and to diffuse (Schein, 1996). Note that the next chapter will further elaborate on the link between innovation and OC.

The decisions top management makes reflects their OSC. But what may be forgotten

is that an organization is made out of a cultural map, or if aware, it may be repressed. From top management's view, wholesale solutions seem interesting, in terms of strategy, structure, and control systems, but as mentioned before, today's complex organizations often contain various OSCs which may be poorly served by such company-wide solutions (Hofstede, 1998:b).

3.4 CULTURE AND CLIMATE

The feeling of an organization reflects both its climate and culture (Ahmed, 1998). Climate and (organizational) culture are two concepts which are often used interchangeably (McLean, 2005). The climate feeling is the result of its members, which in turn is the result of the organization's practices and procedures. The climate is in sense the core of the organizations true priorities (Ahmed, 1998). It can be described as how employees understand and execute the guiding principles encapsulated in the OC (Davila et al., 2007: 124). Culture, which is intangible, can be seen as a reflection of climate (tangible), but operates at a deeper level (values of top management). It refers to the manifestation of practices and patterns of behaviour which are rooted in the culture's assumptions, meanings, and beliefs. A way to make the distinction more clear is to see organizational climate as the 'what' happens, and organizational culture as the 'why' happens in an organization (Davila et al., 2007: 124-125).

Organizational climate has had a longer research tradition by the virtue that it is a more salient cultural phenomenon and thus lent itself

¹¹ Note that even more OSCs might be added if locations where also considered, although we did not find any proof in the literature for this statement.

to direct observation and measurement. Schein (1990) argues that climate, because of this, does not allow one to delve deeper into the causal aspects of how organizations function (Schein, 1990). "We need explanations for variations in climate and norms, and it is this need that ultimately drives us to 'deeper' concepts such as culture", (Schein, 1990). On the other side McLean (2005) states that the organizational culture and climate characteristics that support creativity are similar, making a differentiation between the constructs unnecessary.

The approach as taken in this research, where the perceiving of practices by the employees is seen as the major determinant of OC, has indeed an overlap with the climate construct ('what'). Note that further elaboration on this topic would go beyond the scope of this research, as for the remainder of this study this concept has no further influence.

3.5 CHANGING ORGANIZATIONAL CULTURE

Controlled change is very difficult if one does not fully understand what it is one is attempting to change (Lewis, 2000). OC is a construct and therefore not directly observable, but, as mentioned in a previous section of this chapter, employees work mostly according to set practices (how they perceive them) designed according to the values of top management. Practices are less basic than values and are subject to intended change. Values also change, but not according to planned change (Hofstede, 1998:a). So, although difficult, it is possible to change an OC intended by changing the (perceived) practices itself.

Only if a group adopts the new practice, and perceives the solution as a well working one, it will be used in the future. It will become something that is taken for granted, taught to newcomers and subsequently becomes embedded in the OC (Schein, 1983). In that way, new solutions (innovations) can lead to new accepted practices, newly introduced practices may then lead to new innovations. The difficulty is how a founder or leader convinces the group to do things in certain ways which later becomes embedded in the culture (Schein, 1983).

Adler and Shenhar (1990) state that changing an OC takes several years. The main problem is that, in today's fast paced business environment, managers try to change their OC in a fast way, albeit overnight results are not possible. OC could have its roots deep in the organization's past in the form of traditions and history and thus can not be changed fast.

The approach as taken by Hofstede et al. (1990) and adopted by this research makes OC to some degree quantifiable, and therefore measurable, because it is about (changes in) perceptions of daily practices. In this way, it becomes possible to compare different organizations in terms of OC, and even measure a single OC as a multitude of OSCs. This would enable researchers to make cultural maps of complex organizations.

In order to cope with change, Lewis and Thornhill (1994) made a change program. It can be said that the activities for a change program are as described next: (1) Defining the desired goals, this consists of clear, measurable, time-specific goals: (2) Analysing the current state

and reviewing the change strategies available. (3) Deciding on the appropriate strategies, and (4) Implementing and evaluating the strategies. Further elaboration on these activities would go beyond the scope of this research.

3.6 DIMENSIONS OF ORGANIZATIONAL CULTURE

As stated before, it would make no sense to use the five dimensions of national culture to describe OCs, because of the fact that national cultures depend much more on the values of people, which does not form the core of OCs. Therefore Hofstede et al. (1990) performed an extensive empirical research to reveal the dimensions that distinguish organizational units from each other. Twenty OCs from ten different organizations in Denmark and the Netherlands were studied. A large part of the differences among these twenty units could be explained by six factors. These six dimensions were labelled: (1) process versus results oriented, (2) normative versus pragmatic, (3) loose versus tight control, (4) parochial versus professional, (5) open versus closed system, and (6) employee versus job oriented.

Later ITIM (2007), a company specialized in measuring OCs, and building upon the theories set by Hofstede et al. (1990), discovered two additional dimensions. Adding these two dimensions gives us the following comprehensive list of dimensions (note that the first six dimensions are the same as described above but with a less ambiguous label): (1) Means versus goal orientation, (2) internally driven versus externally driven, (3) easy-going versus strict work discipline, (4) local versus

professional focus of interest, (5) open versus closed system approach, (6) employee versus work oriented management philosophy, (7) low versus high acceptance of the leadership style, and (8) low versus high identification with the company as a whole.

Some researchers believe that the phenomena under investigation should be related to all of the dimensions. This is a misunderstanding. Hofstede (1980: 465) explains that the strength of the model is precisely that it allows for conceptual parsimony, meaning that it allows for the detection of those dimensions responsible for a particular effect and which dimensions are not. Note that all dimensions are statistically proven to be mutually exclusive (ITIM, 2007).

These dimensions are adopted in this research and will now be further explained based on the view of Hofstede et al. (1990) and ITIM (2007). (1) Dimension one focuses on the differences between an orientation on means and an orientation on goals. In a goal oriented culture, the focus is on reaching a goal, whereby results go before procedures. Employees perceive themselves as being comfortable in unfamiliar circumstances and they are able to deal with uncertainty and ambiguity. They are willing to put in a maximum effort to cope with new challenges each day. In a means oriented culture, each day is pretty much the same and people try to avoid risks while spending only limited effort on their job.

(2) The second dimension deals with an internally driven culture versus an externally driven culture. Externally driven cultures are

market-driven and its aim is to do anything to satisfy the market, even if this is not in the customers' best interest; results are most important and therefore there is a pragmatic attitude. An internally driven culture is based on business ethics and honesty and the faith that the members know what is best for the customers and the world. This dimension differs from the first one, in that way that it is about the satisfaction of the customer and not about personal matters.

(3) The third dimension takes into consideration the amount of internal structuring of an organization and is about an easy-going attitude versus a strict work discipline. Employees in an organization with a loose control do not think about costs, and meeting times are only kept approximately. There is a lack of predictability, lots of improvisation, and the work always delivers surprises. Employees in an organization with a tight control are the opposite, these people perceive their environment as cost-conscious and meeting times are kept punctually.

(4) Dimension four, a local focus of interest versus a professional focus of interest, shows the distinction between OCs where employees derive their identity largely from their boss and/or organizational unit, and OCs where employees identify themselves with their job or content of their job. The former has a strong social control to make all employees behave in more or less the same way. These people do not look far into the future, but assume that the organization does so for them. For a professional focus of interest the opposite applies; in essence, it shows to which degree it

is allowed for the individual to be different from the internal norm.

(5) Dimension five, focuses on the difference between a closed system and an open system approach and is about the accessibility of the organization to new members. In an open system, newcomers are easily accepted and adaptation is not hard; people will feel at home after only a few days. In a closed system, the organizations and its members are closed and secretive. This could be due to industrial espionage and/or confidential customer information.

(6) The sixth dimension, an employee orientation versus a work oriented management philosophy, explores the differences between a concern for people and a concern for getting the job done. In an employee oriented culture, the organization takes into account the personal problems of the employees and feels responsible for the welfare of its employees, even if it is at the expense of work quality and/or quantity on the short term. In a job oriented culture the most important thing within the organization is that the job gets done, the rest are side issues (e.g. employee health conditions) and the organization does not care about the personal life of its employees.

(7) Dimension 7, low acceptance versus high acceptance of the leadership style, concerns whether or not the leadership style equals the style preferred by the employees.

(8) The eight and last dimension, low identification with the company versus high identification with the company, is about the degree to which employees identify themselves with the organization as a whole.

Note that there is no such thing as a good or a bad OC; it all depends on where the organization wants to go (Hofstede et al., 1990).

3.7 THE MODEL OF OC

Lewis and Thornhill (1994) separated OC into two main components, corporate culture and OC. Corporate culture is concerned with management's preferred way of doing things, whereas OC are the similarities of all sub-cultures within the organization (including corporate culture). We adopt this approach in our research and present in the findings from the literature review concerning OC in Figure 14.

National culture determines both the values of top management and the employees. As top management has a philosophy of how to succeed, they will transform this philosophy using their values into practices designed for their employees. These perceived practices need to be aligned with the philosophy of success ('why' versus 'what'). As the company grows, different OSCs will develop, which all work according to their perceptions of these practices, making the alignment more difficult. Successes and failures by the different OSCs will gradually change the perception of the practices. Culture may be (gradually) changed by either changing the perceptions and/ or the practices by using the strategies as outlined before. Finally, OC can be measured by using the eight dimensions as described in this chapter. Empirical proof showed that the perceptions of practices play a far more important role for measuring the OC than the (national) values (Hofstede et al. 1990).

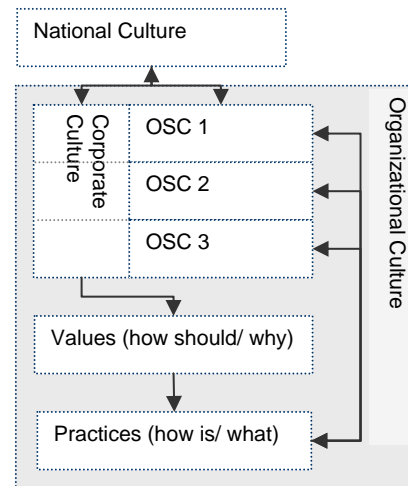


Figure 14: Cultures defined.

4 INNOVATION & OC

The fourth and last chapter of the theoretical part results in the propositions that are going to be compared in the empirical part of the study. The chapter consists of nine sections namely the eight dimensions of OC and a concluding section presenting the final framework. In the first eight sections, each of the dimensions of OC is related to radical innovation, through arguments and illuminating examples found in the literature. The focus is, as described in chapter 2, on the first stages of the BI innovation process, implying the seed phase. All these sections finish with a proposition, concluding the optimal score on the specific dimension to enhance radical innovation and, furthermore, its relative importance to other dimensions for creating innovative performance. The last section, 4.9, draws a conclusion about the relationship between OC and innovation in this case, and answers the research questions in a theoretical manner. Subsequently, the final model is presented.

According to many scholars, (radical) innovation is the result of the OC that supports innovation (Pienaar, 1994; Johnson, 1996; Judge et al., 1997; Tesluk et al., 1997; Shaughnessy, 1998; cited by Martins and Terblanche, 2003). It is often argued that OC is a factor significantly contributing to the creativity of an organization and therefore contributing to inventions and innovations. It is said that the potential of creativity resides in all

human beings and is part and parcel of the human condition (Ahmed, 1998; Jamrog et al. 2006; Bessant and Tidd, 2007: 406; Davila et al., 2007: 5). It follows that organizations, by their OC, can create encouragement for this natural inclination. So for organizations to become innovative it is required to have an OC that constantly guides its employees to strive for creativity and innovation (Tushman and O'Reilly, 1997; Ahmed, 1998).

Comparative literature suggests that certain (organizational) cultures are being more innovative or entrepreneurial than others (George and Zahra, 2002). Indeed, OC can provide an understanding for the differences that may exist between successful companies operating in the same national culture (Schein, 1990; Lim, 1995). This reveals that there are certain configurations of the OC which will give a better innovative performance. An example of an OC tuned for innovation is an OSC building upon the principles of corporate entrepreneurship (Thornberry, 2003).

The possession of the right (interpretations of) practices, meaning OC, provides the organization with the necessary ingredients to innovate, and to sustain innovations (Ahmed, 1998). However, remarkably few authors describe the details of this relationship (McLean, 2005). Even if the details are described, they are not structured in a way that would enable measurements of the optimal OC for radical innovations.

In this study, therefore, we will explore how the eight dimensions of OC should be set for radical innovations during the early stages of the BI innovation process. According to the

literature there are many practices needed for successful innovation. In this research the details of the relationship between OC and radical innovation will be elaborated on through a critical examination of these practices and relating those with the dimensions of OC. This will lead to the propositions. A summary of the theoretical model can be seen in Figure 15.

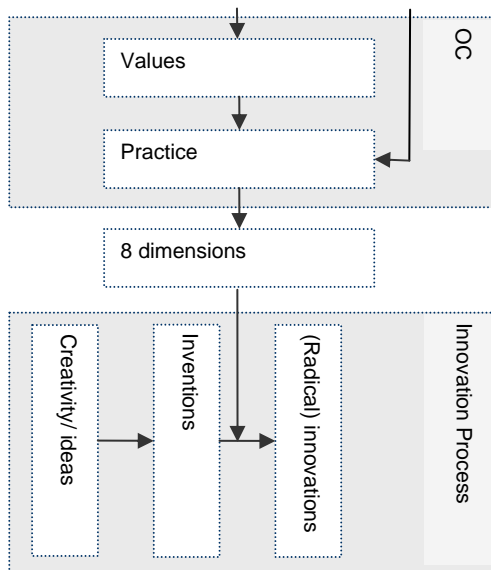


Figure 15: The theoretical model.

4.1 DIMENSION 1: MEANS ORIENTED VERSUS GOAL ORIENTED

As described in the chapter concerning innovation, for radical innovations the core concepts are overturned, and the linkages between the core concepts and components are changed (Henderson and Clark, 1996). Next to this, the product will often be introduced in a new market (Christensen and Overdorf, 2000). Both these factors could lead to a lot of uncertainty and ambiguity concerning the product and its processes.

4.1.1 UNFAMILIAR SITUATIONS

IBM's Emerging Business Opportunities (EBOs), the place where IBM develops its radical innovations, operates in highly

ambiguous environments (Garvin and Levesque, 2004). Note that there is a distinction between uncertainty and ambiguity; in uncertain environments, alternatives and options are reasonably clear, and the likelihood of different outcomes can be assessed probabilistically. In ambiguous environments, neither the full range of alternatives nor the full range of outcomes is known in advance (Garvin and Levesque, 2004); meaning that little is given or predetermined. This lack of clarity has an important implication for managers: in ambiguous environments, it is seldom possible to 'get it right the first time'. Traditional planning and analysis are of limited value, since hard numbers are difficult to come by, options are hard to compare, and past practices offer little guidance for the future.

A goal orientation is characterized by employees who perceive themselves as being comfortable in the before described unfamiliar circumstances and able to deal with uncertainty and ambiguity. They are willing to put in a maximum effort to cope with new challenges each day. This makes this kind of orientation suitable for the development of radical innovations.

4.1.2 RESULTS BEFORE PROCEDURES

Several authors state that an innovative supportive culture should focus on goals (Ahmed, 1998; Judge et al., 1997; McLean, 2005; Carayannis, 2007: 161). Indeed, there should be enough freedom and autonomy here for employees to determine their means by which to achieve the goals set; they should be empowered to work towards set goals by their own solutions (Ahmed, 1998), as this will

enhance people's creativity (McLean, 2005; Carayannis and Chanaron, 2007: 161). According to McLean (2005), there should be clarity and communication about the goals and expectations how these goals should be accomplished. In this way, people are able to suggest new and better ways of doing things (Bessant and Tidd, 2007: 66). Judge et al. (1997) described this as chaos within guidelines; top management prescribes a set of strategic goals, built to allow personnel great freedom within the context of the goals.

Note that this does not mean that the employees should decide upon the goals (Jamrog et al., 2006), as this will lead to less innovations (Ahmed, 1998) because people may go off in their own independent directions, showing little concern for organizational priorities (Bessant and Tidd, 2007: 66). Or the lack of clarity about goals will leave employees spending time and energy on trying to determine which goals should receive focus (McLean, 2005).

The tolerance of uncertainty and ambiguity constitutes risk taking (Bessant and Tidd, 2007: 65) meaning that having a goal orientation also implies that there is a certain amount of risk involved. Taking risk and experimentation are characteristics that are associated with creativity and innovation (Utterback, 1994: 230; Jamrog et al., 2006; Carayannis and Chanaron, 2007: 161; Davila et al., 2007: 6). Tolerance of mistakes, or well-intentioned failure, is an essential element in the development of an OC that promotes creativity and innovation (Martins and Terblanche, 2003; Khazanchi et al., 2007). Failures are inevitable

and should be expected (Garvin and Levesque, 2004). The way in which mistakes are handled in organizations will determine whether employees feel free to act creatively. For instance, at 3M the tendency is not to ask why people failed, but what they have learned (Davila, 2007: 196).

Nevertheless, it is important that a balance is reached in the degree to which risk taking is allowed (Martins and Terblanche, 2003). Too much risk can lead to many failures as people will be confused with ideas floating around but few sanctioned (Bessant and Tidd, 2007: 66). Conversely, not enough risk leads to incremental innovations only¹², as employees will offer few ideas that are well outside of what is considered safe or ordinary (Bessant and Tidd, 2007: 65). In risk avoidant organizations people often complain about their boring, low-energy jobs and become frustrated by a long, tedious process used to get ideas to action (Bessant and Tidd, 2007: 65). In either way, employees will get frustrated that nothing gets done.

4.1.3 NEW CHALLENGES

People respond positively when faced with new challenges, on the condition that they are provided with sufficient scope to generate novel solutions (Ahmed, 1998). High levels of challenge and involvement mean that people are intrinsically motivated and committed to innovate (Bessant and Tidd, 2007: 69). This

¹² The right amount of risk taking is dependent on many (external) variables, e.g. the competitors and the industry where the company is operating.

leads to the in the literature much discussed topic of rewards in relation to innovation. According to Jamrog et al. (2006), there should be a balance between intrinsic rewards and extrinsic rewards. Intrinsic being internal feelings of accomplishments, extrinsic are those things such as pay increases, bonuses, and shares and stock options.

Intrinsic rewards are the key driver to creativity (Amabile, 1998; Ahmed, 1998; Montes et al., 2003). Too much focus on extrinsic rewards, e.g. bonuses, will destroy the employees' intrinsic motivation, as the main aim then becomes pursuing the rewards, thus redirecting attention away from experimentation (Ahmed, 1998; Jamrog et al., 2006). Indeed, if rewards are not structured for innovation, but for the performance of routine operations, employees are going to respond with caution and uncertainty (Ahmed, 1998). On the other hand, other research pointed out that this is not always the case (Jamrog et al., 2006). Extrinsic rewards have to be present at the base level to ensure that individuals are at least comfortable with their salary (Ahmed, 1998).

4.1.4 CONCLUSION

Concluding from the above standing, we argue that because radical innovation brings along uncertainty and ambiguity there is a need for a goal orientation. On the other hand, our focus on BIs implies that, since the technology is readily available because of the later stage in the innovation process, the level of uncertainty and ambiguity is slightly lower. Nevertheless, a goal orientation has been found as the most suitable way to handle these types of situations

and can stimulate the development of creative solutions. Note that special attention should be paid to the amount of risk allowed to be taken, and the use of rewards. Indeed, being too goal oriented will also impede radical innovation. Indeed, the balancing act of the characteristics of this dimension has a large influence on the effectiveness of innovation. For these reasons the first proposition is formulated as:

Proposition 1: a medium strong goal orientation will stimulate the development of radical innovations.

The literature often cites that a goal orientation is crucial for innovation success. Allowance for risk taking, a dynamic work environment, result orientation, and reward systems, will allow employees to work towards their goals in a very creative manner. In that sense, it determines, till some extent, the amount of creativity in a company. Next to this; we argue that a goal orientation will allow for the innovation process to be tackled faster because of the lack of a routine based work environment and the allowance for finding improved ways of 'doing things'. For these reasons we consider the importance of this dimension as high for the creation of an innovative OC.

4.2 DIMENSION 2: INTERNALLY DRIVEN VERSUS EXTERNALLY DRIVEN

In essence, the second dimension deals with the notion of customer orientation. The scale of the dimension makes a distinction between an internally driven culture in which

the employees of the company are convinced of knowing what is best for the customer, and an externally driven culture, in which the satisfaction of the customers is most important even if this is not in the customers' best interest.

4.2.1 PROCEDURES OR FLEXIBILITY

Flexibility in this context means to what degree an organization is able to react on customer demands which differ from the way it goes normally. Procedures in this dimension are standardized ways or rules which have to be followed to serve the customers and to prevent mistakes. So, in other words, the higher the amount of procedures concerning customer orientation an organization has, the less flexible it is to react on customer demands. Deshpandé et al. (1993) found that flexible and responsive to the market OCs outperform more consensual and internally oriented cultures. In an external environment, the competitiveness with other companies encourages continual changes in products, technology, and customer preferences, which stimulates innovation (Martins and Terblanche, 2003). Note that organizations should still make use of a low to moderate amount of formal rules and regulations (Martins and Terblanche, 2003). All companies should have some guidelines to work within. Furthermore many products and processes are restricted to rules for safety and health reasons.

4.2.2 ETHICAL BUSINESS METHODS

Another aspect that shows the difference between an internally driven orientation and an externally driven one is how organizations deal with ethics. Biotechnology is an example of an area in which many (radical) innovations are

developed. Organizations that develop these innovations thus have a more pragmatic view about ethical methods than other organizations. Nevertheless it is still the consumer that has to accept this kind of innovations. In the beginning of the 1990's, the company Calgene developed the so-called 'Flavr Savr Tomato' which was superior to normal tomatoes, due to changes introduced to the genome of the normal tomato with biotechnological techniques. Although this tomato was healthier and tasted better, the average consumer did not accept genetically engineered food (yet). Nowadays, genetically engineered food has crossed the chasm (see TLCC), and reached the main market implying a huge market value. This example shows that for new inventions, sometimes the borders of ethical issues should be sought, to turn them into innovations.

4.2.3 CUSTOMER FOCUS

Jamrog et al. (2006) found that the ability to focus on customers is considered to be a top ranked factor for developing an innovative culture. According to Hauser (1998), a market orientation is always required for developing a successful new product, but especially for radical innovations, it is not a substitute for a technology orientation. The innovation literature shows that a focus on the current market alone does not guarantee that a culture will be innovative. Current customers may not see the possibilities of major technological breakthroughs, and therefore primarily demand incremental innovations (Herstatt, 2002; Jamrog et al., 2006). Indeed this is one of the reasons Henderson (2006) states for the failure of incumbent firms to see radical innovations,

as showed in chapter 2.

For this dimension the distinction between radical and incremental innovation is of high importance as it relates to the notions of technology push and market pull. The early stages of the innovation process are defined by discovery and invention, often depending on (more) technology push (internally driven orientation). The later stages of the innovation process ask for a more externally driven approach, market pull (Carayannis and Chanaron, 2007: 41). Burgelman et al. (2004: 682) argue that a primarily technology push view or a primarily market pull perspective poses serious pit falls to the innovation process. As technology push orientation may address the needs of the atypical user and a lock-in into one particular solution. Market pull will indeed result in the risks of incremental innovation only. Therefore, traditional market research methods, with a focus on current customers, used for the discovery of radical innovations in the form of new market/technology combinations possess only limited suitability (Danneels, 2004).

Nevertheless, for radical innovations, this does not mean that customer focus should be forgotten. Indeed, being customer-oriented does not necessarily imply an exclusive focus on current customers (Danneels, 2004). Chandy and Tellis (1998) found that firms that were focusing on potential future customers had a higher degree of radical product innovation, compared to companies focussing on their established customers. This implies firms should understand the latent and unexpressed needs of its customers (Danneels, 2004).

Indeed, customers are not aware of future needs and therefore organizations should use specially qualified, innovative knowledge carriers early on in the process. Examples of these are lead users or external experts with relevant knowledge from analogous markets (Herstatt, 2002; Jamrog et al., 2006). Understanding the deep shifts in consumer behaviour is notoriously difficult, but once understood, can bring great potential, namely radical innovation (Henderson, 2006).

4.2.4 CONCLUSION

As can be derived from the previous three sections, an organization stimulating innovation should be flexible and should not have too many procedures (concerning the customer orientation) as this will impede radical innovation. Next, a pragmatic attitude concerning ethics could have a positive effect on the search for new inventions. However, the example used in this section proves that crossing the chasm takes more time and effort. The last paragraph discussed the customer focus related to radical innovations. It is concluded that for BIs, which are located later in the innovation process (after the technology has been invented), it is important to have a strong focus on the future customers through for example lead users, balancing technology push and market pull. From the above standing, the following proposition is adopted:

Proposition 2: a medium strong externally driven orientation stimulates the development of radical innovations.

As stated by Henderson (2006), the characteristics of this dimension might be (one

of) the reason(s) why existing firms fail to respond to radical innovations. A choice has to be made about the use of customer influence for the development of (radical) innovations. It is of course of essential importance that customers see the added value of an innovation in order to achieve commercial success. This will have a great influence on the development of the innovation. For the reasons described above we consider the importance of this dimension as high for the creation of an innovative supportive OC.

**4.3 DIMENSION 3: EASY GOING
VERSUS STRICT WORK
DISCIPLINE**

The third dimension focuses on the amount of internal structuring in an organization, and therefore the predictability of the employees. Large companies like IBM face numerous obstacles when they seek to create new businesses. One of these obstacles is to set the right amount of internal structuring for the development of radical innovations businesses (Garvin and Levesque, 2004).

4.3.1 INTERNAL STRUCTURING

Utterback (1994: 230) states that for radical innovation to occur, traditional organizational controls must loosen. Indeed, decentralization is preached by many scholars of innovation (Martins and Terblanche, 2003; Burgelman et al., 2004: 702; Jamrog et al., 2006; Bessant and Tidd, 2007: 66). With little freedom, people are not able to work in a creative way because of the strict guidelines and roles, in that sense; they have to carry out their work in prescribed ways (Bessant and Tidd, 2007: 66). Next to this, in these

circumstances employees are likely to spend a great deal of time and energy obtaining permissions and support (Bessant and Tidd, 2007: 66). An OC that is willing to promote innovation should allow its employees to take time to think creatively and experiment, as too much control will not allow for this and consequently is found to be a major impedes for creative performance (Martins and Terblanche, 2003; McLean, 2005).

On the other hand, Tushman and O'Reilly (1996: 26) found that, to have an OC that stimulates innovation, an organization should simultaneously poses loose and a tight control. "They are tight in that the [OC] is broadly shared and emphasizes norms critical for innovation [...]. The culture is loose in that the manner in which these common values are expressed varies according to the type of innovation required". Successful innovation requires companies besides setting the stage for generating new ideas, also to have the business discipline and processes need to take those new ideas to the market (Jamrog et al., 2006). Khazanchi et al. (2007), found empirical proof for this and defined it as flexibility control tensions; flexibility stimulates creativity and control provides discipline, necessary for a focus on the innovation initiatives.

A good example of problems that occur when there is a loose structure only could be seen during the dot.com crash. Many youthful and exuberant companies got into serious problems for putting too much faith in creativity and too little value on traditional business discipline and experience (Leavy, 2005). This can happen because these

employees simply do not know the right procedures and do not possess the right skills (Bessant and Tidd, 2007: 66). For example, Netscape was too late in introducing business discipline in its competition with Microsoft in the browser market and lost a huge amount of market share subsequently.

Examples of finding a balance between control and internal structuring are companies renowned for innovation, such as Google and 3M, which tell employees to spend a certain percentage of time on creative work on their own initiatives without any guidance (Davila et al., 2007: 143), and in this way creating a balance of freedom and discipline. To support this aspect, specific seed funding is provided, and the individuals are encouraged to share and involve and become involved in each other's projects (Ahmed, 1998). People should be given room to grow, to try things and to learn from their mistakes (Leavy, 2005).

The balancing approach can also be seen at IBM's EBOs. Although they are largely exempt from the oversight processes and budgetary pressures facing IBM's mainstream businesses¹³, they are not without discipline and control. Review moments during the design process like design evaluations, market experiments, flesh out strategies, and performance measurement against milestones, ensure that plans are realistic and attainable (Garvin and Levesque, 2004). Freedom is

essential for innovation and the design of cutting-edge products, services, and technologies, while control is essential for keeping the vision manageable, the strategy coherent, and implementation on target (Garvin and Levesque, 2004).

4.3.2 BALANCED RESOURCES

Being a cost-conscious organization has among other things to do with the resource policy. Having too few resources may hinder innovation, but having too many could also be an obstacle (McLean, 2005). Too many may be a hindrance because employees with plenty of time and money to get results will lose their direction and motivation (Amabile, 1998; McLean, 2005; Bessant and Tidd, 2007: 61). The right balance is also important as too little resources will force employees to spend their time searching for other resources or they become too lean inhibiting innovation (Bessant and Tidd, 2007: 61). On the other hand, too much money does not lead to a positive effect on creativity (McLean, 2005; Jamrog et al., 2006). Bessant and Tidd (2007: 61) and Bell (1991: 21) argue that some amount of slack can function as a dynamic shock absorber when change and innovation is needed, as it allows scope for experimentation.

The EBO system of IBM encourages experimentation and creativity, while providing thoughtful oversight and strategic advice (Garvin and Levesque, 2004). It ensures that adequate resources are available, and that managers do not have to spend excessive time searching for funds. At the same time, the system does not ignore tangible, short-term results (internal structure). Businesses are not

¹³ This means a flexible authority structure with fewer levels in the hierarchy (Martins and Terblanche, 2003).

allowed to languish, nor are they given unlimited time frames. EBO leaders are tasked with meeting concrete, measurable milestones.

4.3.3 LACK OF PREDICTABILITY

The operational mindset found at many large companies, results in managers focusing primarily on disciplined execution, growth goals are secondary. The resulting mindset, a laser-like focus on operations, cost-cutting, and short-term financial performance, is inimical to the open-mindedness and flexibility required for new business creation (Gupta et al., 2006). In such settings, managers strive for tight control and error-free performance. They try to create a predictable environment of control, where the employees do as they are told. This neither encourages creativity or bold thinking, mavericks and rule-breakers are quickly weeded out (Gupta et al., 2006)

4.3.4 CONCLUSION

A need of balance between control and freedom is crucial for this dimension. As described above, too much control is found as a major obstacle for innovation, but too less control may also inhibit the development of innovations. According to the literature though, it still necessary to be on the 'easy going work discipline' side as this has a positive effect on the resource handling (not too much but certainly not too few) and the less-predictable behaviour of the employees (which is more likely to result in radical innovations). Derived from the above stated, the following proposition is made:

Proposition 3: a moderate easy going work discipline stimulates the development of radical innovations.

Again, the content of this dimension, internal structuring, resources, and the belonging level of predictability, is very often mentioned in the innovation literature. Although many authors argue that there should be an extreme loose work discipline, we think it is necessary to have some control as well. Nevertheless, the factors influencing this dimension will have a great impact on the degree to which it is allowed to be creative in an organization, the degree to which the employees are predictable. Concluding, we consider the importance of this dimension as high for the development of successful radical innovation.

4.4 DIMENSION 4: LOCAL VERSUS PROFESSIONAL FOCUS OF INTEREST

This dimension shows the difference between a local focus of interest and a professional focus of interest. It is about the distinction between OCs where employees derive their identity largely from their boss and/or organizational unit, and employees which identify themselves with their job or contents of their job. It also deals with the amount of social control and therefore to which degree it is allowed to be different from the internal norm. In a local focus of interest, the employees do not look far into the future, but assume that the organization does so for them. For a professional focus, the opposite applies and employees do have a future orientation

concerning their job.

4.4.1 IDENTIFICATION WITH JOB

Employees that define themselves by their technological speciality rather than by the organization they work for, see themselves as completely separate from the company at large and often the company at large views them as separate as well (Pfleger and Zetlin, 2006). This kind of specialization is often found in a professional OCs (Hofstede et al., 1990), and could potentially inhibit innovations (Ahmed, 1998). This is because high domain relevant skills may narrow the search heuristics to learnt routines and thereby may constraint fundamentally new perspectives (focus on depth only in a particular field or technology, not on width, meaning other fields or technologies). On the other hand, skills and knowledge in a particular field enhances the possibility of a new and deeper understanding (Ahmed, 1998), which is important for technical, radical innovation. Weggeman (2007: 230) also contributes to the distinction between a local versus a professional focus of interest. Most important for our research is that he argues that knowledge workers (as can be found in BIs) tend to prefer a professional focus of interest. A good way to deal with the balance of depth and width is to combine them by the use of teams as described by Christensen and Overdorf (2000) and in chapter 2 of this research. Weggeman (2007: 230) argues that extremes are rare in this dimension, with likely values between 60 and 80 (on the scale of 0 to 100, 0 having an extreme local focus of interest, 100 as the most professional focus of interest).

4.4.2 LOW SOCIAL CONTROL

If there is a strong social control, as is the case with a local focus of interest, it is not possible for the employees to go beyond what is normally accepted and everybody will behave more or less in the same way (ITIM, 2007). Group similarities, which can be the results of a strong social control, do comfort us because they seem to facilitate an easier work situation, although being short term and uncreative (Carayannis and Chanaron, 2007: 217). This will lead to very predictable behaviour and therefore inhibit radical innovations by thwarting creative behaviour and short term thinking. The opposite (professional focus of interest) guarantees long-term creativity because the employees are not forced to thinking 'the same'.

4.4.3 FUTURE ORIENTATION

In the literature, not much has been found giving an indication about the link between innovation and the future orientation of employees. Weggeman (2007: 231) gives some insight into this by stating that employees with a high professional focus of interest can be easily tempted to switch to another organization if given more freedom and better opportunities to use his/her expertise. The loyalty to the organization can thus be considered as low. This future orientation of employees with a professional focus of interest could thus possibly inhibit innovations, because key people may leave during the project.

4.4.4 CONCLUSION

Identification with the job implies a thorough technical knowledge which has been found to be necessary for the development of

radical innovations. Combined with a low social control, which allows going beyond what is normally accepted, and a future orientation, we argue that a medium professional focus of interest is most suitable for the development of radical innovation. Therefore the following proposition is adopted:

Proposition 4: a medium strong professional focus of interest stimulates the development of radical innovations.

This dimension measures to what extent it is allowed for an individual to deviate from the internal norm. Taken into account the references found in literature and the low emphasis on its importance, we argue that this dimension of OC is of medium importance for an innovative driven OC.

4.5 DIMENSION 5: OPEN SYSTEM VERSUS CLOSED SYSTEM

The fifth dimension is the distinction between a culture with a closed system and a culture with an open system. An important characteristic of a closed system is that people do not fit easily into the organization, which is in contrary to an open system, where people will fit easily into the organization.

4.5.1 ACCEPTANCE

If outsiders are coming into a community with new assumptions and they find the culture difficult to budge (an example of a closed system) it will decrease the innovative potential for the fact that they often will give up in frustration or find themselves ejected by the

organization as being too foreign in orientation (Schein, 1983)¹⁴. Carayannis and Chanaron (2007: 161) described this as liveliness, and it is about continuous organizational changes whereby deep-seated assumptions, goals, problem-solving approaches are questioned. It is argued that doing so will increase the creativity and thus innovation.

If there is an open system culture in place, it will stimulate diversity, because employees will welcome all newcomers and almost everybody will fit in the organization. Numerous authors have found that heterogeneous workforces are rich seedbeds for ideas, creativity, and innovation (Hauser, 1998; Anderson, 2003; Johansson, 2005; Bassett-Jones, 2005; Leavy, 2005; McLean, 2005; Jamrog et al., 2006; Bessant and Tidd, 2007: 66; Carayannis and Chanaron, 2007: 161), due to the fact that different perspectives (individuals with a range of abilities and interests¹⁵) will generate a diversity of creative solutions to a given problem.

A model example of a company that refused to collaborate with a team of people with a radical new innovative idea because of a closed system is IBM. In the early 80's, Bill Gates and his team showed their ideas about the future of software to the board of the directors of IBM (at that time a hardware company). One of the reasons why the so-called Gates' bunch

¹⁴ Schein (1983) argues that this scenario is especially plausible when the distinctive parts of the OC are based on biases that are not economically justifiable in the short run.

¹⁵ This is called bandwidth at Microsoft.

was refused was because they did not fit into the closed IBM organization. This OC was very formal while the Gates' bunch looked like a couple of hippies.

The highly innovative Xerox PARC can also be used as an example of how an open system could work for innovative initiatives. The easy fit within this special department allows employees to act and appear in the way they think is suitable, attracting a diversity of knowledge workers. Because of this, they have become notorious for long hair, beards, and working shoeless and shirtless (Burgelman et al, 2004: 672).

Anderson (2003) states that the last thing organizations should be doing is hiring for 'fit', bringing on board like-minded people who can get along with the rest of the team. Appointing people of diverse backgrounds should lead to richer ideas and processes that should stimulate creativity and innovation. This is because a constructive conflict will lead to improved information flows (Martins and Terblanche, 2003; McLean, 2005; Jamrog et al., 2006; Anderson, 2003).

Conflict, sometimes seen as a negative dimension, can actually have a positive effect on performance but only when there is open system in place (Bessant and Tidd, 2007: 62). This is necessary, because otherwise the consideration of more options and alternative strategies, thus avoiding groupthink, will degenerate into personal relationships of conflict and avoidance (Bessant and Tidd, 2007: 62). Too few conflict situations can result in individuals lacking any signs of motivation and disinterest in their task as meetings and

deadlines are more about 'tell' and not consensus (Bessant and Tidd, 2007: 63).

On the other hand, diversity is also a cause of misunderstanding, suspicion and conflict on the workplace that can result in absenteeism, poor quality, low morale and loss of competitiveness (Montes et al., 2003). Too much conflict can lead to individuals disliking each other and for this reason start holding back information, lying, exaggerating, etc. (Bessant and Tidd, 2007: 63). Therefore companies should pay attention to ensure social 'fit' beyond technical expertise (Ahmed, 1998). The conflict generated must be well managed to make sure such conflicts remain constructive (Jamrog et al, 2006). It is important to prevent emotion conflict, as this is generally energy-sapping and destructive as they create anxiety and hostility (Hauser, 1998; Bessant and Tidd, 2007: 62).

4.5.2 NON-SECRECACY

The last characteristic of this dimension is whether or not the organization and its members are closed and secretive. This could be due to of industrial espionage and/or confidential customer information. Chesbrough (2003) argues that indeed internal R&D and secrecy formed an effective entry barrier for competitors in many markets, but, as was explained before, the model of 'closed innovation' is not a standard anymore because of the growing amount of knowledge workers and private venture capitalists. Therefore the new concept of open innovation is adopted by many firms, which is an example of an open system, allowing them to commercialize external (as well as internal) ideas by deploying

outside (as well as in-house) pathways to the market.

An example can be seen at Xerox PARC where researchers developed numerous inventions which were not seen by Xerox as promising technologies¹⁶, with their main focus on high-speed copiers and printers. With an open innovation philosophy, these technologies could have been sold to firms interested in it. For example, they could have sold the concept of the Graphical User Interface to Apple or Microsoft or they could have made a spin-off. In the same way, new promising technologies can be acquired from other firms, which fit the buying company's long term strategy.

4.5.3 CONCLUSION

If people feel accepted by the organization, they will not swap their jobs as easily as people working in a closed system. Next to this, it will allow for the creation of a diverse workforce, thus creating a diverse knowledge base. When balanced to maintain a level of constructive conflict by using an open system structure (relationship conflict should be prevented), this can result in creative problem solving capabilities. The right balance of conflict will result in people behaving in a more mature manner with constructive debate. The open system approach is in line with the system of open innovation which leads, as described before, to an increased innovative potential. Therefore the following proposition is

formulated:

Proposition 5: a strong open system stimulates the development of radical innovations

The implications of a diverse workforce are large and therefore we consider the importance of this dimension as high. Not only because the characteristics of an open system are often cited in the relevant literature, but also because of the open innovation approach, which is described as an excellent choice for companies pursuing radical innovations. This dimension is likely to influence the speed of the innovation process, as a heterogeneous work force will be able to tackle problems in enhanced ways, avoiding group think behaviour.

4.6 DIMENSION 6: EMPLOYEE ORIENTED VERSUS JOB ORIENTED

A job oriented OC is only interested in the work people perform, while an employee oriented culture takes into account the personal problems of the employees and feels responsibility for the welfare of its employees, even if this results in less productivity.

4.6.1 CONCERN FOR PEOPLE

An example of an innovative employee orientation is demonstrated by the Starbucks Coffee Company, well known as a company that encourages innovation by taking responsibility of the welfare of their employees (e.g. health benefits). According to the top management of Starbucks, this has led to more innovations, because of the extreme low attrition level (Davila et al., 2007: 145). This

¹⁶ Ethernet and the Graphical User Interface (GUI) are examples of these.

organization believes that there is a direct link between the way the employees are treated and their innovativeness. To give an example, Starbuck's was the first organization in the United States to give comprehensive, health benefits and stock options to every employee, including part-timers.

In line with this, Davila et al. (2007) further argues that when people are in a positive mood, they tend to be more playful, engage in more divergent thinking, and be more integrative and flexible in terms of seeing connections between different kinds of stimuli. Thus according to Davila et al. (2007), an employee orientation will result in the fostering and promotion of creativity in the groups or teams within the organization.

Another way of supporting employees is by creating a suitable work environment for creating innovations (McLean, 2005). Although the direct link between the design of the physical space and creativity is unproven, work environments have become integral parts of innovation strategies (Haner, 2005). Reigle (2001) states that employees should have comfortable work areas with updated computer equipment. The physical environment of the workplace helps to stimulate new ideas (Jamrog et al., 2006). The availability of facilities, for example computers and Internet, are important resources for successful innovation (Martins and Terblanche, 2003).

Note that creating a suitable work environment can be seen as job and employee orientation, as providing employees with the newest equipment to get the job done is a clear example of job orientation, whereas creating a

comfortable work area can of course be seen as an employee orientation. In line with this, Bessant and Tidd (2007: 59) state that there is the need for a balance between the situation where subordinates feel supported and at the same time empowered.

When the employees feel that the organization has the best interest for their welfare in mind, they can act more open to take risks and put forth creative ideas (McLean, 2005). Some organizations have started with implementing family friendly policies designed to recruit and retain valued workers in tight labour markets (Akdere, 2006), which could help to attract suitable and talented people.

In practice, established organizations are implementing organizational 'innovation laboratories' which are dedicated facilities for encouraging creative behaviour and supporting innovative projects (Haner, 2005). Xerox PARC pays careful attention to the physical work environment of their employees (Burgelman et al, 2004: 671). It illustrates the success of an innovation laboratory for encouraging creativity and developing inventions by, among others, supporting the work environment.

4.6.2 EMPLOYEE HEALTH

The last characteristic relates to the amount of stress employees face in order to get the job done. Ideally, time is described as the amount of time people can use for developing and elaborating new ideas. Extreme workloads can be seen as an obstacle to creativity and the development of ideas (Carayannis and Chanaron, 2007: 162). This is confirmed by Ahmed (1998) who states that running too

much projects at the same time will overload individuals, and spread effort too thinly, thereby inhibiting innovation. Bell (1991: 21) also argues in line with this and states that the main reason for avoiding over scheduling is the increased risk of burnouts which can occur when employees work at a very high pace for several years. On the other hand, too much time could also be seen as an obstacle to innovation, as this will take away the challenge and thus creativity.

4.6.3 CONCLUSION

We argue that a firms who are able to find the balance between an employee and job orientation, will be able to attract and keep key people for the innovation process, because of the facilities offered, modern equipment and good working conditions. We therefore assume that this dimension should score near the middle in order to stimulate innovations, as an extreme job orientation will cause employees to leave or to be ineffective because of the strong work pressure experienced, and an extreme employee orientation will lack the challenge needed for radical innovations. Concluded, this proposition is adopted:

Proposition 6: a balance between a employee and job orientation stimulates the development of radical innovations.

Not many scholars have focussed on the characteristics of this dimension in relation with (radical) innovation. This does not imply that it is not important, but we argue that this dimension might be of less importance than the former dimensions discussed, although it can play a crucial role in attracting key personnel

and keeping them.

4.7 DIMENSION 7: ACCEPTANCE OF THE LEADERSHIP STYLE

Information concerning this dimension is confidential; therefore only the proposition is given.

Proposition 7: a medium high acceptance of the leadership style stimulates the development of radical innovations.

In the literature, there has been written much about the relationship between leadership (styles) and innovation. Conversely, there is not much known about the acceptance of the leadership style in relation to innovation. It is therefore that we cannot specify the relation and its implications for radical innovation in detail, although a rough estimation can be made following the proposed link between acceptance and style. Indeed, considering the information found, the actual leadership style seems to influence the acceptance of it. We argue that the acceptance of the leadership style is of medium importance for an innovative supportive OC, although we can only derive it of deductive reasoning instead of on illuminating examples.

4.8 DIMENSION 8: IDENTIFICATION WITH THE COMPANY AS A WHOLE

The last dimension deals with the (rarely described) link between the identification with the company, which is about the degree to which employees identify themselves with the organization as a whole, and innovativeness.

4.8.1 IDENTIFICATION WITH THE FIRM

Corporate identification and unity has been positively associated with innovation

(Ahmed, 1998), due to the sense of pride, ownership, and concern for the whole organization (McLean, 2005). It allows for a shared vision and common directions. In other words, they look to nurture besides technical abilities a sense of sharing and togetherness (Ahmed, 1998). If the right types of norms are held, and they are widely shared, then culture can activate creativity (Ahmed, 1998), because of the open communication, open access and intrinsic motivation, all stimulating (radical) innovations.

Nokia, a company known for his (incremental) innovations in the telecommunication industry, has this kind of community feeling, meaning trust in your colleagues, peers, and the people around you, which makes it possible to take pretty big risks (Leavy, 2005).

Bessant and Tidd (2007: 58) state that trust can make the decision making more efficient as it allows for positive assumptions and expectation to be made about competence, motives, and intentions. It can motivate employees to contribute, commit, and cooperate, by facilitating knowledge and resource sharing, and joint problem solving. When there is a lack of trust, people will hoard resources; this may also result in a lack of feedback on new ideas due to the fear of having concepts stolen. Too much trust is also not wishful; as resources at work will be spent on personal issues. More important, the lack of questioning each other, can lead to mistakes or less productive outcomes.

4.8.2 CONCLUSION

Not much is known about this dimension,

and what seems to be known, has no significant empirical proof. In spite of this, the reasons presented by Ahmed (1998) and McLean (2005), could hold truth, as indeed a high identification with the company can, logically seen, lead to intrinsic motivation (described to be positively related with innovations), because of the pride for the company. Leavy (2005) further argues that a positive identification with the company could potentially increase the trust levels in the company. As has been specified, when balanced properly, trust has a positive influence on the innovation process. Therefore the proposition is as follows:

Proposition 8: a high identification with the company stimulates the development of radical innovations.

The relationship between the identification with the company and (radical) innovation has been mentioned rarely in the relevant literature, making it difficult to draw sound theoretical conclusions for this dimension. The few sources available describe it either vague or relate it to the topic of intrinsic motivation (which has been described before) and trust. Although not unimportant, trust is something that does not necessarily have to follow from this specific dimension, hence, it can also be related with the leadership style, procedures, and/ or internal structuring. It is for these reasons that we argue that this dimension might only be of moderate importance for the development of radical innovations, although it can deliver enhanced trust and motivation.

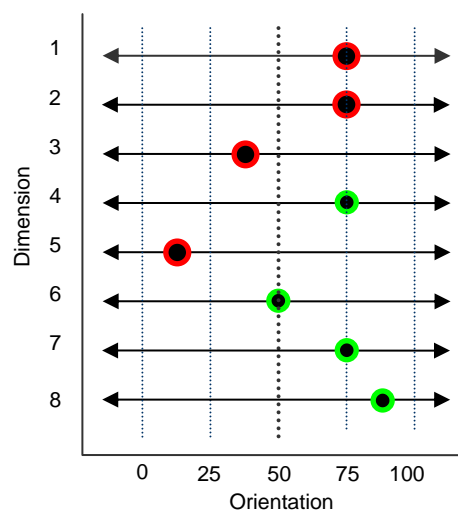
4.9 OC FRAMEWORK FOR THE DEVELOPMENT OF RADICAL INNOVATION

In this chapter, eight propositions have been formulated based on how an OC should be structured, according to the eight dimensions of Hofstede et al. (1990) and ITIM (2007), for the successful development of radical innovations. The results of this chapter are summarised in Figure 16 below. Clearly, balance and understanding of context are important (Ahmed, 1998), as has been argued at several dimensions. This is confirmed by the practical example of the EBO system of IBM which also has been designed to manage a series of competing balancing acts.

Note that the propositions have been transcribed into values in Figure 16, the key can be found in Table 4.

0 = extreme	37,5 = moderate	75 = medium
12,5 = high	50 = balance	87,5 = high
25 = medium	62,5 = moderate	100 = extreme

Table 4: Propositions transcribed into values.



- 1 – Means versus Goal oriented.
- 2 – Internally versus Externally driven.
- 3 – Loose versus Tight discipline.
- 4 – Local versus Professional.
- 5 – Open versus Closed systems.
- 6 – People versus Work oriented.
- 7 – Low or High acceptance of leadership style.
- 8 – Low or High identification with the organization.

Figure 16: Summary of the propositions about the eight dimensions.

Although these eight dimensions together form the total OC, some dimensions are of higher importance than other dimensions in explaining the ability of firms for developing radical innovations. In the former sections we briefly argued about the importance of each dimension for developing successful radical innovation. Figure 16 gives, besides an overview of the results, also the importance (big dot implies more important) for the development of radical innovations.

So, based on our literature review, we can assume that the ideal innovative performance OC is mainly characterized by a medium strong goal orientation, a medium strong externally driven customer orientation, a moderate easy going work discipline, and strong open systems. Following the found literature, we labelled these four dimensions as the most important ones. Indeed, some dimensions are expected to

posses a greater explanatory power for innovative performance than others. Hostede (1980: 465) described that making a choice between different dimensions is normal and labelled it as conceptual parsimony.

Next to this, the need to carefully balance the characteristics of the different dimensions is of crucial importance as has been described in the different sections. This goes especially for the four most important dimensions, but certainly also for the four less important dimensions.

Part II: Data Collection and Analysis

“It is common sense to take a method and try it. If it fails, admit it frankly and try another. But above all, try something.”

Franklin D. Roosevelt (1882 - 1945)

5 METHODOLOGY

Section 6.1 will describe the chosen research strategy, meaning whether to use experiments, surveys, case studies, or other methods of investigation. Hereafter, a selection is going to be made in section 6.2 of the target population, and how the sample will be measured, e.g., quantitative, qualitative, or a combination. Then section 6.3 follows giving insight into the applied theories about reliability. The operational definitions will be discussed in section 6.4 of the two main variables, OC and positioning the new ventures. The next section, 6.5, will describe the methods of analysis applied for this research, the within-case and cross-case analyses. Hereafter, the topic of validity will be discussed in section 6.6. Section 6.7 then focuses on the controls used to safeguard the validity, both internal as external. The last section, 6.8, presents a graphical summary of the methodology for this research.

Methodology in essence is the study of methods that can be applied within a research. It outlines particular proven methods, procedures, and techniques to collect and analyse data concerning a research topic.

The development of theory, as done in the former chapters, is a central activity in organizational research (Eisenhardt, 1989). The next step however, is to test the developed propositions in an empirical way, as this can greatly improve the confidence of the theoretical findings. A structured approach is important as the careful preparation of the

research setting, specification of the measurement instruments, and replications will reduce threats to validity (Graziano and Raulin, 2004: 194). According to Dul and Hak (2008: 13), the first step to take in the methodological part of a research, and what the following section will describe, is to choose the research strategy.

5.1 RESEARCH STRATEGY

Our research strategy here is to compare the findings from the literature, concerning the most optimal OC in the early phases of business incubation, with the findings from the case companies. Although this will give no statistical significant results, it could give reasons for statistical research into the relationship between OC and innovativeness.

Appendix C: Statistical Conditions, is devoted to how the research should be performed if the relationship between OC and innovative performance would have been researched in a more statistical manner (as this was the original approach of this research¹⁷).

Comparing OCs instead of testing a possible relationship between OC and innovative performance brings along the assumption that BIs in general are innovative, as otherwise comparing the propositions with the empirical findings would make no sense. On the other hand, the empirical findings could also be used for making suggestions to the case

¹⁷ Data gathering problems and time constraints forced us to take a different approach. Therefore we chose to compare the literature with the OCs of the BIs at the early stages of the innovation process.

companies for improvements to the OC of their BIs. This indeed implies two ways of looking at the results: (1) Comparing the literature with the empirical findings and thereby adjusting the propositions (Chapter 7 Results and Discussion). (2) Comparing the literature with the empirical findings and making recommendations for the case companies concerning the most optimal OC (Chapter 9 Managerial implications).

Dul and Hak (2008: 175) make the distinction between two research strategies: Theory building research and theory testing research. Theory building research is appropriate when there cannot be relied on previous literature or prior empirical evidence (Eisenhardt, 1989). Although there is no abundance of literature about the relationship between OC and innovativeness, there has been published about the individual variables and even some about the relationship, making theory building research unsuitable for this study. Subsequently, theory testing can be divided into initial theory testing research, and replication studies. Indeed, initial theory testing research would be appropriate for this type of research, although some studies yielded some insight; there is no extensive body of information available at this moment. The objective of this study is therefore to contribute to the development of theory regarding organizational cultures' effect on radical innovation in the business incubator setting, by testing the propositions, which specify the relation between the concept of OC and innovation in the early stages of the BI's innovation process. These propositions, the

results from chapter 4, are listed in Table 5. Note that relying on theoretical propositions to guide the design and data collection for case studies is the most common and advised strategy according to Yin (1994: 103).

Proposition 1	A medium strong goal orientation will stimulate the development of radical innovations.
Proposition 2	A medium strong externally driven customer orientation stimulates the development of radical innovations.
Proposition 3	A moderate easy going work discipline stimulates the development of radical innovations.
Proposition 4	A medium strong professional focus of interest stimulates the development of radical innovations
Proposition 5	A strong open system stimulates the development of radical innovations
Proposition 6	A balance between a people and work orientation stimulates the development of radical innovations.
Proposition 7	A medium high acceptance of the leadership style stimulates the development of radical innovations.
Proposition 8	A high identification with the company stimulates the development of radical innovations.

Table 5: Propositions to be tested for this research.

Researches often combine multiple data collection methods as it provides a stronger substantiation of the constructs¹⁸ and propositions (Eisenhardt, 1989). This is part of a control called triangulation¹⁹ (Eisenhardt,

¹⁸ Constructs are abstractions that help the rise above the messy details to understand the essence of what the phenomena are and how they operate (Christensen, 2006).

¹⁹ Triangulation consists not only of combining multiple data collection methods, but also includes gathering data from several sources, and utilizing multiple investigators. More information will follow in section 5.7.

The original derivation of the concept is that a point in geometric space may be established by specifying the intersection of three vectors, not more, not less (Yin, 2003:

1989, Onweugbuzie and Leech, 2007). In this way it becomes possible to combine quantitative with qualitative evidence, which is often considered more compelling and the results of the study become more robust (Yin, 1994: 45). Qualitative data (interviews, observations) are helpful for understanding the rationale or underlying relationships which are revealed in the quantitative data (archives, questionnaires), meaning for understanding why or why not relationships hold. Indeed, Qualitative approaches alone may be limited in their ability to contribute towards proposition testing, while quantitative measures alone may give 'superficial' results (Lim, 1995). Given the respective shortcomings of employing purely quantitative or qualitative methods, the best option for this research would be to combine the survey and case study method for this research. Combining the two methods is also crucial for the establishment of internal validity (Eisenhardt, 1989), as will be discussed later on.

Case studies should be either longitudinal and/or comparative. Note that a longitudinal case study has some advantages over the comparative case study like the allowance for multiple tests over time of the propositions within the same case. However, for most research, the latter is not a feasible option because of the limited time frames usually available. Therefore a comparative case study should be conducted. In the comparative case

study, two or more instances are selected with different values of the independent concept, OC (Dul and Hak, 2008: 81).

Deciding upon the best ways to conduct the research is critical, but as important is to determine which participants to observe. The more representative the sample, the more confidence we can have in the findings (Graziano and Raulin, 2004: 138).

5.2 POPULATION AND SAMPLE

According to Eisenhardt (1989), one of the most important things to consider is the selection of cases, as it controls for external variables and helps to define the limits for generalization of the findings. The domain of interest is the high-tech industry because this sector is known for their rapid rate of product innovations and thus also their dependence on innovations (Reigle, 2001). Especially in high-tech industries, businesses face environments that are poorly defined and ambiguous (Garvin and Levesque, 2004). Therefore, as explained in chapter 2, many large high tech firms are making use of corporate entrepreneurship in order to develop radical innovations. The population of the research is therefore BIs in the high-tech industry, the tool to operationalize corporate entrepreneurship in existing firms. Furthermore, all the researched BIs should be in the early stages of their innovation process thus allowing for comparison. From this population, several samples will be researched. A graphical representation can be seen in Figure 17.

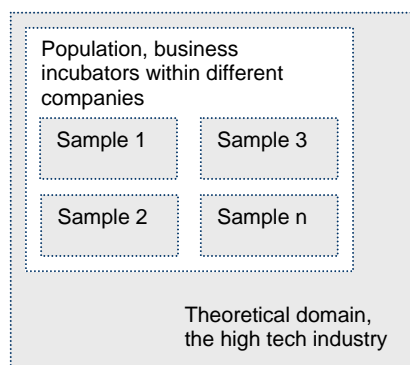


Figure 17: Theoretical domain, population, and samples.

Companies in the high tech industry using BIs often share the following characteristics²⁰: (1) Concerns large multinational companies which are making use of corporate entrepreneurship. (2) A large budget is available for R&D operations. Inventions are then subsequently transformed into innovations using BIs. (3) There are many competitors, both domestic and international. (4) Typically using the concept of open innovation. (5) They are moving in the fast changing high-tech sector, serving several different markets. (6) Typically, employee's possess a high level of education, knowledge workers. (7) They have existed for an extended period of time, successfully proving their ability to cope with creative destruction.

Companies which suffice to this selection criteria are Philips and DSM. These two large Dutch multinationals are known for their innovativeness and are both using BIs (corporate entrepreneurship) for their radical innovations. Also, both companies have shown

to be able to survive for an extended period of time; over 100 years. An interesting difference between the two companies is that Philips is mainly business-to-consumer and DSM mainly business-to-business. Philips and DSM have both agreed to cooperate with this research by allowing investigations to three of their BIs each.

The selection of cases in this research follows the replication logic and not a random sampling one. This implies that the cases were selected for the reason that they claimed to have positive outcomes beforehand (Yin, 2003: 110). Case study researchers should make use of on beforehand selected samples (direct replications) based on the theory, that are likely to confirm and replicate the emergent theory for the selected sample (Eisenhardt, 1989; Yin, 2003: 110; Onwuegbuzie and Leech, 2007). On the other hand, according to Graziano and Raulin (2004: 163), we should make use of random sampling in order to be able to generalize to a larger population. Nevertheless, our aim is to generalize only within the characteristics as described above, and not to a larger universe, for which random sampling would be necessary (Yin, 2003: 110). Indeed, meaning, rather than frequency of occurrence, is of relevance (Lim, 1995). Therefore the replication strategy is chosen. Successful replications which confirm emergent theories enhance confidence in the validity of the propositions (Eisenhardt, 1989). Next to that, the development of consistent findings, over multiple cases, can be considered to be more robust (Yin, 2003: 110).

Hofstede (1980: 463) agrees with this

²⁰ These characteristics also define the limits for generalization.

logic, although described for national culture, he states that research should be done only on matched samples. He argues that the samples should be similar in all respects except (organizational) culture as the scores of (organizational) culture are affected by factors as education level, genders, and ages. So our aim was to find samples that are more or less similar except for the OC. Table 6 shows a summary of the selected sample.

Firm	Business Area (location)	Business Incubator	Head-count
Philips	Lifestyle (Eindhoven)	Care Servant	12
Philips	Lifestyle (Eindhoven)	New Wellness Solution	10
Philips	Lifestyle (Eindhoven)	Skin Imaging	21
DSM	White Biotechnology (Delft)	White Biotechnology	17
DSM	Biomedical (Geleen)	Biomedical	10
DSM	Personalized Nutrition (Geleen)	Personalized Nutrition	9

Table 6: Sample selection.

An interesting difference is that at Philips, the BI's are chosen from the same business area and at DSM, the three business incubators are chosen from different business areas. The former allows for more consistent scores on OC (located in the same building, same floor, so sharing more or less the same OSC), and thus more significant results. The latter allows for finding more discriminating values for OC (located in different buildings and two even in different cities), as should be the case with a comparative case study into culture (Hofstede, 1980: 463). Indeed, as is stated by

Onwuegbuzie and Leech (2007), the replications of findings from other groups, times, settings, or context, increase the confidence about the underlying findings and, consequently, the evidence of legitimating.

5.2.1 PHILIPS

Founded in 1891 by Gerard Philips in Eindhoven (The Netherlands), its first products were light bulbs and other electro technical equipment. From 2008 and onwards, Royal Philips Electronics was divided into three divisions: Philips Healthcare, Philips Lighting, and Philips Consumer Lifestyle (merger of Philips Consumer Electronics and Philips Domestic Appliances and Personal Care). It has grown to become one of the world's largest electronic companies and Europe's largest, with sales of 27 billion euro's annually. Philips currently employs around 128.100 people in over 60 countries. It has market leadership positions in medical diagnostic imaging and patient monitoring, colour television sets, electric shavers, lighting, and silicon system solutions. It has an annual R&D budget (2006) of approximately 1.668 million euros (6.2% of the total revenues) and has about 2100 R&D employees. One of the main sites for R&D and business incubation, the Philips High Tech Campus, is located in Eindhoven (the Netherlands).

Innovations outside the business scope of the existing divisions are handled separately by business incubators (not to be confused with the BIs as described in chapter 2), which are coordinated by Philips Applied Technologies (Apptech). This is the centre for new product development and innovation within Philips.

Currently, Philips is specializing on Healthcare, Lifestyle, and Technology. The incubators identify new growth opportunities for Philips and to turn them into new businesses, called New Ventures. New markets are created by using value propositions that can be sourced internally (Philips research), or externally. Through this strategic building up of emerging business areas, Philips creates early access to new fields of value creation (Elst et al., 2004; Philips, 2006; Philips, 2007).

5.2.2 DSM

DSM has its headquarters in the Netherlands, was founded in 1902, and started out in the mining industry. Since then it has evolved into a large multinational active in life science and nutritional products, performance materials, and industrial chemicals. It has annual sales of approximately 8 billion euro's and employs around 22.000 people in 49 countries. DSM ranks among the global leaders in many of its fields. It has an annual R&D budget of approximately 300 million euro's (3.8% of the revenues) and about 2150 R&D employees. Two of their main R&D and business incubation sites are located in the Netherlands, in the cities of Delft and Geleen.

In 2006, DSM founded the Innovation Centre. The DSM innovation Centre contains several business units: an Innovation Office, Corporate Technology, Intellectual Property, Licensing and Venturing, four Emerging Business Areas (EBA), and Base of the Pyramid Activities. DSM's BIs, not to be confused with the BIs as described in chapter 2, are focused on maximizing value for the EBAs. Besides that, BIs also develop new EBAs with

services in the area of collecting market and company information. DSM has selected four EBAs where a good match is evident between long-term societal and technological trends and DSM's capabilities and market strongholds. These four EBA's are the Biomedical EBA, the White Biotechnology EBA, the Personalized Nutrition EBA, and the Specialty Packaging EBA. While the commercialization of these EBAs will take several years, DSM is already creating value in the initial phases, especially by building strong intellectual property positions, as these build the foundation for fully capturing value later on. In 2006, the four selected EBAs were staffed and their scope was defined, narrowing down the collection of innovation-related ideas to a company portfolio of projects and a proper, actionable pipeline strategy (Meijer, 2006; DSM, 2007).

Figure 18 gives a comparison between the two companies and their ways to organize for corporate entrepreneurship.

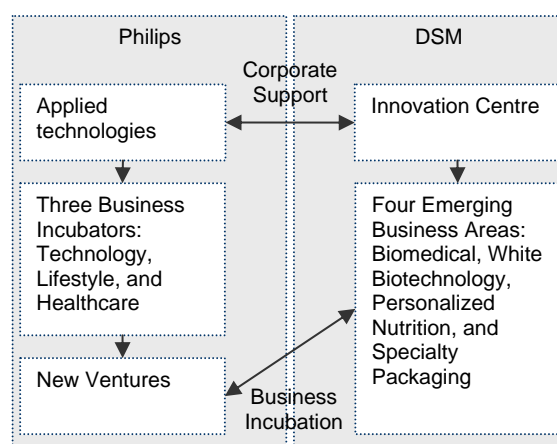


Figure 18: Corporate Entrepreneurship within Philips and DSM compared.

Note that from now on, in order to avoid confusion, we will use the term new venture (NV) to describe business incubator (BI) as was described in chapter 2.

5.3 RELIABILITY

Besides the selection of cases, reliable measures are critical in research as, if the measures are not reliable, the study cannot produce useful information (Graziano and Raulin, 2004: 89). Reliability is about the consistency of the results, regardless of who performs the actual measurement. More specific, it is an assessment to the degree of consistency between multiple measurements. A problem with quantitative replication studies in OC is that the reliability of the measurement cannot be checked in the usual way (Hofstede, 1980: 463). Indeed, as this research is not comparing individuals, but comparing OC, normal reliability calculations (such as Cronbach's alpha²¹) are not applicable. This would imply a reverse ecological fallacy (Hofstede, 1980: 463). Cultures, whether national or organizational, are no king-size personality; they are formed through the complex interactions of personalities, both conflicting and complementary, which create a whole that is more than the sum of its parts (Hofstede, 1980: 463). To test the reliability of the data in a statistical way, the analysis has to be performed across the NVs, and to do this, data is required from at least 10 or more NVs. Hofstede (1980: 463) argues that without this data, there is no way for testing the reliability in a statistical way.

The best proof of the reliability of the

dimensions is to rely on the theoretical propositions and their fit with the found data. If the measures are reliable, they not necessarily have to be valid. On the other hand, if the measures are valid, they have to be reliable, meaning that if validity is proven, reliability follows (Hofstede, 1980: 463). This is illustrated in Figure 19. Validity will be discussed in chapter 5.6.

		Validity	
		Absent	Present
Reliability	Present	X	X
	Absent	X	

Figure 19: Validity and Reliability.

A last way to check for the reliability of qualitative results is the inter-rater reliability test (Graziano and Raulin, 2004: 88). It should be used when the measure is based upon judgement or rating. This method can thus be used for the judgement of the interviews. This could act as a useful tool for measuring the innovative performance in later studies.

An important contributing factor to the reliability of a study is the precision and clarity of the operational definitions, and the care to which the researchers follow them (Graziano and Raulin, 2004: 89). Therefore, the next section is devoted to the operational definitions.

²¹ Cronbach's alpha is a reliability measure that ranges from 0 to 1. Values of .60 are the acceptable lower limit for exploratory research (Hair et al., 2005: 137).

5.4 OPERATIONAL DEFINITIONS

As argued, the two main constructs, OC and the positioning of the NVs in the innovation process have been described to some extent in the literature²². The adopted theoretical approaches in this research allow for the usage of existing methods for measuring the two constructs in practice. A priori specification of the constructs is important because it permits to measure the constructs more accurately (Eisenhardt, 1989). Therefore in this paragraph, multiple indicators will be described that together shape the constructs. This is very important in order to achieve construct validity (Eisenhardt, 1989). In this section, the concepts of OC and the positioning of the of NVs in the innovation process will be described in terms of actual procedures allowing for measurement.

5.4.1 ORGANIZATIONAL CULTURE

The OC has to be measured in order to compare it with the developed theory. In their review, Higgins and McAllaster (2002), state that an innovative supportive culture remains an intricate and amorphous phenomenon. This is confirmed by Detert et al. (2000) who argue that the accumulation of theories of culture is very complex, which is not improved by the dearth of corresponding empirical research. Scepticism exists about whether OC can ever be 'measured' in a way that allows one organization to be compared with another

(Ahmed, 1998). As outlined above, we take the position of Hofstede (2000) who argues that change in an OC demands changes in the perceptions of daily practices. So, although difficult to measure, practices are measurable through the dimensions outlined.

It would be impossible to develop a reliable measurement instrument for OC with the limited resources available for this study. This would imply developing new questions, which are the equivalent to the questions as developed by Hofstede et al. (1990) and ITIM (2007). Although this is still quite possible, the problem is that the validity has to be proven before one can draw any conclusions from the responses (Hofstede, 1980: 464). In order to judge the validity of the newly developed questionnaire, it has to be tested on a big sample and show significant correlations with the existing questions. Indeed, we are not interested in re-inventing the wheel, and thus this goes beyond the scope of this research.

For this reason, the consultancy firm ITIM agreed to cooperate with us concerning the measurement of OC in a quantitative way. ITIM is a company specialised in measuring OCs, and built its expertise upon the principles of Hofstede et al. (1990). The company has agreed to measure the OC for the six NVs of our study. Their extended experience (since 1985) and cooperation with Hofstede, ensures the most valid and reliable measurement available at the moment of writing. It also ensures that the dimensions align perfectly to the ones used in this research (same eight dimensions), resulting in a higher construct validity for OC as will be described later on.

²² The operational definition for innovative performance can be found in Appendix E: The relation between innovative performance and organizational culture.

Note that questionnaires have the tendency to measure only employee attitudes instead of the OC (Hofstede, 1998:a). It is said by many scholars of culture and OC that it is too much a product of the scientist's view rather than the participants' view and therefore also inappropriate (Hofstede, 1998:a). This is partially solved because we are using the correct questions differentiating between the different dimensions on which OC is built.

Most attempts to measure OC have been performed by using case studies, often involving participant observation (Hofstede, 1998:a). Although these case studies can provide profound insight, they are subject to biases because of the subjectivity of the researchers and therefore not complete reliable. The proposed research strategy is in line with Hofstede (1998:a) and McLean (2005) who suggest using quantitative and qualitative data as a prudent middle way. In this way, the advantage of a questionnaire, which allows for the collection of samples from all members, can be combined with the more in-depth possibilities of a case study.

The case study, consisting of six interviews with the team leaders²³ of the six NVs serve the goal of: (1) Confirming the data found in the questionnaire and (2) additional questions for theory building.

For goal 1: (a) First the eight dimensions

were addressed and the opinion about the values asked. Next the following questions were answered: (b) What do you think about the difference between your opinion and the general opinion of the group? (c) What is the cause of the difference of opinion?

Then for goal 2: (d) Could you give some examples of practices for the different dimensions? (e) Which dimensions do you think are the most important? (f) Do you think that there is a relationship between the dimensions? (g) What are the best practices of your new venture? (h) Which practices could improve the innovative performance of the new venture? These answers gave valuable insight in the (perceived) practices.

5.4.2 POSITIONING THE NEW VENTURES

As described in chapter 4, the positioning of the NVs is going to be determined by using the BMD as guideline. The twelve dimensions of the BMD are divided into 4 quadrants as depicted in Table 2: (1) Finance/Control, (2) People, (3) Marketing/Sales, and (4) Product/Technology.

Suitable general questions regarding the positioning of the NVs were formulated to discover how the NVs performance on each of the twelve dimensions, and derived from that, in which stage of the BMD they could be placed. So questions asked should address these four quadrants and are derived from Bell (1991). Next to this, the NV directors themselves are fully aware of their current place in the innovation process. So also their personal opinion should be considered.

Examples of questions that could be asked are: (1) Does the board include members who

²³ Note that it is impossible, due to time constraints, to re-measure the OC in a qualitative way, as for this would imply interviewing all the people working for the six different incubators.

have appropriate operational experience related to product and market development? (2) Does the plan refer to a detailed plan for the next stage of the start-up, including a list of objectives, a schedule with milestones, and allocations of the required financial and human resources? (3) When the company starts up, is its valuation in line with reality as compared to similar endeavours? (4) Does the product continue to show a minimum of a one-year product lead?

Additionally, at Philips, the results are to be confirmed by the Senior Director New Business Development Support, the person responsible for allowing NVs to different phases. At DSM, the Director Innovation Program (responsible for allowing NVs to different phases) was involved in the selection procedure for our sample and was informed by our wishes to investigate NVs in their early phases.

As described earlier, both DSM as Philips are making use of rules based on milestones in order to assess whether or not a specific NVs should advance to a next phase. As Table 7 below demonstrates, all the phases are quite similar, with the only difference that the BMD method splits the first phase into two. Note that Philips has adapted the BMD slightly to serve their particular needs. This allows us to compare the different NVs by placing them into the phases as described by the BMD.

BMD	Philips	DSM	IBM
1 - Concept	Pre-seed	Feasibility	Exploration
2- Seed	Seed	Feasibility	Exploration
3 - Product Development	Beta (Product Development)	Development	Validation
4 - Market Development	Alpha (Market Development)	Scale up	Scale up
5 - The Steady State	The Steady State	Commercialization	Institutionalization

Table 7: Comparing the stages.

5.5 DATA ANALYSIS

At the very heart of research lies the ability to analyze data, but it is also one of the most difficult and least codified parts of the research process (Eisenhardt, 1989). Therefore Eisenhardt (1989) makes the suggestion that case study researchers should make use of within-case analysis, and cross-case patterns.

5.5.1 WITHIN-CASE ANALYSIS

Within-case analysis is basically about comparing your data against the theory you are using (Miles and Huberman, 1994: 91). When comparing the data to the developed theory, the scope of reference (Yin, 1994), the data will either fit (verify) or not fit (falsify) the theory. Critically comparing the findings with the existent literature can provide valuable insight. Tying the emergent theory to the existing literature enhances the internal validity, generalizability, and theoretical level of the theory (Eisenhardt, 1989). The method typically involves detailed write-ups for each site of analysis. They are often simple pure descriptions, but are central to the generation of insight as they help, early in the analysis process, to cope with the often enormous

volumes of data. The method is thus used to get familiar with the data and allows for preliminary theory generation (Eisenhardt, 1989). By summarizing and comparing, the method also serves as a data reduction tool which helps to sharpen, sort, focus, discard, and organize the data, allowing for better conclusions to be drawn (Miles and Huberman, 1994: 91). However, there is no set standard to conduct this type of analysis. Important is to get familiar with each case as a stand-alone entity, which will help to accelerate the cross-case comparison (Eisenhardt, 1989).

5.5.2 CROSS-CASE ANALYSIS

Linked to the within-analysis is the cross-case analysis. In general the idea behind cross-case analysis is to look beyond the initial impressions found in the within-case analysis, meaning that cross-case analysis is about comparing data in one case to data in other cases, as if it were an independent study (Miles and Huberman, 1994: 172; Yin, 2003: 145). Using only within-case analysis holds the danger that investigators reach premature or even false conclusions as a result of information processing biases (Eisenhardt, 1989). To counteract these biases, the data should be examined from many divergent ways, as it will force investigators to look beyond initial impressions and see evidence through multiple lenses. Contrasting and comparing findings from different locations can be very enlightening and, as said before, it allows for a greater confidence in the findings (Eisenhardt, 1989).

Eisenhardt (1989) described three tactics to achieve this: (1) Select categories or

dimensions and look for within-group similarities coupled with intergroup differences. (2) Select pairs of cases and list the similarities and differences between each pair. This juxtapositioning of seemingly similar cases can break simplistic frames. (3) Divide the data by the data source, meaning that different researchers work with different data sets. When a pattern from one data source is confirmed by another one, the finding is stronger and better grounded.

Most findings will have exceptions, also known as outliers. According to Onwuegbuzie and Leech (2007), it is important to consider the meaning of these outliers if they are existent, as they can provide value insight and strengthen the conclusions.

5.5.3 DATA DISPLAY

Data display is an important activity which concerns taking the reduced data and displaying it in an organized, compressed way so that conclusions can be more easily drawn (Miles and Huberman, 1994: 245). These authors state that humans are not able to process extended texts. Large amounts of information can overload humans (Miles et al., 1994: 11). It is also stated that good graphical representations are a major avenue to valid qualitative analysis (Miles et al., 1994: 11).

5.6 VALIDITY

A major concern in scientific research is the validity of the procedures and conclusions. Validity refers to the methodological soundness of the research, which is of concern at all levels of constraint (Graziano and Raulin, 2004: 181), and in all the three major stages of research:

research design and collection, data analysis, and data interpretation (Onwuegbuzie and Leech, 2007). Many factors could affect the outcome of a research; some of these are likely to be threats to the validity of the experiment. Therefore, two of the major tasks of a researcher are to anticipate potential threats to the validity (this section), and create controls to eliminate or reduce them (the next section). There are many types of threats to validity, but they can be divided into two main types, namely internal validity and external validity (Onwuegbuzie and Leech, 2007). The most important threats, characterizing internal as external validity will be described below.

5.6.1 INTERNAL VALIDITY

According to Onwuegbuzie and Leech (2007), internal validity can be defined as the truth value, applicability, consistency, neutrality, dependability, and/or credibility of interpretations and conclusions within the underlying setting or group²⁴. The major threats to the internal validity of this research are: (1) descriptive validity, (2) theoretical validity, (3) observational bias, and (4) researchers' bias (Onwuegbuzie and Leech, 2007).

²⁴ For a study into the relation of OC and innovative performance the following definition could be used. Internal validity is of great concern for the experimenter because it involves the very heart of the experimental goal, namely the demonstration of causality (Graziano and Raulin, 2004: 183). In an experiment, internal validity concerns the question: "Was the independent variable, and not an extraneous variable, responsible for the observed changes in the dependent variable?" An experiment is internally valid when we can conclude with confidence that it was due to the independent variable (OC), which brought about the observed changes in the dependent variable (innovative performance). Any factors that reduce that confidence are threats to the internal validity of the study.

(1) Descriptive validity concerns the factual accuracy of the researched variable as documented by the researcher during the case studies. In this study, we made use of a questionnaire proven valid. In the case of the interviews, used to verify the results of OC and to determine the position of the NV in the innovation process, there is a possibility that the descriptive validity is threatened. (2) Theoretical validity refers to the degree to which the developed theoretical explanation fits the empirical data, and thus is a credible, trustworthy, and defensible theory. Extraneous variables, which threaten the internal validity by allowing alternative explanations of results, are potential confounding variables, threatening this validity (Graziano and Raulin, 2004: 167). Note that this closely related to the notion of construct validity. Construct validity refers to how well the study's results support the theory or variables behind the research and asks if the theory that is supported by the findings provides the best available explanation of the results (Graziano and Raulin, 2004). This thus overlaps with theoretical validity as described by Onwuegbuzie and Leech (2007). Control for these types of validity is crucial for the establishment of internal validity (Eisenhardt, 1989). (3) Observational bias occurs when the data collectors have obtained insufficient data from the study's participants. This is prone to happen when there is no persistent observation or prolonged engagement (Onwuegbuzie and Leech, 2007). (4) Researchers' bias occurs when the researcher has personal biases or a priori assumptions that he/she is unable to bracket. It becomes a bias when the researchers

transfer these assumptions to the participants in such a way that it affects their behaviour, attitude, or experience. For this study, there could be researchers' bias during the interviews as the results of the survey were already known before the start of the interviews.

5.6.2 EXTERNAL VALIDITY

External validity refers to the degree to which we are able to generalize the results of the research to other participants, conditions, times, and places (Graziano and Raulin, 2004: 182). It concerns the question: "Are the results obtained from the sample of the population also true for the population". Onwuegbuzie and Leech (2007) defined it as the degree to which the findings of a study can be generalized across different populations of persons, settings, contexts, and times. The results of this study are generalizable to other new ventures of companies that share the same characteristics as outlined before. This can be said because most of the people within the NVs filled out the survey and six NVs within two companies took part in this research. More information will follow in section 5.7.5. The two major threats to the external validity for this research are: (1) interpretive validity and (2) researchers' bias (Onwuegbuzie and Leech, 2007).

(1) Interpretive validity concerns the extent to which a researchers' interpretation represents an understanding of the perspective of the group under study, and the meaning attached to their words and actions. (2) Researchers' bias, as described above, can be a bias for the external validity because this particular type of bias of the researchers may be so unique that it makes interpretations of the

data ungeneralizable.

Threats to external validity are best controlled by having an adequate, representative sample of participants (Graziano and Raulin, 2004: 182), indeed as described in section 5.2, but more controls, for both internal as external validity, will be described next.

5.7 CONTROLS TO REDUCE THREATS TO VALIDITY

Although there is not a set standard which guarantees to yield valid data or trustworthy conclusions, there are some practices for ruling out rival interpretations of data. Onwuegbuzie and Leech (2007) described 24 strategies after an extensive literature study. Table 8 shows which controls are applicable for which threat in this research.

	Threat	Main control
Internal Validity	Descriptive validity	Triangulation
	Theoretical validity/ Construct validity	Triangulation; Peer debriefing
	Observational bias	Persistent observation
	Researchers' bias	Persistent observation; Triangulation
External Validity	Interpretive validity	Triangulation; Member checking; Peer debriefing
	Researcher's bias	Triangulation; Persistent observation
	Generalizability	Triangulation; Persistent observation

Table 8: Threats and Controls.

5.7.1 TRIANGULATION

As discussed before, we are going to make use of triangulation, which involves making use of different: (1) investigators, (2) sources, and (3) data collection methods to obtain corroborating evidence. This will reduce

the possibility of chance associations as well as biases following from using only one specific method (Yin, 1994; Onwuegbuzie and Leech, 2007). If all sources point to the same answer, the researcher has successfully triangulated the data (Yin, 2003: 83). It then allows for greater confidence in any interpretations made²⁵. (1) This research is using multiple investigators, which is a common practice to reduce threats to validity of case studies (Graziano and Raulin, 2004: 199). The use of multiple investigators brings two key advantages (Eisenhardt, 1989): (a) it will enhance the creative potential of the study because of complementary insights and different perspectives. Convergent and conflicting perceptions add to the empirical grounding of the propositions. Indeed, like was described in chapter 4 for dimension 5, diversity and conflict. (b) It can enhance the confidence in the findings (increased validity). Data obtained by multiple observers can be compared and a shared agreement reached²⁶. Concluding, the use of multiple investigators reduces threats to the descriptive validity and interpretive validity.

A suitable way of taking advantage of multiple investigators is to assign individuals in the research team with individual roles, as it

²⁵ Onwuegbuzie and Leech (2007) stated the following list of advantages: (a) it permits the researchers to be more certain of their findings, (b) it enhances the development of enterprising ways of collecting data, (c) it can unravel contradictions, (d) it can lead to thicker, richer data, (e) it can lead to the fusion of theories, (f) by virtue of its extensiveness, it may serve as the litmus test for competing theories.

²⁶ There can also be made use of inter-rater reliability coefficients or an index of percentage agreement (Graziano and Raulin, 2004: 199).

will enhance the likelihood of having the investigators view cases in divergent ways (Eisenhardt, 1989). The way this was performed for this research, and as described by Eisenhardt (1989), was that one researcher handled the interview questions, while the other recorded notes and observations. The interviewer had the perspective of personal interaction with the informant, while the note-taker had a more distant perspective.

(2) This research investigated six different NVs from two different companies, implying that the data is coming from different sources. These different sources will increase the possibility to generalize (external validity) and the confidence in the findings (theoretical validity).

(3) This research made use of interviews, observations, and a questionnaire in order to collect data. This practice of using multiple data collection methods provides a stronger substantiation of the constructs and thus a better construct validity and theoretical validity (Eisenhardt, 1989).

5.7.2 PERSISTENT OBSERVATION

Researchers have to make a choice in obtaining scope or depth during the observation phase. Scope can be reached by conducting a study for a sufficient period of time, called prolonged engagement. This would allow overcoming reactivity (the Hawthorne effect²⁷), as it includes understanding the company,

²⁷ Note that the nature of this research limits the possibilities for this bias to occur.

building trusts, and checking for misinformation stemming from anomalies introduced by the researcher. Due to time constraints for this research, this could not be considered as a feasible option. Therefore we made use of persistent observation (depth), which implied that the most relevant characteristics for this study were investigated. This was possible because of the extensive literature review, enabling us to separate relevant from irrelevant observations. Subsequently, carefully following the operation definitions ensured that the most relevant attributes were measured. As described earlier, this method reduces the threat of observational bias, which is prone to happen when neither a prolonged engagement nor a persistent observation approach is chosen (Onwuegbuzie and Leech, 2007). The effects of the researchers on the participant, researchers' bias, can also be reduced by using persistent observation²⁸.

5.7.3 MEMBER CHECKING

Member checking is about allowing the participants to play a role in assessing the credibility of the findings. This is a very effective way to eliminate the possibility of misunderstanding and misinterpretation of the group(s) under investigation (Onwuegbuzie and Leech, 2007), thus achieving a higher interpretive validity. Therefore, this control was applied in this research. This implied that the

results of the questionnaire were discussed with the leaders of the NVs.

5.7.4 PEER DEBRIEFING

Peer debriefing is the last tool utilized by this study to provide validity, especially interpretive validity and theoretical validity. It concerns the external evaluations of the research process and is, in essence, another form of inter-rater reliability, although it is logically based, not empirically (Onwuegbuzie and Leech, 2007). The peer de-briefer, in this study our mentors, acted as the 'devil's advocate'. The difficult questions asked implied that the researchers were kept 'honest' about the procedures, meanings, interpretations, and conclusions.

5.7.5 GENERALIZING

According to Onwuegbuzie and Leech (2007) and Dul and Hak (2008: 47), generalization is a common error made by qualitative researchers in the interpretation stage. Note that Dul and Hak (2008: 47) therefore state that external validity is normally not an issue in case study research, as there is no population to generalize to²⁹. Qualitative research should be used to generate particular insight in processes and practices and should not (primarily) aim at generalizations, whether these are populations, locations, settings, contexts, or times. On the other hand, Graziano and Raulin (2004: 205) state that it is possible to generalize with qualitative research to some

²⁸ Other effective controls for researchers' bias are to make the researchers' intentions clear, conducting some of the interviewing in a neutral site, and being careful not to exacerbate any potential problems (Onwuegbuzie and Leech, 2007).

²⁹ Relatively large samples should be utilized if qualitative researchers aim to generalize (Onwuegbuzie and Leech, 2007).

extent. For this, it is important to recognize that the only population to which the results can be safely generalized is defined by the characteristics of the sample (Graziano and Raulin, 2004: 205). This type of sample is called an ad-hoc sample, and to be able to generalize beyond the ad-hoc sample one needs to know the characteristics of the participants and keep the generalizations within the limits of these characteristics (Graziano and Raulin: 2004: 205). Keeping this in mind, we should be very careful in making any claims concerning generalization, although we can increase the confidence of generalization to some extent by keeping the threats to the external validity in mind. Nevertheless, the sample as defined in section 5.2 can be considered as an ad-hoc sample. So although it is not possible to make strong generalizations, the resulting, theoretically optimized OC could be at least applicable for other firms sharing the same characteristics.

5.8 CONCLUSIONS METHODOLOGY

Figure 20 gives a complete overview of the methodology of this research. It also provides the steps necessary to perform a study into the relationship between OC and innovative performance (in grey). It shows the quantitative and qualitative research that was conducted to measure the OC and determine the position of the NVs in the innovation process. Also, the most important threats to the internal and the external validity and their controls are depicted in this figure.

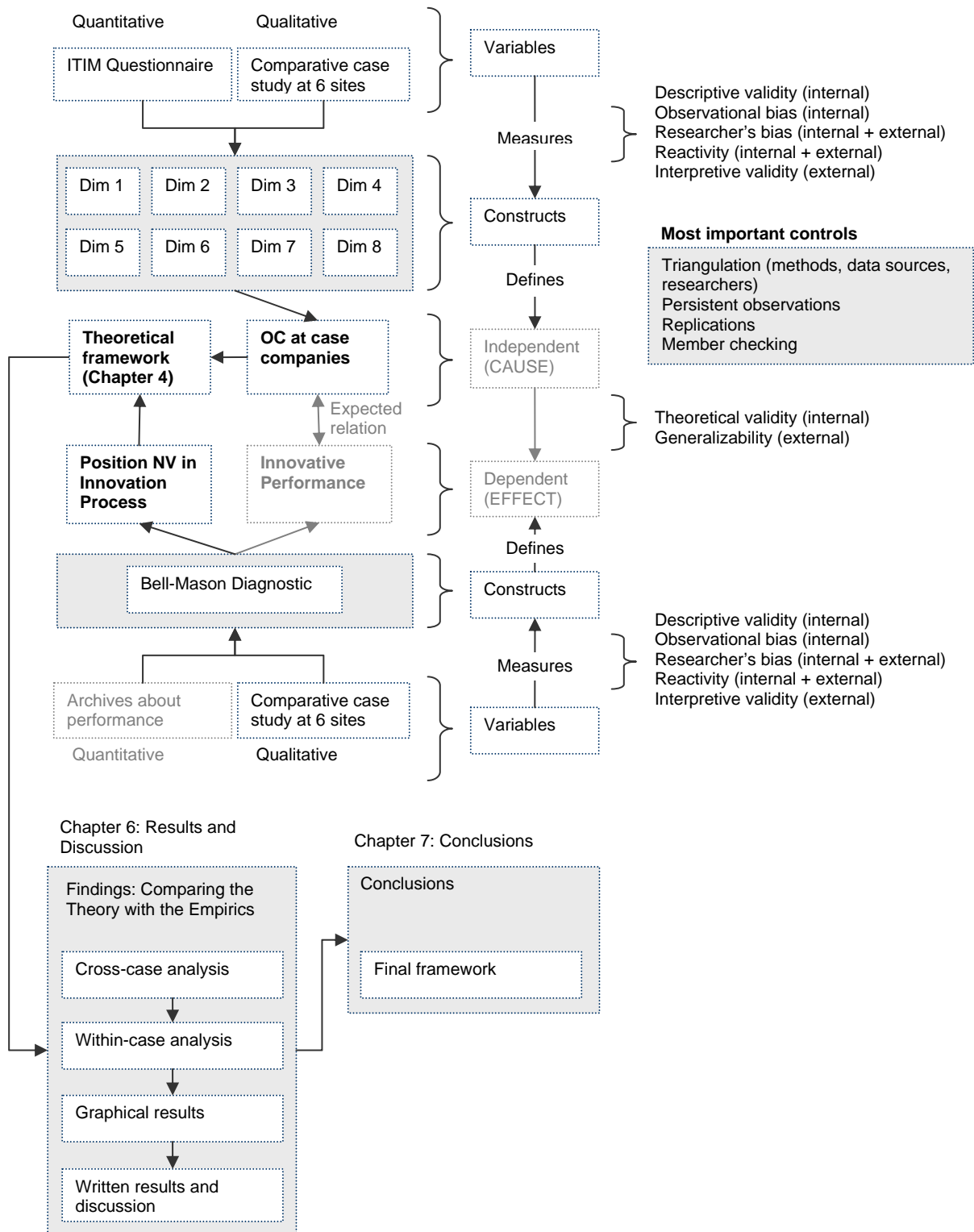


Figure 20: Summary of the methodology of this research.

Part III: Findings

“However beautiful the strategy, you should occasionally look at the results.”

Sir Winston Churchill (1874 - 1965)

6 RESULTS AND DISCUSSION

This chapter will organize the information found in the data gathering phase of this research. The first section, 6.1, will discuss the quantitative results in general terms. This implies the demographics, response rates, and the results will be assessed on their reliability. Section 6.2 will discuss the qualitative results, most important here is the positioning of the NVs in the correct phase of the BMD. Section 6.3 will start with the results per dimension. Here the findings from both the questionnaire as the interviews will be presented. These sections are organized in the following way: (1) brief summary of the dimension, (2) cross-case analysis, (3) within-case analysis, (4) results from the interviews combined with a discussion. Note that the focus will be on two questions: (a) Why the values are the way they are, and (b), the soundness of the propositions as determined in chapter 4. (5) Finally a conclusion will be presented per dimension and an elaboration on its importance for the successful development of radical innovations given.

The data gathering phase and the subsequent results of this phase are key issue for empirical research. The results of the survey and interviews will be structured in such a way that there is an overview for the discussion, and it becomes possible to draw conclusions based on these results and the results found in the theoretical part of this study.

6.1 QUANTITATIVE

The first thing that will be discussed here are the demographics of the selected cases. Indeed, as described in section 5.2, our aim was to select a sample that would be as similar as possible. The results of the sample selection can be seen in Table 9. From this we can conclude, that the selected sample suffices the criteria to be as similar as possible.

New Venture	Average age	Working years	Education years	Male
Care Servant	40	6	16	100%
New Wellness Solution	42	9	17	90%
Skin Imaging	38	7	17	88%
White Biotechnology	40	8	18	75%
Biomedical	40	8	18	63%
Personalized Nutrition	45	7	18	75%

Table 9: Demographics of the selected cases.

The questionnaire concerning OC was administered to the six selected NVs. The overall response rate was 77% from the sample of 79 respondents, meaning 61 respondents. The response rate per BV can be seen in Table 10.

From each NV the eight dimensions of OC were measured using the reliable and validated questionnaire developed by ITIM (2007). The scores on each dimension can range from 0 till 100. A score of 0 on dimension 1, for instance, would mean an extreme means orientation. On the other hand, a score of 100 would imply an extreme goal orientation. The results of the scores are presented in Table 11.

For the readers' convenience, a legend is attached denominating the different dimensions. Note that more findings per NV can be found in chapter 9, the managerial implications.

Firm	New Venture	n	Response rate
Philips	Care Servant	12	8 = 66,7%
Philips	New Wellness Solution	10	10 = 100%
Philips	Skin Imaging	21	18 = 80%
DSM	White Biotechnology	17	9 = 52,9%
DSM	Biomedical	10	8 = 80%
DSM	Personalized Nutrition	9	8 = 88,9%

Table 10: Response rates questionnaire OC.

Dimension	Philips			DSM		
	Care Servant	New Wellness Solution	Skin Imaging	White Biotechnology	Biomedical	Personalized Nutrition
1	56	64	67	62	65	70
2	81	86	84	54	62	48
3	32	28	27	42	43	36
4	64	63	68	59	71	65
5	39	26	33	47	20	22
6	58	49	45	57	42	34
7	13	30	56	25	63	78
8	47	59	42	67	54	54

Table 11: Scores on the eight dimensions per NV.

- 1 – Means versus Goal oriented.
- 2 – Internally versus Externally driven.
- 3 – Loose versus Tight discipline.
- 4 – Local versus Professional focus of interest.
- 5 – Open versus Closed systems.
- 6 – People versus Work oriented.
- 7 – Low or High acceptance of leadership style.
- 8 – Low or High identification with the organization.

Figure 21: Legend of the eight dimensions.

Table 12 depicts the scores of the NVs in terms of their standard deviations. It shows that,

in general, the variation is larger within DSM's NVs compared with Philips' NVs, which means that the OCs of the three projects of the lifestyle business area at Philips are more similar. Indeed, something that was expected as the NVs of Philips share the same floor in one building, something that is not the case for the investigated NVs from DSM's NVs. The most remarkable finding within Philips concerns dimension 7 (acceptance of the leadership style) which scores a significantly higher standard deviation (21.7) compared to the other dimensions. This is also the case for DSM although there also dimension 5 (open versus closed system) (15.0), and to a lesser degree dimension 6 score high values (Employee versus job orientation) (11.7), indicating more variation in the different OCs. These findings are also illustrated in the relational graphs in Figure 22 and Figure 23.

Dimension	Standard Deviation Philips	Standard Deviation DSM	Standard Deviation overall
1	5.7	4	4.8
2	2.5	7	16.6
3	2.6	3.8	6.9
4	2.6	6.0	4.1
5	6.5	15.0	10.5
6	6.7	11.7	9.2
7	21.7	27.3	25.2
8	8.7	7.5	8.8

Table 12: Standard deviation of the scores.

Indeed, only dimension 7 has a very high standard deviation within Philips' NVs and DSM's NVs (21.7 and 27.3). Although this

might indicate a measurement error, pointing out reliability problems, we argue that it has something to do with the actual leadership style as discussed in chapter 4.7. More information will follow in section 6.9.

The results show that in most cases the overall standard deviation is reasonable low. However, for dimensions 2, 5 and 7 a higher value of the overall standard deviation can be observed (respectively 16.6, 10.5, and 25.2) implying rather different OCs between the two case companies and within DSM's NVs.

6.1.1 RELIABILITY OF THE RESULTS

Concerning the reliability of the above standing results, the following can be mentioned. As expected, the Cronbach's alpha showed very diverse values³⁰. This is most likely because of the small sample size. Some values scoring above the threshold of 0.60 (dimension 2 and 5), some below (dimension 1, 3, and 6), and dimension 4 even has a negative value. A summary can be seen in Table 13.

Values of the Cronbach's alpha can turn negative, even though the score values are positive. The most plausible reason for this phenomenon is that the sample variability is too high. This can be solved by increasing the number of NVs. This confirms our expectation and implies that the reliability should be assessed by comparing the found values to the theoretical assumptions.

Dimension	Cronbach's Alpha	Dimension	Cronbach's Alpha
1	0.178	5	0.668
2	0.749	6	0.333
3	0.425	7	n/a
4	-1.569	8	n/a

Table 13: Cronbach's Alpha values for the dimensions.

The best proof concerning the reliability of the values found for the eight dimensions is to rely on the theoretical assumptions and their fit with the found data as was discussed in chapter 5.3. Considering the results presented in Figure 22 and Figure 23 we can conclude that in many cases a good fit with the theory can be observed, implying valid, thus reliable measures.

Another method to assess the reliability is to look at the differences between the NVs from Philips. Indeed, as they are located on the same floor in the same building, one would expect quite similar OCs (Something that is not the case for DSM's NVs). Seen the results, we can only conclude that our measurement instrument was valid. This is something that was already found during the analysis of the standard deviations, where DSM's NVs scores higher standard deviations compared to Philips' NVs. Indeed, the only large deviation at Philips' NVs can be found at dimension 7, acceptance of the leadership style. The figures illustrate the results from the questionnaire. In the blue colours are Philips' NVs and in the green colours DSM's. The brown line denotes the found theoretical optimum.

³⁰ The Cronbach's alpha has been calculated by taking all responses from one dimension, as would have been the case with 'normal' research, thus committing the reverse ecological fallacy.

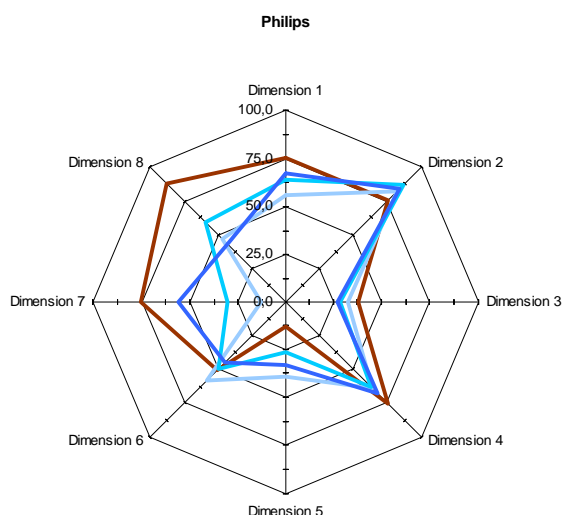


Figure 22: Results NVs Philips.

From left to right on dimension 7, in blue colours, in Figure 22 can be seen: Skin Imaging, New Wellness Solution, and Care Servant.

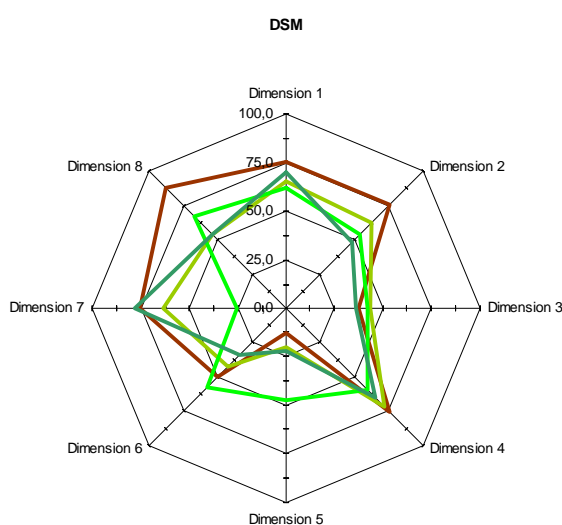


Figure 23: Results NVs DSM.

From left to right on dimension 7, in green colours, in Figure 23 can be seen: White Biotechnology, Biomedical, and Personalized Nutrition.

6.2 QUALITATIVE

A total of six interviews, each lasting one and a half hour, and were held in order to confirm the quantitative findings and to assess the position of the NVs in the innovation

process.

Next to this, several interviews were held with the Manager Digital Systems & Technologies Eindhoven Philips Applied Technologies, the Senior Director New Business Development Support Philips, the Director Innovation program at DSM, the Directed HR Innovation Centre DSM and the Project manager HR Innovation Centre, to further elaborate on these topics. A short elaboration of the results of these interviews will follow now. More results of the interviews will be presented in the sections 6.3 till 6.10.

6.2.1 ORGANIZATIONAL CULTURE

As it was not realistic (due to time constraints) to interview all the members of the NVs, it is not possible to draw real conclusions concerning OC based on the qualitative research. Therefore we chose to interview only the leaders of the NVs and to check whether the results of the quantitative research were a true representation of the OC in the NV. Nevertheless, the interviews confirmed our findings from the questionnaire. Furthermore, the interviews revealed why specific NVs have particular scores on the dimensions. This information will be used in this chapter to explain and to elaborate on the results.

6.2.2 POSITION OF THE NVS IN THE BMD

As explained, this research aimed at investigating the optimal OC in the early stages of the NVs innovation process. Note that the start of the NVs innovation process is at the second phase, development, of the complete innovation process, as described in the second chapter. In terms of the BMD, this implies the around the seed stage. Indeed, selecting NVs

still in the concept stage would make not sense, as can be seen in Figure 11. In the concept stage, the team is formed by only a few individuals implying that no OC can be measured.

The conducted interviews revealed the positioning of all NVs in several ways: (1) the opinion of the NV leader, (2) the opinion of the persons responsible for the support of the NVs, and (3), our personal findings based on the four quadrants of the BMD.

(1) The interviews with the NV leaders showed that at DSM and Philips most NVs are, as expected, around the seed phase, although there are some exceptions. For Philips, Care Servant is the NV which made most progress according to their leader, as it already entered the fourth stage, namely (alpha) market development. New Wellness solution and Skin Imaging are at the end of the second phase, seed. For DSM, the NVs Personalized Nutrition and Biomedical just finished the seed phase and are at the beginning of the third phase, product development. White Biotechnology is still in the seed phase. These results are also summarized in Table 14.

(2) The interviews and discussions with the persons responsible for the support of the NVs (Director Innovation program at DSM and Senior Director New Business Development Support at Philips) revealed no large differences from the above standing findings, except for one noticeable difference. Philips' NV Care Servant was placed in stage 3, product development. Another remark was that DSM's NV Personalized Nutrition (positioned in the product development stage) was just finished

with organizational restructuring.

(3) We analyzed the four quadrants of the BMD in order to assess the current stage of the NVs. This implies that the focus was on the technology and product, the marketing and sales, the people, and the finance and control. Note that because of time constraints, it was difficult to get information on all quadrants. Nevertheless, by using the BMD as a guide, we found no big deviations during the interviews and meetings from the findings already discussed. One aspect worth mentioning concerns the Philips' NV Care Servant. In our opinion, this NV was further developed than the other two of Philips' NVs. This concerning the technology and product (a rather simple technology and almost finished product) but also concerning marketing and sales (a fully working demonstration is available, as are flyers, and a potential customer has been contacted). This implies that we would place this NV in the ending of 3 (product development) or in the beginning of 4 (market development). Note that the findings discussed here are more subjective as the two sources discussed before, but combining the different sources provides us with valid findings which are summarized in Table 14. The most right column transcripts the findings in terms of the BMD.

New Venture	(1) NV Leader	(2) NV support	(3) Our Findings	Stage in BMD (conclusion)
Care Servant	4	3	3/4	4 (beginning)
New Wellness Solution	2 (ending)	2	2	2 (ending)
Skin Imaging	2 (ending)/ 3 (beginning)	2	2	2 (ending)
Biomedical	3 (beginning)	3	3	3 (beginning)
Personalized Nutrition	3 (beginning)	3	3	3 (beginning)
White Biotechnology	2	2	2	2

Table 14: The current stage of the NVs.

Table 15 is depicted again for the readers' convenience, allowing for comparison between the different stages of the two case companies and the stages of the BMD.

Number	BMD	Philips	DSM
1	Concept	Pre-seed	Feasibility
2	Seed	Seed	Feasibility
3	Product Development	Beta (Product Development)	Development
4	Market Development	Alpha (Market Development)	Scale up
5	The Steady State	The Steady State	Commercialization

Table 15: Comparing the phases and stages.

The results in Table 14 show that most of the NVs are very comparable; the relative differences are not that much for the end of the second phase or the beginning of the third phase; implying the transition from invention to innovations. Care Servant is the only exception as it is already in the beginning of the market

development stage.

After the data validation, the results can be presented and discussed. This will be done per dimension following the same logic as chapter 4. The contents per dimension will be structured in the following manner. (1) First a brief summary is given concerning the dimension. (2) Then the cross-care and within-case analyses are presented. (3) Subsequently, the results from the interviews will be presented in the form of a discussion. (4) Then, a conclusion is reached concerning the propositions as developed in chapter 4. (5) And last, the importance of the dimension is reassessed.

6.3 DIMENSION 1: MEANS ORIENTED VERSUS GOAL ORIENTED

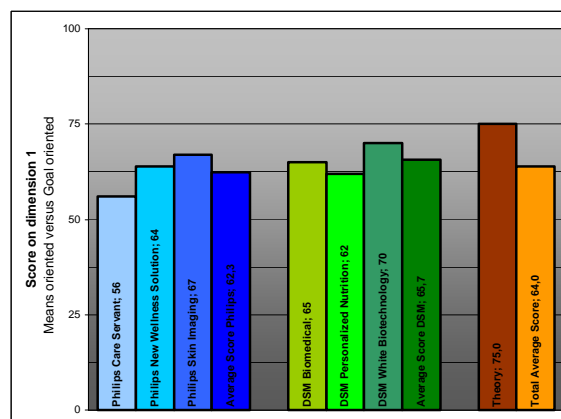


Figure 24: Results dimension 1.

Figure 24 shows the first dimension; means versus goal orientation. In a goal oriented culture, the focus is on reaching a specific goal, whereby results go before procedures. Employees perceive themselves as being comfortable in unfamiliar circumstances and they are able to deal with uncertainty and ambiguity. They are willing to put in a maximum effort to cope with new challenges each day. In a means oriented culture, each day

is pretty much the same and people try to avoid risks while spending only limited effort on their job.

From analysing the cross-case results can be concluded that the results are almost the same all six NVs, although DSM's NVs score slightly higher and on average thus a bit more result oriented. Philips' NVs score between 56 and 67, DSM's NVs score between 62 and 70. Note that Philips' Care Servant scores rather low compared to the rest. Investigation into the questions revealed that this is mainly because of the fact that there is an emphasis on failures and that promises are often violated, indicating a more means orientation.

A within-case focus showed that all NVs score lower than the theoretical predicted value. According to the questionnaire, this is mainly because of the perceived strength in winning trust, and not in the technical capabilities, implying a more means orientation.

Indeed, one of the interesting findings of this dimension is that all NVs were found not to be depended on their technical capabilities. This perceived strength in winning trust can be explained by the fact that the focus is on the transition from invention to innovation, as explained in chapter 2.5.

An extreme goal orientation is usually found in situations characterized by uncertainty and ambiguity, as explained in chapter 2. We argue that during the innovation process both uncertainty and ambiguity levels will decrease. While in the beginning goals are the only way to assess and to guide the NV, as described in chapter 3, later on, unfamiliar situations will dissolve gradually and procedures will be put in

place (see chapter 4). This is necessary, as the interviewees from Philips reasoned, because the team size will also grow. From a small multitasking team towards many specialists with their own tasks and responsibilities as the NV goes through the innovation process. This is especially true when getting ready to enter the market. Indeed something that also becomes clear when looking at Figure 11 (BMD). Subsequently, the focus shifts in the direction of a means orientation as the NV moves towards the product launch. So, the result of this dimension is influenced by the development of the product and the growth of the team composition.

This explains the somewhat lower score than theoretical predicted by some NVs (towards means). It can be seen in Table 14 that Philips' Care Servant, DSM's Biomedical, and Personalized Nutrition are further progressed in the innovation process compared to the other NVs. But note the latter two have just left the seed phase and are thus not significantly further than the other NVs. Considering this difference in position might explain the relative low score of Care Servant on this dimension (56), supporting our theory of the shift from a goal towards a means orientation during the innovation process.

The interviews confirmed this in that way that after a certain stage the balance has to shift. Interviewees from Philips argued that after the alpha phase (market development in BMD terms) flexibility has to make place for procedures and expectations. Indeed, because of the growing team size and the involvement of customers.

Concluding can be said that, although the theoretical optimum (score of 75) might be true in the very beginning of the existence of the NVs, the balance will soon start to shift towards values below the theoretical optimum because of the fact that uncertainty and ambiguity levels decrease during the innovation process. Most OCs we measured were, although still quite in the early stages of the NV innovation process, not at the beginning of the seed phase anymore. DSM's White Biotechnology, which scores closest to the predicted value, still remains in the seed stage. Therefore we argue that our proposition for this first dimension still holds. Here we reach our first conclusion:

Conclusion 1: a medium strong goal orientation will stimulate the development of radical innovations.

As argued in chapter 4, the literature states that a goal orientation is crucial for developing radical innovations. Indeed, a goal orientation that is put well in place allows for risks to be taken and a focus on results as was discussed earlier. The conducted interviews revealed that all interviewees agree with this statement (7 out of 7) and also consider this dimension to be very important for the development of successful radical innovations.

6.4 DIMENSION 2: INTERNALLY DRIVEN VERSUS EXTERNALLY DRIVEN

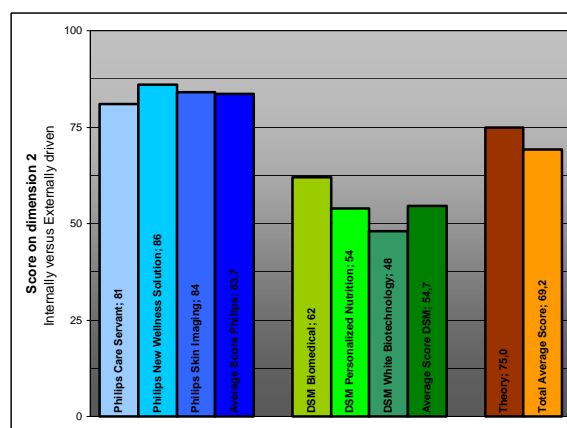


Figure 25: Results dimension 2.

The results for the second dimension, internally driven versus externally driven, are illustrated in Figure 25. Externally driven cultures are market-driven and its aim is to do anything to satisfy the (current) market, even if this is not in the customers' best interest; results are most important and therefore there is a pragmatic attitude. An internally driven culture is based on business ethics and honesty and the faith that the members know what is best for the customers and the world. This dimension differs from the first one, in that way that it is about the satisfaction of the customer and not about personal matters.

The cross-case analysis showed a clear distinction between the NVs from Philips and DSM. Philips's NVs score significantly higher on this dimension than DSM's NVs, something that could also be seen in Table 12, the standard deviations. On this dimension, Philips' NVs have results between 81 and 86, DSM's NVs score between 48 and 62. White Biotechnology (DSM) could even be called internally focused as it has a result around the balance point of 50.

The large difference can be explained, following the questionnaire, by the fact that DSM has an emphasis on correctly following procedures³¹ and the importance placed on ethics. Note that the questionnaire revealed that DSM's Biomedical is less hampered by the procedures which is reflected in the slightly higher score compared to the other two NV's from DSM.

The within-case analysis gave no further insights concerning the results for the NVs of Philips, as they are scoring according to the predicted theoretical value. Nevertheless, for DSM's NVs it shows again that the emphasis is placed on correctly following the procedures and the important role of ethics, which come at the expense of flexibility and a pragmatic approach following from chapter 4.

Besides correctly following procedures and the important role of ethics, other reasons could be used to explain the difference between Philips' and DSM's NVs. Indeed, DSM is mainly focused on the business-to-business market, while Philips is mainly focused on the business-to-consumer market. However, DSM's NV Personalized Nutrition is also focused on the business-to-consumer market and still is significantly less externally driven than Philips' NVs.

So, the two most important characteristics that cause the variation between Philips' and DSM's NVs are: (1) procedures and (2) ethics.

(1) DSM is less externally focused as procedures are hampering this; both the emphasis on procedures and whether they are followed correctly. This has been confirmed during the interviews in which was revealed that all three NVs acknowledge the many procedures DSM has for its NVs. (2) Furthermore, ethics are significantly more important for DSM's NVs than for Philips' NVs. White Biotechnology has to make a trade-off between food and fuel and the other two NVs concern human health.

In that way, procedures are very important as the products could influence human health. Ethics are important as DSM develops innovations that are on the ethical borderline as for example the products of White Biotechnology. These characteristics result in a less flexible attitude and thus a less externally driven orientation. Note that following from chapter 4, too many procedures in the beginning of the innovation process of the NV may hamper the ability to develop the radical innovation.

Dimension 2 does not make a distinction to which customers the focus is aimed: the existing customers or the potential future customers as was explained in chapter 4. The NVs of Philips are even slightly more externally driven than could be expected following the theory. This could be due to a focus on future customers; another possibility is that this is because of a focus on existing customers. An interview however revealed that the complete Lifestyle incubator is aimed at integration with the mother organization, Philips. This could imply a considerable fit with

³¹ Procedures in this dimension are standardized ways or rules which have to be followed to serve the customers and to prevent mistakes.

the existing BU and belonging customers, resulting in not so radical innovations. The interviews showed that at least one of Philips' NVs (Care Servant) has a strong focus on an existing customer, something that can also be derived from the results of dimension 5 (a rather closed orientation on which we will elaborate later on). Especially in the early phases of the innovation process, you have to be able to say no against certain customers in order to remain open for other possibilities. A real marketing orientation should not be there before the market development stage.

Although corporate entrepreneurship implies access to many resources, at DSM, it is at the expense of quick decision making capabilities because of the procedures and ethical considerations. We argue that their scores are too low because of the amount of rules set in place, too early in the innovation process of the NV. All of Philips' NVs score higher which can be explained by the fact that they develop not so radical innovations. This implies that the theoretically set optimum might contain truth. Therefore our proposition remains unchanged and is our conclusion as follows:

Conclusion 2: a medium strong externally driven orientation stimulates the development of radical innovations.

According to the literature this dimension is of crucial importance for firms who want to respond to opportunities concerning radical innovations. Indeed, the concepts of technology push and market pull have to be well balanced. The findings at DSM and Phillips confirm this. Therefore, and fully in line with the

interviewees (6 out of 7 interviewees labelled this dimension as very important), we consider the importance of this dimension as very high for the creation of an innovative supportive culture.

6.5 DIMENSION 3: EASY GOING VERSUS STRICT WORK DISCIPLINE

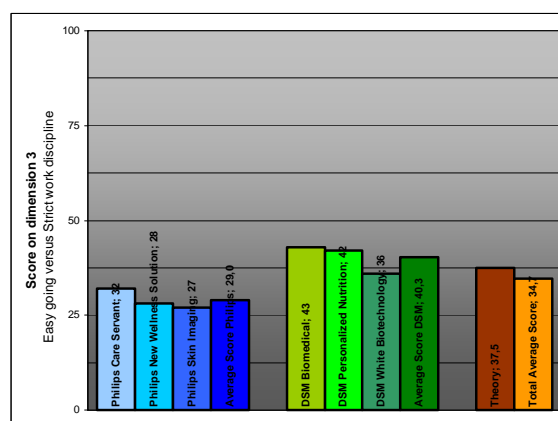


Figure 26: Results dimension 3.

In Figure 26, the results of the third dimension, easy going versus strict work discipline, are depicted. This dimension takes into consideration the amount of internal structuring of an organization and is about an easy-going attitude versus a strict work discipline. Employees in an organization with a loose control do not think about costs, and meeting times are only kept approximately. There is a lack of predictability, lots of improvisation, and the work always delivers surprises. Employees in an organization with a tight control are the opposite, these people perceive their environment as cost-conscious and meeting times are kept punctually.

Looking from a cross-case perspective can be said that the results show that Philips' NVs have an easy going work discipline and score between 28 and 32. DSM's NVs score rather higher, although they still remain in the

easy going work discipline realm with values between 36 and 43. This distinction is mainly due to the fact that DSM's NVs believe that without quality control, they will become inefficient. Or in other words, creativity can also flourish within tight surroundings.

Within-case looking can be said that all NVs score more or less around the theoretical predicted value, although DSM's NVs score closer, in spite of the findings from the cross-case analysis. No additional reasons were found to explain the small differences compared to the theory from the questionnaire.

Some findings from dimension 2 are also reflected in this dimension, notably the emphasis on correctly following the procedures, or more specific for this dimension, the view that creativity can also flourish in tight surroundings (internal structuring). Again, this has most likely to do with the markets DSM's NVs are moving in and towards, where food, human health, and thus ethics form important aspects to consider. The interviews confirmed this and added that DSM is still a rather bureaucratic company where safety comes first. Note that, following from chapter 4, too much internal structuring can impede the development of successful radical innovations.

Following from dimension 1, we argue that for this dimension the balance also has to shift during the innovation process, from loose to tighter³²; implying a shift from research to

business as one of our interviewees named it. Again because uncertainty and ambiguity levels get lower and because the team composition will grow and change as discussed at dimension 1. This reasoning was confirmed by almost all NV leaders. Note that the switching point is commonly agreed (from the interviews at both Philips as DSM) to be once customers get involved, meaning the market development stage. Again, the results give an indication for the above standing discussion. Within Philips' NVs, Care Servant scores slightly tighter than the other two and has also made most progress in the innovation process. Next to this, DSM's White Biotechnology, which has made the least progress, scores slightly looser compared to the other two NVs from DSM.

Concluding can be said that, besides the place of the NV in the innovation process, also the potential market has an influence on this dimension, making it difficult to set an optimum value. Still, all six NVs have a rather good fit with the theory although DSM's NVs have a slightly better fit. The findings from the cross-case analysis would argue that the values measured at Philips would be better for developing radical innovations; indeed, bureaucracy impedes this development as explained in chapter 4. Therefore we argue that the values found at DSM's NVs are (slightly)

³² The next question would be how to make this shift happen, because as described in chapter 3.5, changing (part of) an OC is difficult and takes a long time. Identified

ways include having a separate development group or hiring new people to continue with the project. This latter is something that is prone to happen because the focus of the project changes from a research orientation towards a business orientation; the employee composition will change accordingly and so will the OC.

too high, especially when taking into consideration that we measured the OC of NVs that are not at the beginning of the seed phase anymore. This implies that the theoretically set value was a good starting point, but should be a bit lower:

Conclusion 3: a medium easy going work discipline stimulates the development of radical innovations.

Concerning the importance of this dimension, less than half of the interviewees stated (3 out of 7) that this dimension is very important to create innovative performance. This is in contrast with the theory as discussed in chapter 4. Nevertheless, in the beginning of the innovation process of the NV, the allowance for creative behaviour is of key importance and a correct score on this dimension is crucial to achieve this. Therefore, the importance of this dimension is still considered to be very high for the successful development of radical innovations.

6.6 DIMENSION 4: LOCAL VERSUS PROFESSIONAL FOCUS OF INTEREST

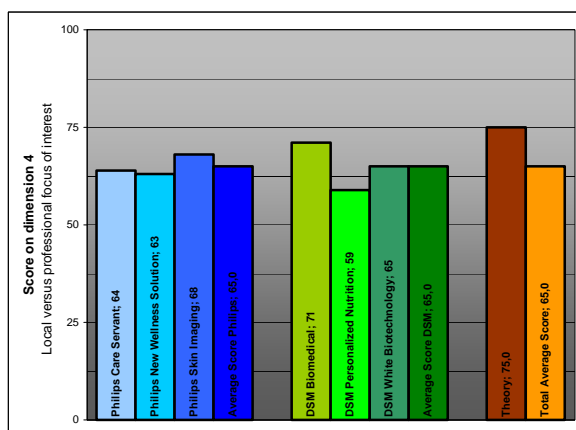


Figure 27: Results dimension 4.

Dimension four, from which the results

are depicted Figure 27, is about a local focus of interest versus a professional focus of interest. It shows the distinction between OCs where employees derive their identity largely from their boss and/or organizational unit, and OCs where employees identify themselves with their job or content of their job. The former has a strong social control to make all employees behave in more or less the same way. These people do not look far into the future, but assume that the organization does so for them. For a professional focus of interest the opposite applies; in essence, it shows to which degree it is allowed for the individual to be different from the internal norm.

The cross-case analysis on this dimension showed that all six NVs have comparable scores, arguing for a rather professional focus of interest for the successful development of radical innovations. The NVs within Philips have a very consequent score which varies between 63 and 68. The scores for DSM's NVs range from 59 till 71, which can also be considered as a quite consistent result, something already indicated by the standard deviations. Nevertheless, the questionnaire revealed that Philips' employees do not think as far ahead as DSM' employees. Next to this, competition and distrust are common between the departments at Philips' Care Servant and DSM's Personalized Nutrition.

The within-case analysis showed that all NVs score slightly under the predicted theoretical value, but no specific reason could be derived from the questionnaire.

The found results are in line with earlier research by Weggeman (2007: 231), as

discussed in chapter 4, who suggested that knowledge workers (as is the case for DSM and Philips with an average of fifteen years of education) normally score between values of sixty to eighty.

Although we stated that the NVs team size and composition will change during the innovation process of a NV, we argue that knowledge workers remain to form the largest part of the NV team. The score might even get a bit more in the direction of a professional focus of interest as suggest by the interviewees, who argued that the team composition changes from ‘multi-taskers’ in the beginning to specialists later on in the innovation process. It is thus unlikely that the scores for this dimension will change towards a more local focus of interest during the NVs innovation process.

Concluding can be said, seen the ‘problems’ as discussed in the cross and within-case analysis, that if these were not present the score would have gotten even closer to our predicted theoretical optimum. DSM’s Biomedical can serve as an example here, as this NV scores really close to this value. Our expectation is that the measured focus of interest will not change significantly during the innovation process and will therefore not likely influence the presented results. Therefore we hold on to the value of our proposition and conclude for this dimension:

Hypothesis 4: a medium strong professional focus of interest stimulates the development of radical innovations.

Concerning the importance of this dimension for the development of radical

innovations the following can be said. Only two of the interviewees labelled this dimension as very important. Combining this with the findings from the literature study we argue that, although not unimportant, this dimension is of medium importance for an innovative driven OC.

6.7 DIMENSION 5: OPEN SYSTEM VERSUS CLOSED SYSTEM

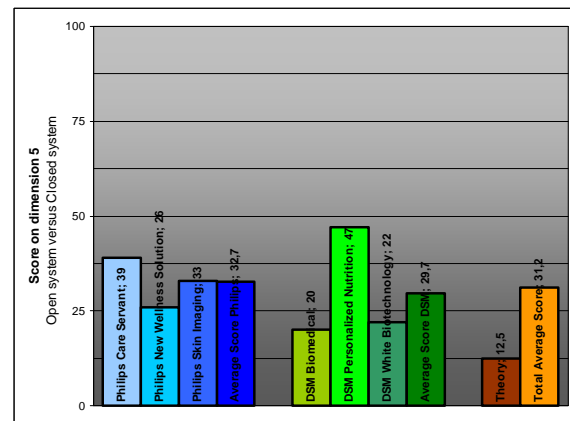


Figure 28: Results dimension 5.

Dimension five, from which the results are shown in Figure 28, focuses on the difference of a closed system and an open system approach and is, among other things, about the accessibility of the organization to new members. In an open system, newcomers are easily accepted and adaptation is not hard; people will feel at home after only a few days. In a closed system, the organizations and its members are closed and secretive. This could be due to industrial espionage and/or confidential customer information.

Concluding from the cross-case analysis can be said that this dimension has a great variation within DSM’s NVs, with values ranging from 20 to 47. DSM’s Personalized Nutrition can be seen as the cause for this variation with a very high score, almost

reaching the balance point (something remarkable as the other two NVs from DSM score below the average of Philips' NVs). Considering the questions from the survey, it becomes clear that the employees from DSM's Personalized Nutrition do not discuss personal issues with their boss. This also applies for Philips' Care Servant and New Wellness Solution. Additionally, at Care Servant, employees are not fully sharing their opinions with the boss. Philips' NVs score between 26 and 39, on average having a bit more of a closed system compared to DSM's NVs.

From the within-case analysis comes another interesting finding. The employees from all NVs perceive that management fails to keep everybody up to date. The result is that all NVs have a slightly less open system. This partly explains the differences with the theory. Indeed only DSM's Biomedical and White Biotechnology are getting close to the predicted optimum. According to the interviews, DSM's Personalized Nutrition³³ is having troubles with the regulations at DSM in order to have an open focus. Note that this is not something we found at the other two NVs from DSM, and the closeness is thus more likely caused by management. Indeed, this is something on which we will elaborate further at dimension 7.

As mentioned in the discussion about dimension 2, it is possible that a NV is very

externally focused but simultaneously much closed, meaning a low score on this dimension³⁴. This could imply that there is too much focus on only a few potential customers too early in the innovation process. The interviews revealed that this is the case at Philips' Care Servant which is currently holding on to one client in the UK. Note that the other two NVs from Philips, New Wellness Solution and Skin Imaging, are also scoring quite high compared to the theory, but the interviews revealed no strong focus on existing customers.

As can be seen from the results, in general, DSM has more open system than Philips. A reason why the investigated NVs from DSM score relatively 'better' than Philips NVs is that they have a history of working together with many partners. An interviewee at DSM stated that besides alliances and acquisitions, open innovation is key, as it is impossible to know everything yourself nowadays. Therefore the relation between universities, medical centres, and companies is of major importance. During some of the interviews at Philips it was also mentioned that it is of key importance to have an open system, as a focus on future markets demands this, although the results do not give proof for this practice. Contrary, one interviewee from Philips (Skin Imaging) stated that it can be dangerous to reveal the new product to the world too fast, as you will subsequently notify potential

³³ Note that the two most divergent scores of the NVs Philips' Care Servant (26) and DSM's Personalized Nutrition (34) could also be explained by their innovative performance as can be seen in Appendix E: The relation between innovative performance and organizational culture.

³⁴ As explained in chapter 4, all dimensions are assumed to be statistically mutually exclusive.

competitors. This could explain the somewhat higher score at Philips' NVs. This is indeed something that relates to secrecy due to industrial espionage as discussed in chapter 4, and causes the NV to score more closed at this dimension.

Both Philips' as DSM's NVs have many people working from outside their organization for them, indicating an easy acceptance and an open system as discussed in chapter 4. This has been confirmed during all the interviews. Biomedical for example has many external people involved in the project, about half is from DSM, and the other half is hired from outside DSM. An interesting fact about DSM's NVs is that there are relatively more females employed than at Philips' NVs, as can be seen in Table 9, which could also be a reason for the difference in openness between Philips' and DSM's NVs.

Concluding can be said that there are some issues at all investigated NVs, were DSM's Biomedical and White Biotechnology have the smallest 'problems'; indeed, 'only' the failure to keep everybody up to date. Therefore we conclude that the proposition as discussed in section 4.5 could hold truth, as all NVs could and should have scored more open:

Conclusion 5: a strong open system stimulates the development of radical innovations.

Dimension 5 has been mentioned several times during the interviews when asking which dimensions are very important for the development of radical innovations (4 out of the 7 times). Also the literature review revealed that

the implications of this dimension are large, because of the possibility of a diverse workforce but also because of the concept of open innovation, which closely relates to this dimension as discussed in chapter 4. Therefore we consider the importance of this dimension as very high for the successful development of radical innovations.

6.8 DIMENSION 6: EMPLOYEE ORIENTED VERSUS JOB ORIENTED

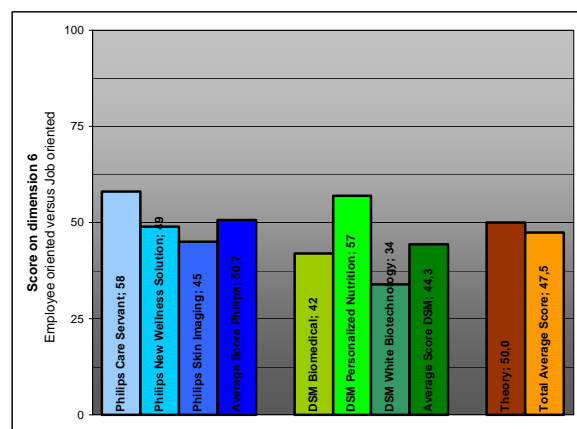


Figure 29: Results dimension 6.

Figure 29 illustrates the results for dimension 6, employee orientation versus work orientation. This dimension explores the differences between a concern for people and a concern for getting the job done. In an employee oriented culture, the organization takes into account the personal problems of the employees and feels responsible for the welfare of its employees, even if it is at the expense of work quality and/ or quantity on the short term. In a job oriented culture the most important thing within the organization is that the job gets done, the rest are side issues (e.g. employee health conditions) and the organization does not care about the personal life of its employees.

When looking at the scores from the

cross-case analysis, it can be said that DSM's White Biotechnology and Philips' Care Servant are most deviating from the average score. In general, Philips' NVs have a score around the middle, with scores varying from 49 to 58, implying a balance on this dimension. The scores for DSM's NVs varies from 34 to 57, where again Personalized Nutrition is the cause for the high standard deviation within DSM's NVs. The reason is that there is a perceived strong pressure to finish the work compared to the other investigated NVs from DSM (This also goes for, although to a lesser degree, Philips' Care Servant). The difference between Philips' and DSM's NVs can be traced back to the decision making policies; where at the former important decisions tend to be made by individuals and at the latter important decisions tend to be made by the group (Care Servant has a peak score on this question). Note that this closely related to the next dimension, 7, where more info about this subject will be provided.

The results from the within-case analysis show that almost all NVs have quite a good score compared to the theory. The most divergent NV is DSM's White Biotechnology (16 toward employee orientation). For Philips' Care Servant and DSM's Personalized Nutrition goes that they score towards a job orientation. Indeed, in both cases the employees perceive the work pressure to be high. As a consequence of this, they score above the balancing point (respectively 58 and 57).

Again, the innovation process provides an explanation for these findings. Later on in the innovation process, as ambiguity and uncertainty levels decreases and the team size

grows, performance becomes easier to measure because of the more detailed job descriptions. Here one could expect a shift towards a more job orientation as all responsibilities become clear and the deadlines concerning market development approach. The fact that Philips' Care Servant has the highest score on this dimension could thus be explained by their positioning in the innovation process. Indeed, DSM's White Biotechnology has the lowest score strengthening this statement. The high score of DSM's Personalized Nutrition could be explained by the fact that there was an organizational restructuring which could have had, according to the interview, its influence on this dimension (increased work pressure).

As shown in the BMD people quadrant in chapter 2 (Figure 11), and as revealed during the interviews, an orientation on people is important as the employees make or break the project. This is especially true in the seed stage because of the high levels of ambiguity and uncertainty. According to the interviews, a stronger employee orientation could lead to higher levels of intrinsic motivation. Next to this, too much work pressure could overload people and lead to mistakes, which often take much time to correct. Note that this is in line with our theory about a concern for people as described in chapter 4.

Concluding can be said that all NVs score in a predictable way, but still a bit divergent from our proposition. We still argue for a balance on this dimension but because of the results and theory presented above, and our focus on the seed stage, we reason that the proposition should be changed towards a more

people orientation.

Conclusion 6: a moderate employee orientation stimulates the development of radical innovations.

The conclusion of the theoretical section of this study was that the aspects of this dimension in combination with innovative performance are not often mentioned in the literature. This view did not change during the interviews with only one NV leader mentioning this dimension as important. Note that this does not imply that the dimension is unimportant, on the contrary, but compared to the former discussed dimensions this one might be of lesser importance for the successful development of radical innovations.

6.9 DIMENSION 7: ACCEPTANCE OF THE LEADERSHIP STYLE

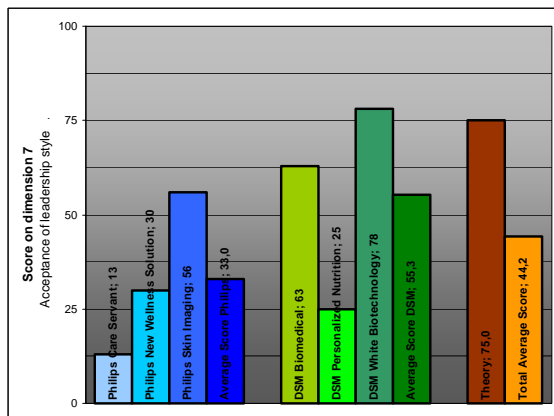


Figure 30: Results dimension 7.

Dimension 7, low acceptance versus high acceptance of the leadership style, concerns whether or not the leadership style equals the style preferred by the employees.

Because the content of this dimension is confidential, more information concerning this dimension is not included in this version of the report. Nevertheless, concluding can be said

that:

Conclusion 7: a medium high acceptance of the leadership style stimulates the development of radical innovations.

During the interviews, much attention was given to the leadership style itself. This has mainly to do with the fact the acceptance of the leadership style is something that is greatly dependent on the leadership style itself. Nevertheless, only two interviewees mentioned that this dimension is very important for the successful development of radical innovations (but what in fact was meant was the leadership style itself). Combined with the findings from the literature, we argue that this dimension is of medium importance for an innovative supportive culture.

6.10 DIMENSION 8: IDENTIFICATION WITH THE COMPANY AS A WHOLE

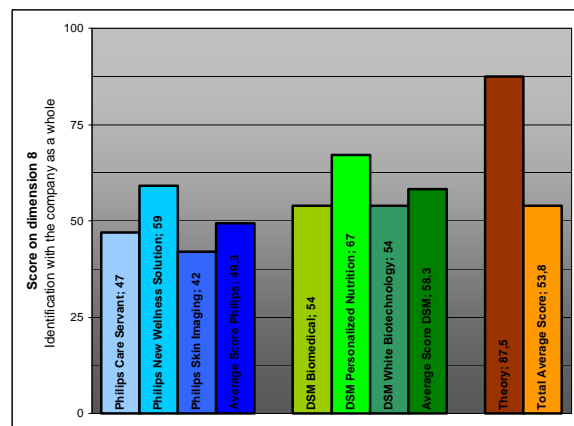


Figure 31: Results dimension 8.

The results for dimension eight are depicted in Figure 31. This last dimension is about the degree to which employees identify themselves with the organization as a whole.

The results³⁵ show that the identification is higher at DSM's NVs as they score between 54 and 67, while Philips' NVs score varies between 42 and 59. So, all NVs share around the same level of identification (50) with the company as a whole, although DSM's NVs, on average, score slightly higher.

The problem with this dimension is that the value for dimension 8 greatly depends on the respondent's interpretation of the questions. As corporate entrepreneurship involves the creation of a company within a company, the items in the questionnaire can be interpreted in two ways, either the identification with the company as a whole, or the identification with NV itself. The questionnaire itself is not discriminating between these two possibilities.

One way to solve this problem is to interview all respondents in an ex-post investigation. Regrettably, this is simply not a feasible option because of time constraints and the burden it places on the case companies. However, the conducted interviews as described in the methodology gave some indications that the former form of identification might be the case, meaning identification with the company as a whole. This would subsequently explain the difference found between the theory and practice. As explained in chapter 4.8, we assumed this score to be for the identification with the NV itself. For this reason we still argue

that these values would have been higher if explicitly measured for the NVs and not for the company as a whole (or a possible combination), something that has been confirmed by all the interviews.

On the other side, another factor to consider while looking at these results is the fact that many people are hired from outside Philips and DSM to work for the different NVs on a temporal base. One of the interviewees told us that if the NVs do not possess the necessary expertise, they will hire it. Subsequently, these people will not identify themselves with the NVs or the nurturing companies (Philips or DSM), but with the company they are actually working for (the one paying their monthly salary).

Note that, if measured only for the company as a whole, this dimension could also be related to the balance of integration and separation. Indeed, if there is much separation, the value is likely to be very low. The opposite is also true, meaning when there is too much integration; the value is likely to be rather high. As explained before in chapter 2, this is also something that IBM (2005) was struggling with; too much integration implies less flexibility, and too much separation could result in, besides resource problems, products being too unrelated to the core competencies of the nurturing company. Nevertheless, seen the results, all NVs seem to have reached a balance.

Following from this discussion we can argue for several different values. But as this dimension is about, as can be seen in chapter 3, the identification with the company as a whole (thus DSM and Philips and not the NVs),

³⁵ A more detailed within-case and cross-case analysis for this dimension is not possible because of the limited amount of data provided by ITIM (2007). However, using findings from other dimensions and the interviews enabled us to get around this limitation.

we argue that this dimensions should be related to the balance of integration and separation. This is then subsequently confirmed by the empirical data. Therefore our proposition will not stand and has to be changed to:

Conclusion 8: a medium identification, implying a balance, with the company as a whole stimulates the development of radical innovations.

The importance of this dimension has been emphasised by two of Philips NV leaders from which at least one is having a program to make people feel more related to the NV. On the other hand, the literature, as could be seen in chapter 4, is not specific about the influence of this dimension on the successful development of radical innovations. Therefore we remain to argue that this dimension is of moderate importance for the development of radical innovations.

Part IV: Conclusions

“A conclusion is the place where you got tired of thinking.”

Martin H. Fischer (1879-1962)

7 CONCLUSIONS

The seventh chapter of this report will give answers to the research questions as outlined in the introduction of this study. First, in section 7.1, the question is answered how a NV should score on each of the dimensions of organizational culture. Thereafter, in section 7.2, an answer will be formulated regarding the second research question, which dimensions are the most important for the development of radical innovations. Then, a final framework is presented summarizing the results from the theoretical section and the empirical findings in section 7.3.

The aim of our study was to formulate an answer to the following question: “What are the requirements for the optimisation of an organizational culture in order to maximise the production of successful, radical innovations?” Therefore, a comprehensive study was performed. The following conclusions are therefore determinations made by studying the results of preceding work in the literature review and the empirical investigation and follow from the discussions.

7.1 RESEARCH QUESTION 1

Starting with dimension 1, a means versus a goal orientation, from the literature review was found that the need for a goal orientation follows from the ambiguity and uncertainty in the beginning of the innovation process of the NV. This because the allowance to work towards results is found suitable for dealing with unfamiliar situations (otherwise people

have to carry out their work in prescribed ways). This is especially important during the early phases of the NVs, the seed stage from the BMD, which is our focus of interest. The allowance for being too goal oriented will also impede radical innovation, as this can lead to many failures as people will be confused with ideas floating around but few sanctioned. Nevertheless, a goal orientation has been identified as the most suitable way to create creative ideas and solutions. Next to this, it has been identified that the balance on this dimension will likely shift towards values below the optimum because of the fact that uncertainty and ambiguity levels decrease during the innovation process. However, the proposed score, a medium strong goal orientation, has been developed for the specified stage and has been confirmed by the literature, the questionnaire, and the interviews.

For dimension 2, internally versus externally driven can be said that the flexibility to focus on potential future customers is of key importance. Therefore it is important that there are not too many procedures and rules set in place, too early in the innovation process of the NV, as this will impede this flexibility as has been shown in this study. In addition, there should be a pragmatic attitude concerning ethics for developing truly radical innovations. This study has shown that to be able to do the latter could also be depended on the product in development, as some products are bound to ethical considerations. Next to this, it has been revealed that a true customer orientation should happen after the market development stage. Nevertheless, it is important to have a strong

focus on the future customers by applying, for example, lead users, indeed balancing technology push and market pull. For the score on this dimension, with the focus late in the innovation process, but early in the innovation process of the NV, this implies that a medium strong externally driven orientation stimulates the development of radical innovations.

The third dimension is about an easy going versus strict work discipline. Here there has to be found a balance between control and freedom. Indeed, following from this study it can be said that too much control is a major obstacle for innovation, as people are not able to work in a creative way because of the strict guidelines and rules (too much bureaucracy). Too less control may also cause problems as seen in the example of Netscape, which was too late in introducing business discipline and subsequently lost a large part of its market share. Indeed, introducing discipline requires a shift on this dimension. The study showed that the balance on this dimension has to shift during the NV's innovation process after the market development stage, as ambiguity and uncertainty levels drop and the project team grows. Besides the place of the NV in the innovation process, this research found that also the potential market has an influence on this dimension, as some products that concern human health are bound to higher levels of structuring. Nevertheless, according to the presented findings it is necessary to be on the 'easy going work discipline' side in the seed stage of a NV. Therefore we conclude that a medium easy going work discipline stimulates the development of radical innovations.

Dimension 4 is about a local or professional focus of interest. The main finding here is that a professional focus of interest will stimulate the development of radical innovations. Indeed, for product innovations there is the need for the in-depth knowledge from knowledge workers, as skills and knowledge in a particular field enhances the possibility of a new and deeper understanding. Next to this, an extreme local focus of interest brings along so much social control that going beyond what is normally accepted becomes impossible, and therefore everybody will behave more or less in the same way, inhibiting the development of radical innovations. Concerning the innovation process of the NV, we argue that this dimension will not change significantly during the lifetime of the NV, as knowledge workers will remain to form the largest part of the team, even if it expands over time. The scores as theoretically predicted, and after further investigation confirmed empirically during this research, are in line with earlier research by Weggeman (2007: 231). Therefore we state that a medium professional focus of interest is most suitable for the development of radical innovation.

For the fifth dimension, open system versus a closed system, this research found that an easy acceptance (open system) will generate the ability to create a diverse knowledge base as it gives the ability to create a diverse workforce. This has been positively related with creative problem solving capabilities and thus the development of radical innovations. Next to this, it has been shown that open innovation policies, which are strongly related to an open

system, are important for successful innovations. Although empirical results (interviews and questionnaire) demonstrate that a very open attitude is difficult to sustain, as secrecy is still considered to be one of the key tools for intellectual property protection. Indeed, this also implies that everybody in the development team should be kept up to date, even if they are not working on a permanent base for the NV. This will allow people to feel accepted by the organization and subsequently create a right level of constructive debate, which has been positively associated with the development of radical innovations. Furthermore, theoretical results show that these employees will not swap their jobs as easily as people working in a closed system. The final conclusion for this dimension is therefore that a strong open system stimulates the development of radical innovations.

Dimension 6 deals with the notions of an employee orientation versus a job orientation. From the literature review it was concluded that NVs should strive after a balance on this dimension. Too much employee orientation can take away the challenge and effectiveness needed for radical innovations, and too much job orientation can, as shown by the empirical results, lead to perceived high work loads and belonging mistakes by the employees. Other reasons in favour of an employee orientation include the ability to attract and keep key people in the organization. Empirical data however suggested that in the beginning of the innovation process of the NV, a somewhat more employee orientation is necessary. Indeed, in the beginning ambiguity and uncertainly levels

are high, and therefore the NV is very depended on the efforts of its (few) employees, which should be triggered by intrinsic motivation. Later on in the innovation process of the NV, presumptive during the market development phase, efficiency and affectivity will become more important which will most likely result in a more job orientation. The results of the theory and empirics thus show that a moderate people orientation stimulates the development of radical innovations best.

For dimension 7 there was not much to be found in literature that related the acceptance of the leadership style to innovation. Nevertheless, this research could draw several conclusions regarding this dimension. These conclusions are not published here since they are confidential.

The last dimension, 8, concerns the identification with the company as a whole. The expectations from the theoretical section that a high identification will lead to intrinsic motivation were confirmed during the interviews. Nevertheless, uncertainties about what exactly was measured, makes it difficult to draw a valid conclusion for this dimension. The results can be either the identification with the company as a whole, but it might also be the identification with the NV itself. For the latter, one could then argue that a high identification is desirable for the development of radical innovations, as indeed, this will lead to high(er) levels of intrinsic motivation. In that case the score could be seriously influenced by the many people that are working on a temporarily bases for the NV (and subsequently do not identify themselves with the NV). For the former reasoning one could argue that it is related to

the balance of integration and separation. Indeed, for the successful implementation of corporate entrepreneurship, a certain degree of separation is necessary. Too much integration implies less flexibility. On the other hand, too much separation could result in products too unrelated to the core competencies and give resource problems. Note that here the influence of hired people on a temporarily bases could be seen as positive aspect, bringing balance on this dimension. We assume, seen the presented empirical findings, that this in fact has been measured. Therefore the conclusion for this dimension is that a medium identification with the company as a whole, implying a balance, stimulates the development of radical innovations.

7.2 RESEARCH QUESTION 2

As discussed throughout chapter 4, and summarized in section 4.9, we argue that the most important dimensions of an OC for the development of radical innovations are the dimensions 1, 2, 3, and 5. During the interviews, after explaining and discussing all of the dimensions, the interviewees were asked what, according to them, were the four most important dimensions for the development of radical innovations. Their score is depicted below in table 25.

Dimension:	1	2	3	4	5	6	7	8
Theoretical Results	X	X	X	X	X			
Biomedical	X	X	X	X	X			
Personalized Nutrition	X	X	X	X	X	X		
White Biotechnology	X	X	X	X	X			
Director NBDS Philips	X	X	X	X	X			
Skin Imaging	X	X	X	X	X		X	X
New Wellness Solution	X	X	X	X	X		X	X
Care Servant	X	X	X	X	X		X	X
Total Votes	8	7	4	2	5	1	2	2

Table 16: Most important dimensions following from the interviews.

Unanimous agreement has been reached on dimension 1, optimally with a medium strong goal orientation, which has been identified by everybody as important. The main reason for this finding is that it allows for risk taking (as this is one of the main characteristics of an entrepreneurial venture where iterations are common) and a belonging focus on results. Indeed, no radical innovation would be possible without taking risks. Therefore dimension 1 is most important for the development of radical innovations.

Dimension 2, optimally with a medium strong externally driven orientation, is also recognized by many as important for the development of radical innovations. Although the technology is often the distinguishing part of an invention, a new venture should make the transition from an invention into an innovation by adapting the product to the customer's wishes. Furthermore, for the development of a product often external parties are involved. Therefore an external focus is of crucial

importance for firms who want to respond to opportunities for radical innovations.

The third dimension, optimally with a medium easy going work discipline, is selected by 3 out of the 7 interviewees. Nevertheless, it is this dimension which allows employees to behave in a creative manner making it of crucial importance for an innovative OC.

Dimension 4, optimally with a medium professional focus of interest, measures till what extent it is allowed for an individual to deviate from the internal norm. Note that knowledge workers will remain to form the majority of people working for the NVs, implying an 'automatic creation' of a professional focus of interest. This makes this dimension of moderate importance for the development of radical innovations as also reflected Table 16.

The majority of the interviewees stated that dimension 5, optimally with a strong open system, is important for the creation of an innovative OC. The main reason identified was that this dimension allows NVs to attract a diverse workforce which has a positive effect on constructive conflict and subsequent prevention of 'group thinking'. Next to this, dimension 5 closely relates to the concept of open innovation, which has been identified to be crucially important for the development of radical innovations.

Dimension 6, optimally with a moderate people orientation, has been identified to be of moderate importance as it is only mentioned by one interviewee. This had mainly to do with the possible prevention of mistakes as a result of too high work pressures. Next to this, this

dimension could lead to increased intrinsic motivation of the employees. Nevertheless, following from the literature and the interviews, we consider this dimension to be of moderate importance for the development of radical innovations.

When considering dimension 7, optimally with a medium high acceptance of the leadership style, it is important to separate the acceptance of the leadership style, and the actual leadership style. Indeed, the actual leadership style can be related to many other dimensions, making this dimension very important. Although this research found a likely relation between the two, further (empirical) research is needed to proof this relation. Therefore, resulting from this study, we argue in line with our interviewees that this dimension is of moderate importance for the development of radical innovations.

The last dimension of our analysis, dimension 8, optimally with a medium identification with the company as a whole, is found to be most likely related to the amount of integration versus separation of the NVs. Although important for the development of an innovative OC, we argue that other dimensions are more important. This is mainly because the interviews revealed that around half of the people are hired in from several companies, thereby creating a balance on this dimension when talking about the identification with the company as a whole.

So we conclude that for a NV dedicated to the development of radical innovations and in the beginning of their innovation process, all dimensions have to be taken into account and

are important for having an innovative, entrepreneurial culture. However, our study suggests that NVs, comparable to those at Philips and DSM, at the start of their innovation process, should be at least result oriented, externally focused, easy going and have an open system.

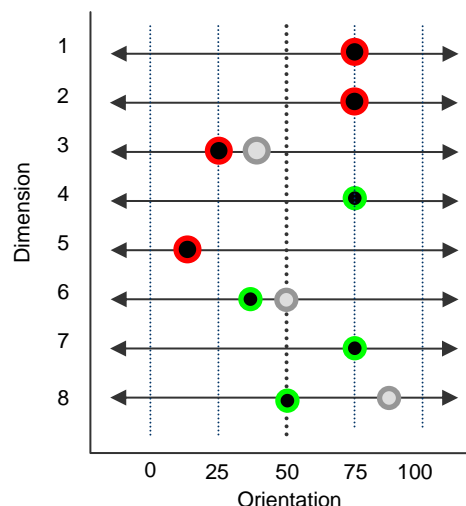
7.3 FINAL FRAMEWORK

Following from the former two sections, the final framework of our research is presented in Figure 32. Seen from the findings of the literature, the values of some dimensions have been changed as a consequence of the empirical part of this research (the old values are depicted by grey dots). Indeed, these dimensions are 3, 6, and 8. The dimensions considered to be the most important for the development of an innovative OC (1, 2, 3, and 5), were confirmed during the empirical part of this research and are denoted as the red dots.

For the readers' convenience, Table 17 again shown here, allowing for an easier interpretation of Figure 32.

0 = extreme	37,5 = moderate	75 = medium
12,5 = high	50 = balance	87,5 = high
25 = medium	62,5 = moderate	100 = extreme

Table 17: Propositions transcribed into values.



- 1 – Means versus Goal oriented.
- 2 – Internally versus Externally driven.
- 3 – Loose versus Tight discipline.
- 4 – Local versus Professional.
- 5 – Open versus Closed systems.
- 6 – People versus Work oriented.
- 7 – Low or High acceptance of leadership style.
- 8 – Low or High identification with the organization.

Figure 32: Summary of the conclusions of the research questions.

8 LIMITATIONS AND FURTHER RESEARCH

First of all, there is still a fierce discussion whether something as abstract as organizational culture can be measured with survey instruments (Schein, 1990). As we followed the theories as proposed by Hofstede (1980), discussed in chapter 3, we take the position that it is possible. Nevertheless, a problem has been identified with this approach. The eight dimensions have been statistically derived from large samples of items, indeed, giving this method reliability and validity. However, it is not clear whether the initial item set is broad enough or relevant enough to capture what may for any given organization be its critical cultural themes.

The next limitation that applies to this research is the measurement of OC at only one moment in time. This makes it more difficult to draw conclusions regarding the innovation process as described in the discussion and conclusion. It would have been interesting to measure the OC over an extended period of time in order to confirm the expected change in OC after the market development stage. Next to this, it could be very interesting to link OC to the specific stages of the innovation process to a further extent than described in this report. This may give more insight in the practices needed in order to maximize the production of successful, radical innovations. See the managerial implications, chapter 9, for more insight into the expected shift.

Related to this is the measurement of OC by using mainly the questionnaire. Indeed, it

would have resulted in more valid results if we would have been able to interview all the respondents in order to confirm the results from the questionnaire. Also, because not all the employees filled out the questionnaire. However the limited resources did not allow for such a large scale operation. Nevertheless, the conducted interviews confirmed our findings from the questionnaire.

In this research we assume that the measured NVs are innovative in a radical manner. Although we are convinced that they are, there is no empirical evidence for this claim. Therefore, further research should investigate how the innovativeness of NVs should be measured. Our findings concerning this topic can be found in Appendix D: Innovative Performance. Next to this, the described methodology in chapter 5 and the information given in Appendix C: Statistical Conditions, can be used as a starting point to set-up such a research.

Next to this, we assume that the innovativeness of an organization is (partly) dependent of its culture. Again, as can be seen in Appendix E: The relation between innovative performance and organizational culture, we have good reasons to do so. However, it could also be the other way around. Innovations may have a severe impact on the organizational culture (Elst et al., 2007). The innovativeness of an organization could have its influence on the OC. This is line with the figure of creativity, Figure 5. Indeed, new solutions (innovations) may lead to new accepted practices (following from chapter 3), newly introduced practices may then lead to innovations. Also other

(external) factors could have their influence on this relationship, such as the strategy and structure of an organization. Further research could investigate the above described relations.

A sample size of 6 NVs is too small to draw any real statistical conclusions about this subject. Future research could try to continue with this study, but testing the model on a larger sample while considering the link between innovativeness, the place of the NV in the innovation process, and the OC of the NV.

The last limitation of our study is the fact that we searched for a particular score on each dimension. This implies that the proposed values should be considered as indications from which can be deviated to a small degree. This on the other hand means that follow up research could investigate the amount of deviation allowed per dimension so that the OC is still able to maximize the production of successful, radical innovations.

Hofstede (1991) and ITIM (2007) argue that their dimensions are mutually exclusive, implying no relationship between the dimensions of OC. Nonetheless, we argue, based on suggestions in literature and remarks during the interviews, that there are some possible relationships which could be researched further.

The first possible related dimensions are dimension 7 and dimension 1. We argue that the leadership style at a company could have influence on the way employees are coordinated. The second possible related dimensions are dimension 7 and dimension 5. As revealed in the questionnaire, the leader determines till a large extent whether a NV has

an open or a closed system. The third possible related dimensions are dimension 7 and dimension 6. The same as the previous suggestion counts for these dimensions. A leader of a NV determines for a large amount whether a NV is employee oriented or job oriented. The fourth possible relationship is between dimension 2 and 3. Both these dimensions are influenced by the rules and procedures within an organization as could be seen at the results from DSM's NVs. As already explained, dimension eight is not clearly defined. It is possible that dimension 8 is related and based on the results of all other dimensions as the identification with a company can depend on many factors.

Besides the possible causal relationships between some of the dimensions, further research could also be performed into combinations of dimensions that enhance innovation, in stead of a score on each dimension separately (like proposed in this research). As suggested by the results, the NV Care Servant has a medium low score on dimension 5 (open system) and an extreme high score on dimension 2 (external orientation). This could imply that there is too much focus on a particular market, in combination that they are not open to new markets, which could impede the development of radical innovations.

As last remark concerning future research we would like to argue that, besides that the innovation process asks for interdepartmental collaborations, meaning collaborations between the different OSCs, OSCs could be used as a tool for creating a balance between incremental and radical innovations (indeed, creating a

ambidextrous organization). This might be reached by shaping the correct OSCs which enable organizations to balance incremental and radical innovation. For example, when small ventures are taken over by a large organization, they often do not live up to their assumed potential, this may be caused by the wrong sets of OSCs (Hofstede, 1998:b).

Doing research in the social sciences is always influenced by factors like: (1) enactment, (2) priming, (3) the hermeneutic circle, (4) situatedness, and (5) sense-making. We have taken notice of these factors, and considered them during the research. More information can be found in Appendix F: Barriers for the social sciences.

9 MANAGERIAL IMPLICATIONS

This last chapter of the study will first address the general managerial implication of this research. After this, in sections 9.1 till 9.6, each investigated NV is addressed and specific managerial implications are given in order to improve the organizational culture for the development of innovations. Note that an OC is difficult to change, but possible, as explained in chapter 3. Therefore we give specific examples per NV how to further optimize their OC for the development of successful radical innovations. We will end this chapter with some interesting findings that concern differences between Philips and DSM in section 9.7.

One could argue that the implementation of corporate entrepreneurship is about achieving a different OC compared to the nurturing organization. Subsequently, a focus on the development of the correct OC for corporate entrepreneurship can have a great positive impact on the successful development of radical innovations. The model presented in the conclusions of this report, and depicted in Figure 32, can act here as a benchmark for NVs in the early stages of their innovation process in order to achieve the correct OC for this purpose.

First we would like to stress the importance of four dimensions and their specific scores needed for the successful development of radical innovations: (a) dimension 1 should score a medium strong goal

orientation as a focus on results and allowance for risks stimulates the development of radical innovations; (b) dimension 2 should be a medium strong externally driven orientation implying a focus on future customers and markets. (c) Dimensions 3 should score a medium easy going work discipline as this will create an allowance for creativity by having an easy going work discipline. (d) The last one, dimension 5, should score as a strong open system as this will stimulate the creation of a diverse workforce and the usage of the concept of open innovation. Although all the dimensions combined make up an OC, this model allows for conceptual parsimony, meaning that it allows for a selection of the dimensions that have the greatest impact on the development of radical innovations. Nevertheless, this does not imply that the other dimensions are unimportant and should thus also be considered by NVs willing to optimize their OC.

Indeed, the outlined optimal OC should be valid for the early stages of the NV. Another managerial implication is the shift in the OC that is to be expected during the market development stage of the BMD. We argue that NVs should adapt their OC accordingly. Although future research has to define the exact values, this research found that the scores on the following dimensions are likely to change: dimension 1, towards means and dimension 3, towards a more strict work discipline as more procedures and internal structuring will be set in place to manage the growing group. As a result of a reduction of uncertainty and ambiguity, the NV will also automatically turn

a bit more job oriented, so dimension 6 is also likely to change. (d) Last, in order to achieve the change on dimensions 1 and 3, the leadership style should change. Therefore, the acceptance will automatically decrease.

For the readers' convenience we have included a graph per NVs relating the scores of these NVs with the conclusions. Next to this, the legend of the dimensions can be found in Figure 33 below.

- 1 – Means versus Goal oriented.
- 2 – Internally versus Externally driven.
- 3 – Loose versus Tight discipline.
- 4 – Local versus Professional focus of interest.
- 5 – Open versus Closed systems.
- 6 – People versus Work oriented.
- 7 – Low or High acceptance of leadership style.
- 8 – Low or High identification with the organization.

Figure 33: Legend of the eight dimensions.

The focus in the next sections will be placed upon the four dimensions which were identified as most important.

9.1 PHILIPS' CARE SERVANT

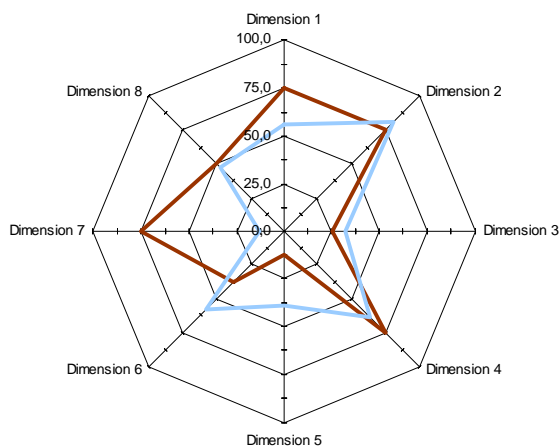


Figure 34: Results Philips' Care Servant.

Care Servant is the only NV which is currently at the market development stage. This fact has to be considered while looking at Figure 34 as has been discussed in the beginning of this chapter. The brown line denotes the theoretical optimum and the blue

line represents the OC of Care Servant.

Dimension 1 is found to be more on the means side compared to the other NVs which can indeed be explained by the fact that this particular NV is currently positioned in the market development stage. Nevertheless, it has been found that promises are often violated, and a focus is placed on only mentioning failures. Attention should be paid in order to correct these problems in the future.

The next dimensions, 2 and 3, have rather good scores and no further recommendations can be made. However, for dimension 5, the questionnaire revealed several problems which cannot be explained by the current position in the innovation process. These are that the employees do not share their opinions with the leader. Next to this, management fails to keep everybody up to date, and last, personal issues are not discussed with the leader. These identified issues cause this dimension to score not as open as recommendable.

9.1.1 OPTIMIZING CARE SERVANT

The problems concerning the OC of Philips Care Servant seem to be related to the team, and more specific to the coherence of the team. These problems result in a rather closed score on dimension 5 and a low acceptance on dimension 7. It is on these two dimensions where we see the biggest opportunities for improvements for this particular NV. We argue that if more attention is paid to communication by allowing employees to share their ideas (by whatever means), and that subsequently management keeps everybody up to date, a positive increase will occur on dimensions 5 and 7. The former because the NV will be more

open for its own employees, and the latter because the leadership style will be more accepted. More information concerning dimension 5 can be found in the last section, 9.7. Furthermore, attention should be paid to the issues found at dimension 1. This implies that attention should be paid to the promises made and an emphasis on giving compliments in stead of a focus on failures. These measures will most likely lead to an improvement in the trust levels of the employees and a more coherent team stimulating the development of successful radical innovations.

9.2 PHILIPS' NEW WELLNESS SOLUTION

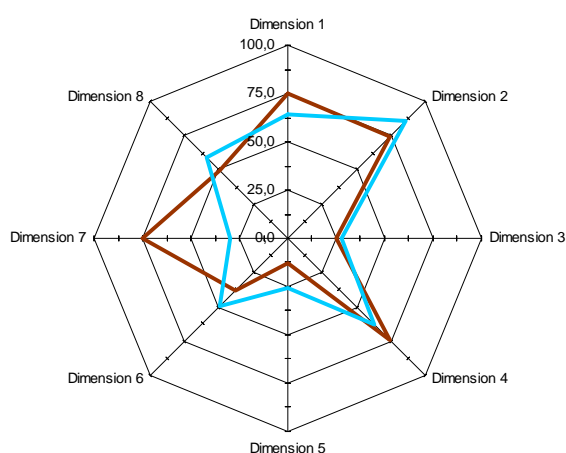


Figure 35: Results Philips' New Wellness Solution.

New Wellness Solution is currently positioned at the end of the seed stage and can subsequently be compared with the proposed model. The results are depicted in Figure 35, where the blue line represents New Wellness Solution and the brown line the theoretical optimum.

This NV scores in line with the theoretical model on the four most important dimensions. Nevertheless attention should be paid to the small differences on dimension 1 and 2. Indeed,

the focus should remain on results, and taking risks should be stimulated to a certain extent, next to a focus on multiple future markets. Dimension 5 seems to score in this way, mainly because management fails to keep everybody up to date.

9.2.1 OPTIMIZING NEW WELLNESS SOLUTION

This NV scores rather well on most of the dimensions and we have only few suggestions for further optimization of the OC. The first one is related to dimension 5, and implies that employees should be informed in more detail about the progress of the project by management. Indeed, this could result in the NV being more open towards its own employees which subsequently stimulates the development of radical innovations. More information concerning dimension 5 can be found in the last section, 9.7. Belonging, but related to another dimension, is that the employees of this NVs should be involved more in the decision making process. This will help to develop a more suitable leadership style, which could result in a higher acceptance. Doing so will enable the NV to keep track of all ideas.

9.3 PHILIPS' SKIN IMAGING

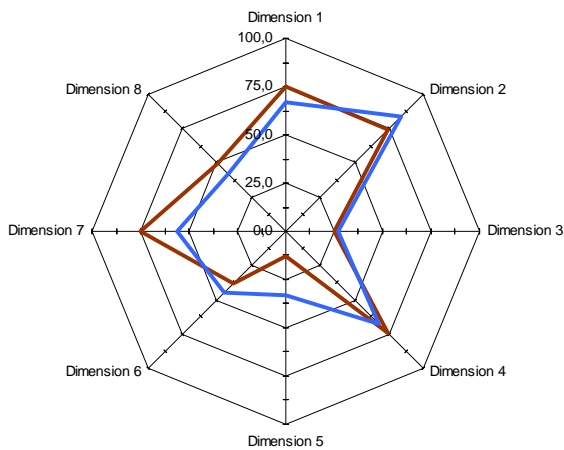


Figure 36: Results Philips' Skin Imaging.

Philip's Skin Imaging is currently positioned at the end of the seed stage. For this reason, it can be compared well with the proposed model. In Figure 36, the blue line represents the OC found at Skin Imaging, the brown line the conclusions from the research.

As can be seen in this figure, Skin Imaging is scoring rather well compared to the developed model. Indeed, from the four most important dimensions, only dimension 5 has a deviation from the theory. This is mainly because of the secrecy of this NV. The questionnaire revealed that the organization is very closed, even for its own employees. Next to this, management seems to fail to keep everybody up to date.

9.3.1 OPTIMIZING SKIN IMAGING

Although this NV has a good fit with the proposed model for the optimal OC, it has comparable points of improvement as the before described NV; New Wellness Solution. Dimension 5, which shows the largest deviation from the four most important dimensions, can be improved by involving employees more in

the decision making process. This is important as the empirical results showed that employees perceive that the important decisions are made by individuals. Belonging, employees should be kept up to date by management in order to make this NV more open for its own employees. These improvements can stimulate the successful development of radical innovations. More information concerning dimension 5 can be found in the last section, 9.7.

9.4 DSM'S BIOMEDICAL

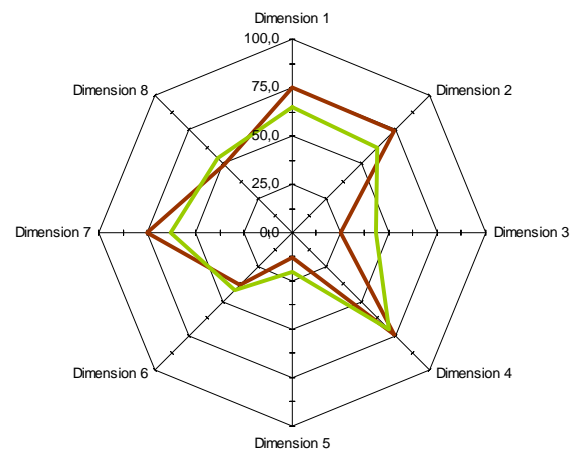


Figure 37: Results DSM's Biomedical.

The stage in which DSM's Biomedical is currently positioned is at the beginning of the product development stage. Again, this implies that it can be compared to the developed model. Figure 37 shows the results of this NV in the green line. The brown line denotes the model as explained in the conclusions.

Starting with the first dimension, a small difference is observed with the model. Results suggested that this is because promises are often violated, resulting in a more means orientation.

For dimensions 2 and 3, a comparable

reason has been found for the deviating score on these dimensions: Procedures and the emphasis on following them correctly, next to a stress on honesty and ethics. This leads in dimension 2 to a limitation in the flexibility to focus on future markets (external orientation). In dimension 3, it results in the belief that creativity can flourish in tight surroundings, something that contrasts with the theory and the proposed model.

Dimension 5 scores rather good, except for findings that management fails to keep everybody up to date. So, also at this dimension there is room for improvement.

9.4.1 OPTIMIZING BIOMEDICAL

In spite of the fact that this NV is scoring rather well according to the developed optimum, it can be said that the OC might be further improved if attention is paid to dimensions 2 and 3. These two dimensions are affected by procedures and the focus on correctly following them. Regarding the findings from this study, a too large focus on correctly following the procedures may seriously inhibit the ability to successfully develop radical innovations. For dimension 2, it may inhibit flexibility needed to pursue future markets. For dimension 3, it could result in employees not being able to work in creative ways. Note that this might indeed imply a problem in the amount of separation as will be discussed in the final remarks later on. Nevertheless, this NV should try to 'loosen up', which implies that the focus should shift away from procedures, in order to further stimulate the successful development of radical innovations. Next to this, a focus should be

placed on building a better relationship with the employees by keeping them up to date and preventing the violation of promises as this might improve scores on, respectively, dimensions 5 and 1.

9.5 DSM'S PERSONALIZED NUTRITION

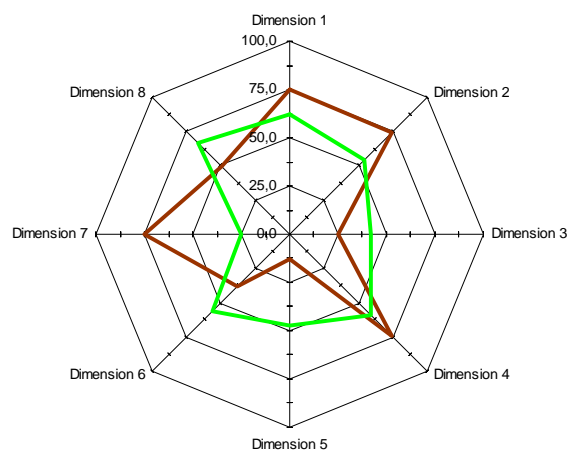


Figure 38: Results DSM's Personalized Nutrition.

DSM's Personalized Nutrition is at the start of the product development stage thus its OC is suitable to be compared with the proposed model. The green line in Figure 38 denotes the OC of Personalized Nutrition while the brown line represents the proposed model.

Indeed, concerning the four important dimensions, all of them seem to be scoring significantly different compared to the model. This might have something to do with the NV's reorganization; nevertheless, an elaboration will follow concerning these differences.

Starting with dimension 1 it can be said that this value is lower than expected because of the tendency to only mention failures. This subsequently leads to a more means orientation.

Dimensions 2 and 3 are related and the reasons are comparable as discussed at Biomedical. Indeed, it is about following the

procedures in a correct manner, next to the emphasis placed on ethics. This results in less flexibility concerning an external orientation for dimension 2, and the belief that creativity can flourish in tight surroundings concerning dimension 3. Indeed, these two attitudes have been found to impede the development of radical innovations.

Concerning the last of the most important dimensions, 5, several problems have been identified that cause this rather high score: (1) Management fails to keep everybody up to date. (2) Personal issues are not discussed with the boss. (3) The organizational is closed, even for its own employees.

9.5.1 OPTIMIZING PERSONALIZED NUTRITION

The results of the research show that this NV has both problems as found at DSM and as some common problems found at Philips' NVs. Dimensions 1 could be improved by a focus on good results. Indeed, the perceived score on this dimension is lower than would be wishful and may subsequently hamper the development of innovations. Next to this, the OC may be further optimized by loosening the emphasis on correctly following the procedures, as was described at the NV Biomedical. Indeed, a too low score on dimension 2 might imply a lack of flexibility to pursue future markets, and a too high score on dimension 3 may inhibit employees' creativity. The last aspect that could be further optimized is dimensions 5. For dimension 5 to be improved, everybody should be kept up to date. This may subsequently lead to a more coherent team, but also implies that the NV is more open towards its own

employees, which stimulates the development of radical innovations. Most of the found differences could be related to the reorganization. It is however of importance that trust is build among the team in order to improve dimensions 1 and 5.

9.6 DSM's WHITE BIOTECHNOLOGY

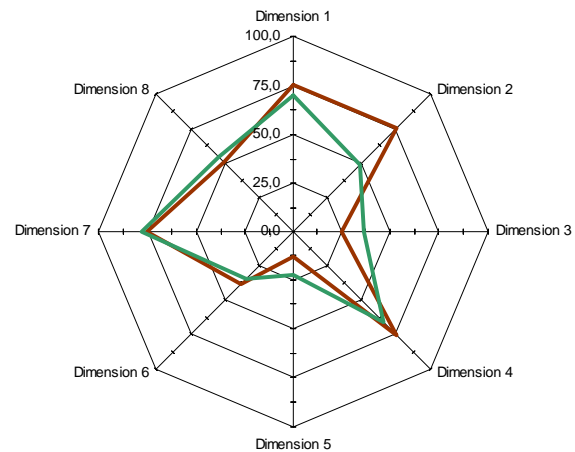


Figure 39: Results DSM's White Biotechnology.

DSM's White Biotechnology is currently located in the seed stage, making its OC very comparable with the proposed model. In Figure 39, the OC of White Biotechnology is represented in the green line. The proposed model is denoted by the brown line.

Dimension 1 has a rather good score, and subsequently no further information can be given regarding this dimension.

Nevertheless, the same phenomena regarding dimension 2 and 3 has been observed as seen at the other two investigated NVs from DSM. The emphasis on the procedures and correctly following them, next to the stress placed on ethics. Indeed, with the same results, less flexibility to achieve an external orientation regarding dimension 2. Concerning dimension 3, the belief that creativity can also flourish in

tight surroundings is in contrast with the theory, which states that creativity is hampered by tight surroundings.

Regarding dimension 5, which scores slightly higher than recommendable, can be said that management fails to keep everybody up to date. This subsequently causes the difference with the model.

9.6.1 OPTIMIZING WHITE BIOTECHNOLOGY

The only problem seen at White Biotechnology seems to be the struggling with the procedures put in place, as there is a strong emphasis on correctly following them. Indeed, the same as observed at the other NVs from DSM. This might inhibit the innovative performance and therefore this focus should be on a more pragmatic attitude and a more easy going work discipline. This is important to be able to be flexible regarding its focus on future markets (dimension 2), and to enable the employees to act in a creative manner. If this NV is able to loosen the rigid procedures, it would score in a perfect manner according to the developed model for this stage in the innovation process. The small difference at dimension 5 could be further improved by keeping all employees up to date as this will make this NV more open. These improvements would likely further stimulate this NV's ability to successfully develop radical innovations.

9.7 FINAL REMARKS

Some issues can be found at all NVs of which the failure of management to keep everybody up to date is one. This may be explained by two reasons:

(1) First, a large part of the team is

composed of external people hired in on a temporarily bases in order to tackle a specific problem. Because of the specific tasks that are given, it may seem irrelevant to keep these people up to date concerning all aspects; indeed, it may even hold a threat to the intellectual property (which may explain why some organizations are closed, even for its own employees, resulting in a more closed system). Nevertheless, it should not be forgotten that external people are forming a large part of the team, and subsequently are thus a major cause of the OC which has been measured. In that sense, they should also be involved in the whole process in order to improve the OC.

(2) The fact that the manager was usually the person who started the NV implies that he or she has much knowledge concerning all the aspects related to the NV. This vision may cause problems to keep everybody up to date as the team grows during the innovation process.

Note that next to this, at all investigated NVs from DSM it was observed that procedures are playing a very important role. This indeed suggests that the NVs are not separated enough from the mother organization and implies a focus on the structure of the organization; something that was not considered in detail during this research. Nevertheless, further separating the NVs from the mother organization (both physically as in procedures), might solve the problems concerning dimensions 2 and 3 (which were identified as being most important) and could increase the potential to successfully develop radical innovations. Indeed, at Philips the NVs seem to be more separated from the mother organization

than at DSM. Not only in procedures, but also because their NVs are physically separated at the High Tech Campus. These might subsequently explain the found difference in scores at dimensions 2 and 3.

At Philips, the main obstacle concerns dimension 5. All the NVs seem to score too much towards a closed system. Although at Philips open innovation is an important issue (that is indeed partially the reason why the NVs are situated at the High Tech Campus), the NVs could have problems utilizing this concept. Following the results, we argue that this is partially because of intellectual property protection and partially because of the ‘not invented here syndrome’. These issues may follow from the fact that at Philips, the largest part of the product is developed by the Philips NVs themselves, decreasing the perceived usefulness of an open system. The combination of the high score on dimension 2, and the relative high score at dimension 5, could imply that at Philips’ Life Style Incubator open innovation is not used optimally, as there is too much focus on (only) a few external partners and customers. Conversely, at DSM the development of products involves many partners. This is mainly caused by the very complex products in development, making many relations necessary as “DSM cannot know everything themselves”. This is subsequently reflected in their score on dimension 5.

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APPENDIX A: BUSINESS PLAN EVALUATION AIDS

There are several methods found in literature to make decisions concerning the potential success of incubators by assessing milestones and those methods are grouped under the name Business Plan Evaluation Aids (BPEA). Mainprize and Hindle (2005) described five methods in their article namely the: (1) Venture Opportunity Screening Guide, (2) Bell-Mason Diagnostic, (3) ProGrid Venture, (4) FVRI System, and the (5) New Venture Template.

(1) The Venture Opportunity Screening guide (Timmons, 1994) is a paper based decision aid that is composed of two stages. The first stage, a Quick Screen, is designed to screen several plans down to a select few, using a shorter version of the complete criteria. After the initial screening stage, the full version includes 55 cues rated on a scale from high potential to low potential. Of these cues, 43 use qualitative anchors at each end of their scale, and the remaining 12 cues are anchored with quantitative values. Timmons (1994) derives these 55 cues from a list of criteria for evaluating venture opportunities based on his experience plus a variety of studies in the field of entrepreneurship. So, The Venture Opportunity Screening guide and its 55 judgment criteria are based on researched venture attributes. However, it does not have a method to combine these 55 criteria to determine the overall potential viability of the entrepreneurial business plan (EBP). Without a method to weight the importance of each of the 55 cues, an overall conclusion will be based on unsystematic judgementalism (Mainprize and Hindle, 2005).

(2) The Bell-Mason Diagnostic (BMD) (Bell, 1991: 252) seeks to evaluate companies quantitatively. The diagnostic is a rule-based tool that is applied manually to characterize the status of a high-technology venture at five predetermined stages (concept, seed, product development, market development, and the steady-state). The BMD is designed to evaluate 12 dimensions and plot them against an ideal situation on a relational graph. The 12 dimensions, which are listed below, encompass the most important factors that influence the course of a start-up. (1) Business plan, (2) Marketing, (3) Sales, (4) CEO, (5) Team, (6) Board of Directors, (7) Cash, (8) Financeability, (9) Operations/ Control, (10) Technology/ Engineering, (11) Product, (12) Manufacturing. The diagnostic is carried out by answering a series of 70 yes or no questions that are derived from 700 rules for the success of a new venture. Bell (1991: 271) derived the dimensions and rules from his own experience and understanding from working with hundreds of ventures. The strength of this method lies in its ability to assess the venture through the five stages of growth. This method does not have an algorithm, or some systematic means, to weight the importance of each cue to the overall viability of the EBP (Mainprize and Hindle, 2005).

(3) ProGrid Venture (Bowman, 1997) is a software-based BPEA that consists of 12 cues that concentrate on 3 characteristics of an opportunity: (1) the venture, (2) the connectors, and (3) the benefits/ impact. The 12 cues are evaluated on a 4-point ordinal scale whereby each of the 4 points is qualitative anchored. Bowman (1997) derived his 12 cues based upon his experience and testing with

commercial clients. No literature about new ventures is cited so we may conclude that the source of the twelve cues is individual cognition. Compared to the previous two methods, this method does have an actuarial model operationalized by computer software that optimally combines the values assigned to the individual criteria. This is done by means of using a weighted algorithm to derive the potential viability of the new venture. An example of a ProGrid Venture's summary charts and analysis are given in Figure 43 and Figure 44.

(4) The FVRI system (Fied et al., 2003) is a paper based BPEA that aims to predict the wealth-creating potential of venture ideas. The BPEA uses 51 cues to asses 4 wealth-creating attributes namely (1) fit, (2) value, (3) rarity, and (4) inimitability. The 51 cues consist of 45 Likert scales (from 0 to 5) and 6 cues that require numeric values. The FVRI System enables the judge to rate and enter values for the 51 questions independently. The underlying theory of this model is based on the authors' theoretical research, giving it a more solid background than the other models discussed till now. The FVRI System also requires that the user assigns weights to all factors, where the sum of all weights must equal one. The model combines the values assigned to the individual criteria using a weighted algorithm to derive the wealth creating potential of a venture idea.

The New Venture Template (Mitchell, 1994) is a web-based software decision aid. The BPEA uses 15 cues to asses 6 viable venture attributes. Answering is possible on a 9-point Likert scale. The 15 cues are divided into innovation, value, resistance, appropriability, and flexibility. The model, driven by the software, optimally combines the values assigned to the individual criteria using a weighted algorithm to derive the potential viability of the new venture in terms of the 15 cues. Two graphical displays in the form of charts summarize the analysis of the actuarial model. Afterwards it is compared with 14 venture prototypes and matched to the one it most correlates with. From this analysis it becomes possible to categorise the result into a quadrant; long term/lower profit, long term/higher profit.

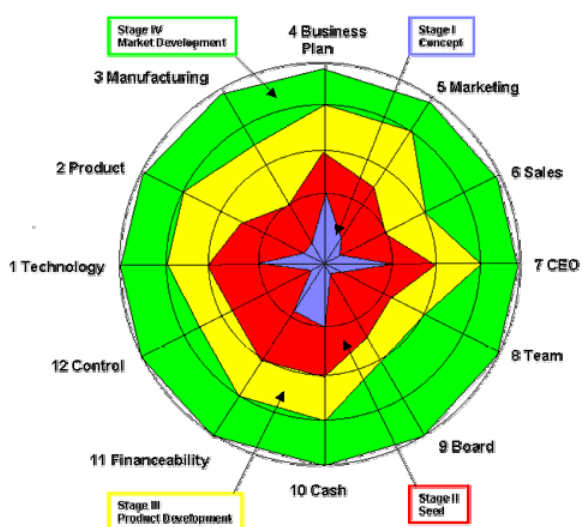


Figure 40: 12 Dimensions and 4 Stages of the Bell-Mason Diagnostic (Mainprize and Hindle, 2005).

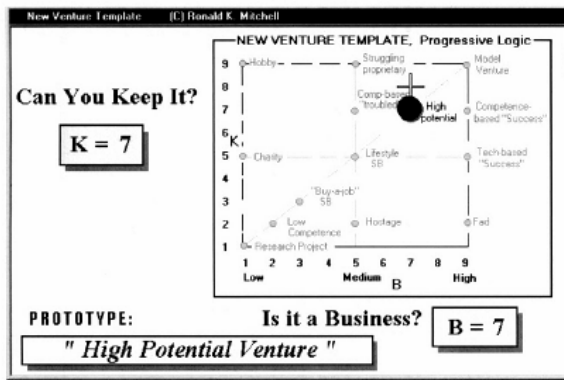


Figure 41: New Venture Template Profile Chart (Mainprize and Hindle, 2005).

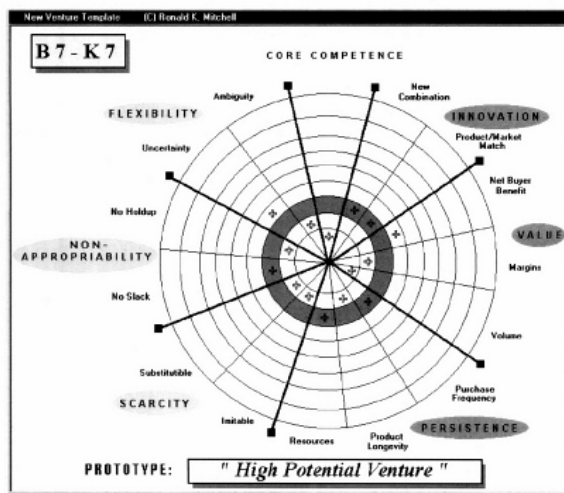
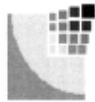


Figure 42: New Venture Template Radar Chart (Mainprize and Hindle, 2005).



ProGrid VC - an evaluation of the "investment readiness" of a new Venture:

Name of Entrepreneur: Brent Mainprize
 Venture Title: Brent's Sample Venture

Summary of the Venture:

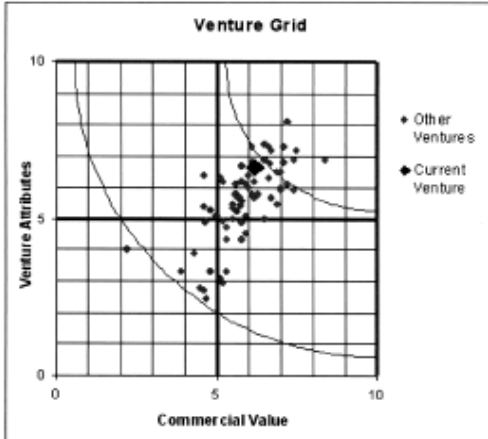


Chart 1 - The Venture Grid

This chart shows the current grid position for the venture, in terms of the two overarching criteria - the Venture Attributes and the expected Commercial Value of the venture. The chart also compares the current grid position of the venture to a sample of other ventures that have been evaluated using the same criteria.

The location of the venture in the Venture Grid is:

Commercial Value = **6.2**
 Venture Attributes = **6.7**
 Overall Score = **64%**

(The overall score represents the distance towards the point x=10 and y=10, with the point 10,10 representing 100% and the point 0,0 representing 0%)

Chart 2 - Venture Profile

This chart shows the ratings for each of the performance criteria as rated by the evaluator. This chart is very useful in identifying the strengths (tall bars) and weaknesses (short bars) of the proposed venture.

The next step in obtaining venture funding is to have your assessment validated by three external reviewers. If you would like to proceed with this evaluation, please contact ProGrid Ventures Inc. by e-mail at:
 info@progrid.nu

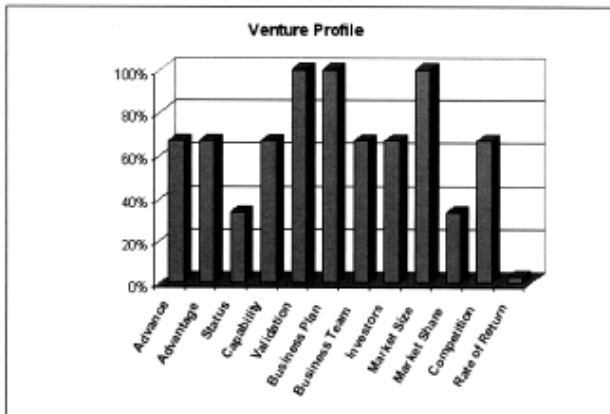


Figure 43: ProGrid VC - an evaluation of the 'investment readiness' (Mainprize and Hindle, 2005).

<u>The Venture</u>	<u>The Connectors</u>	<u>Benefit/Impact</u>
Advance	Validation	Market Size
Advantage	Business Plan	Market Share
Status	Business Team	Competition
Capability	Investors	Rate of Return

Figure 44: ProGrid Venture Characteristics and Associated Decision Cues (Mainprize and Hindle, 2005).

APPENDIX B: THE STAGES OF GROWTH FOR A START-UP

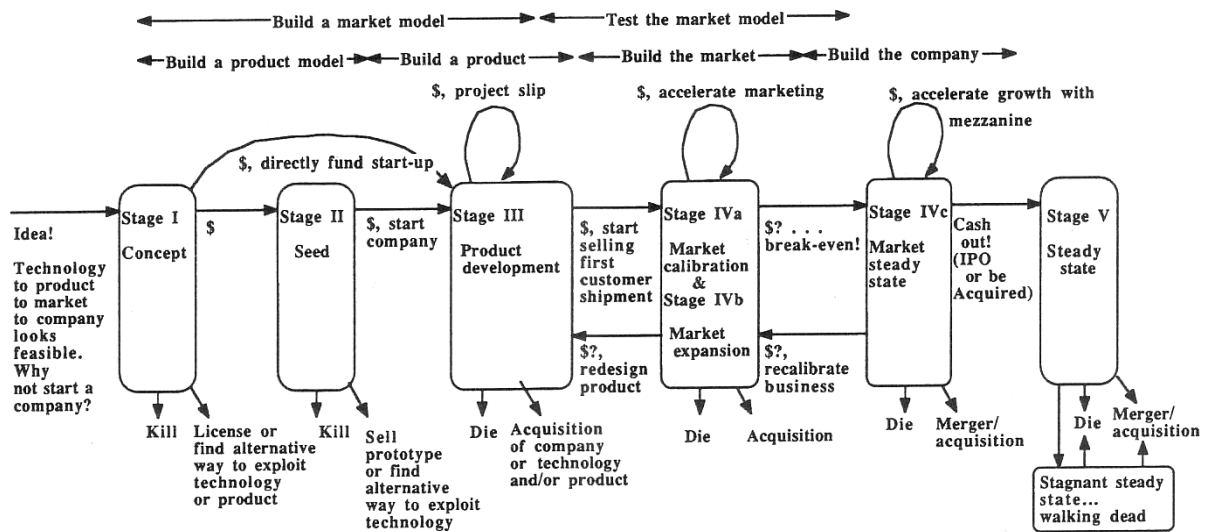


Figure 45: The stages of growth for a start-up (Bell, 1991: 257).

APPLYING THE BMD

According to Bell (2000) a diagnostic is performed in the following way: (1) Review Business Plan and Historical Material (1/2 day), (2) select appropriate stage BMD questionnaires, and re-read questions prior to the interview (1 hour), (3) arrange and perform diagnostic interview session with CEO and top-level team (1/2 day), (4) analyze and summarize interviews using the BMD software for comments, scoring and graphing, (5) produce results package and recommendations for company (1/2 day), (6) present results of diagnostic to company (2 hours).

APPENDIX C: STATISTICAL CONDITIONS

The propositions can take a probabilistic or deterministic way of expressing (Dul and Hak, 2008: 66). In this research we argue for the deterministic way as can be read from the propositions. Deterministic propositions can be further divided into three variants (Dul and Hak, 2008: 66), those with: (1) sufficient conditions, (2) deterministic relations, and (3) necessary conditions. The choice between these three variants influences the way the data should be collected (Dul and Hak, 2008: 77).

(1) The sufficient condition for this study implies: “if there is a suitable OC there must be innovative performance”. But it also means that innovative performance can be present even without a suitable OC as can be seen in Figure 46. This contradicts with the ideas presented in this research.

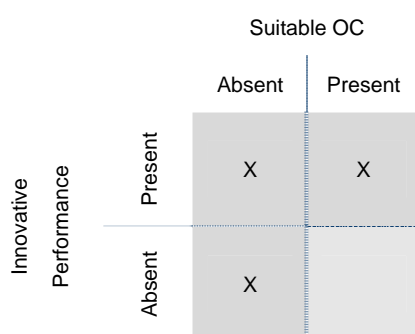


Figure 46: Illustrating the sufficient condition (Dul and Hak, 2008: 68).

(2) A deterministic relation means the following for this research: “the more suitable the OC, the higher the innovative performance”. Because of the linear nature of this relationship, it is impossible to have an innovative suitable OC but no innovative performance. This makes it an unlikely relationship for this research, as there are other factors, besides the OC, that will influence the outcome of a BI. Figure 47 below gives a graphical representation of the deterministic condition.

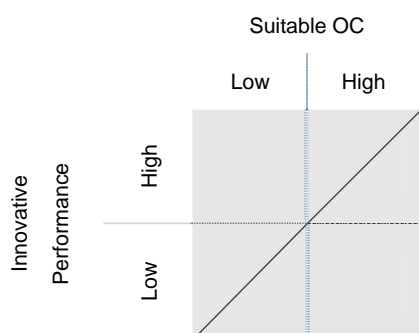


Figure 47: Illustrating the deterministic condition (Dul and Hak, 2008: 70).

(3) The last one, the necessary condition states for this research: “if there is innovative performance; there must be a suitable OC”. This is illustrated in Figure 48. As can be seen, it allows for a suitable OC, to not be innovative. But it does not allow for a business incubator with a good innovative performance to have no suitable OC. This ideology is in line with this research.

		Suitable OC	
		Absent	Present
Innovative Performance	Present		X
	Absent	X	X

Figure 48: Illustrating the necessary condition (Dul and Hak, 2008: 69).

Before any data can be collected, the researcher must determine which observations to make and under what conditions (Graziano and Raulin, 2004: 43). Different research theories can be used in theory testing research. Dul and Hak (2008: 76) distinguish between three types: (1) experiments, (2) surveys, and (3) case studies. Some strategies are more appropriate than others and for this type of study (initial theory testing research with necessary conditions) the preferred research strategy is the experiment, second best the longitudinal case study or the comparative case study, and third best the survey (Dul and Hak, 2008: 77).

(1) Experiments manipulate the independent variable (OC) and measure the effect on the dependent variable (innovative performance). As stated by Adler and Shenhar (1990) and as argued in chapter 3, changing an OC, the independent variable, takes several years, and therefore this research method cannot be considered as a plausible option for this study. (2) A survey tries to establish a statistical relationship between the dependent variable and the independent variable in a population of instances, whereas (3) a case study determines the relationship between OC and innovative performance in one instance or a small group of instances (Eisenhardt, 1989).

APPENDIX D: INNOVATIVE PERFORMANCE

Among the top ten practices for developing an innovative culture stands the ability to measure the results of innovation (Jamrog et al., 2006). The innovative performance of a company can be seen as the achievements of companies in terms of ideas, sketches, models of new devices, products, processes, and systems (Hagedoorn and Cloodt, 2002). Note that this definition can be interpreted in a narrow sense; the degree to which they actually introduce inventions into the market. Or in the broader sense; which indicates the achievements in the trajectory from conception of an idea up to the introduction of an invention into the market (Hagedoorn and Cloodt, 2002). This latter view overarches the whole innovation process, from R&D, to patenting, to the market introduction. In this study, we adopt the broader definition of innovative performance. According to Hagedoorn and Cloodt (2002), this implies that we should make use of a range of methods as each method will measure a distinct part of the innovation process.

MEASURING INNOVATION

In the recent years there has been an increasing interest in the measurement of innovative activities, primarily because of the growing recognition of the importance of innovation (Hagedoorn and Cloodt, 2002). Several methods have been widely described in the literature including: (1) R&D expenditure, (2) issued patents, (3) patent citations, (4) the Literature-Based Innovation Output indicator, and (5) the Direct Innovation Survey (Evangelista et al., 1998; Acs et al., 2001; Hagedoorn and Cloodt, 2002). A discussion will follow concerning these methods.

(1) The use of R&D expenditure assumes a linear model in which innovation is the result of a roughly linear progression from research to invention to innovation and then the diffusion of new techniques (Evangelista et al. 1998). This method has been criticised widely because the innovation process is seen as a progression between separate stages rather than in terms of interactions and feedbacks between different innovative functions, meaning that innovation is just a matter of R&D expenditure. On the other hand, R&D expenditure can be seen as a reliable indicator for innovative effort as argued by Hagedoorn and Cloodt (2002). They state that it not only reflects current input, but also the previous successes, because the previous R&D expenditures affect subsequent R&D inputs. Successful R&D input at a former stage will increase the commitment to the allocation of future R&D resources (Hagedoorn and Cloodt, 2002).

(2) Acs et al. (2002) and Hagedoorn and Cloodt (2002) found that patent measurement provides a good, although not perfect, representation of innovative activity/output. Its major drawback is that this measurement actually represents inventions and thus not innovations. Some authors argue that these numbers are only an input, which has no necessary relation to innovation outcomes (Acs et al., 1998). Empirical research performed by Hagedoorn and Cloodt (2002) states the opposite; when used in the correct manner, they can provide an appropriate indicator to compare the innovative

performance of companies in the form of new technologies, new processes, and new products. Nevertheless, the use of patents for this purpose has had a longstanding debate regarding its shortcoming. It is often mentioned that there may be variation in firms' propensity to patent³⁶ (Coombs et al., 1996), due to international or sectoral differences, and the identical weight given to very important patents as well as to less important patents (Hagedoorn and Cloudt, 2002).

(3) Patent citations are increasingly used as method to measure the innovative performance of companies (Hagedoorn and Cloudt, 2002). They can be used as a more qualitative measure compared to purely quantitative patent measures. The number of patent citations increases when a particular new patent cites earlier patents with somewhat similar or related technical claims, thus giving a good indication of its importance on the marketplace. Some authors are sceptical about this way of measuring; they state that scholars are counting patent citations without the necessary in-depth knowledge of the underlying citation reports (Hagedoorn and Cloudt, 2002).

(4) Literature-Based Innovation Output indicators, also known as new product announcements, are sampled from announcement sections of technical and trade journals. The advantage of this method is that it actually measures innovation instead of inventions. The drawback for our research would be that this data could only be collected in a few years from now as the products need to be launched to the market first. Next to this, the press releases are generally coming from the marketing departments of companies and little to no screening appears to be done by the database operators themselves (Hagedoorn and Cloudt, 2002). Meaning that the companies themselves will determine what new products are. This will result in an overload of incrementally improved 'new products' in the databases for promotional purposes.

(5) The last method, the Direct Innovation Survey, involves questionnaires being sent to firms to gather information about new or modified products introduced during a particular period (Coombs et al., 1996). It provides information about their technical features, and the economic significance. The major problem with this approach is the burden they place on the responding firms to provide the data (Coombs et al., 1996).

A combination of the tools described above can be used to reliably measure the number of company wide innovation successes (Hagedoorn and Cloudt, 2002). They all have their advantages and disadvantages, but their focus on company (or industry) wide innovation successes makes them unsuitable for our purpose, measuring the innovative performance of incubators.

This implies that an alternative way has to be used to assess the innovative performance of BIs. As was explained in chapter 2, the main purpose of corporate entrepreneurship and thus BIs is to allow large organizations to overcome the difficulties of achieving radical innovation (Thornberry,

³⁶ Companies may not always patent their latest inventions in order to keep it a secret for a longer time.

1991). It is an instrument to promote (radical) innovation and counter the high start-up failure rate (Aerts et al., 2007). The focus on inventions that do not fit within the existing business units and subsequent use of BIs automatically means a high degree of innovativeness.

BIs go through several phases of the innovation process in about four years (van den Elst et al., 2006). The focus during these four years is on a single product and its success thus depends on the result after these four years (successful exit as described in chapter 2). As all BIs are prone to be innovative, the key difference then becomes whether or not the BI will be able to successfully apply its exit strategy. Therefore the focus will shift from measuring the innovative performance to the general performance of BIs.

ASSESSING THE PERFORMANCE OF INCUBATORS

BIs are a quite recent occurrence, as described in section 2.3, and the result of this is that existing research has its limitations, because of the novelty of the BI concept and the consequent lack of longitudinal research (Eshun, 2004). The use of a narrow focus, difference in sampling frames, lack of empirical data, and the use of different outcome measures do not contribute to the progress of BI research (Lewis, 2000; Galbraith et al., 2007). Although progress is made on the delineation and categorization of incubators, studies to the characteristics of a successful BI are lagging (Hamdani, 2006). This has led to a lack of consistency in incubator performance research. It follows that conducting an aggregate performance evaluation of BIs is problematic as there is no clear cut standard to measure incubator performance (Eshun, 2004; Aerts et al., 2007; Bergek and Norrman, 2007).

Nevertheless, there has been a wide interest in understanding the factors that will lead to successful technology deployment and commercialization (Galbraith et al., 2007). The literature states a wide variety of measures which can be grouped into the form of input, output, and value growth (Garnsay et al. 2006). Measures of input could be the (1) investments, (2) funds, and (3) employees working for the new firm. Measures of output being: (4) patents, (5) publications in, for knowledge produced scientific papers, and (6) the (number of) new products, as percentage of sales/ profits (Bessant and Tidd, 2007: 406). (7) Values growth measures could consist of assets, market capitalization, and economic value-added (Garnsay et al. 2006).

The above mentioned methods of input (1 & 2) correspond with the aforesaid R&D expenditure logic and therefore not valid for this research, furthermore, inputs do not necessarily relate with innovations (Acs et al., 1998). Employee growth (3) cannot be considered as a valid measure as there is suggested that not all incubators are mandated to create jobs (Eshun, 2004), indeed some radical innovations were the work of a small selected group that did not grow accordingly its success during the development (Eshun, 2004). (4 & 5) Patents and scientific papers have also been discussed before and are for the same reasons not suitable for measuring the success of incubators. (6) The number of new products could be a suitable indicator for an incubator park instead of a single BI, normally working on a single product. (7) Value growth measures could provide a good measure if not that

some incubators are prone to have more assets, market capitalization, and economic values than others, for instance, simply by the technologies utilized. This has then nothing to do with the performance of the BI.

While no single measure is perfect, the evaluation of the performance of BIs should be done by using a multidimensionality of attributes and therefore the use of multiple indicators and measures to present a meaningful assessment (Eshun, 2004). Aerts et al. (2007) states that balanced screening practices should be the main target as it will result in a lower tenant failure. According to (Mainprize and Hindle, 2005) the use of such a method causes an improvement in the accuracy and consistency of human judgement. There have been described only few performance approaches in the literature utilizing a multidimensionality approach (Eshun, 2004), the next section will describe the most widely accepted one, the goal approach.

THE GOAL APPROACH

In the goal approach, the performance of the BI is assessed in terms of its organizational effectiveness, or the degree to which the start up realizes its goals. Indeed, performance measures are generally related to the extent to which goals are attained (Lim, 1995). This implies that it is not enough to measure the outcome of specific activities of the incubator as it needs to be related to expected outcomes, the expected goals (Bergek and Norrman, 2007). In this approach, the BIs' goals and development objectives are therefore specified (at the start and during the lifetime of the incubator) and the expected outcomes from the mission are summarized. These expected outcomes are then used as milestones at which the incubators can be assessed. This approach has dominated the methods and criteria adopted by firms. The reasons for this being its practicality of measuring actual goals attained against intended ones but also because it facilitates the evaluation of quantifiable outcomes. Barse (1993) argues that the evaluation of incubator performance must be guided by the program's design and goals. Indeed, specific measures are then be related to the milestones set and the evaluations would be on the BIs own merits. Typical milestones include forming the executive team, crafting the organization, meeting the customers, and gaining favourable mentions in the press (Garvin and Levesque, 2004).

One of the companies that use such a method is IBM. At IBM the managers of EBOs (IBM's BIs) are evaluated on project milestones, they are set and serve as the primary basis for evaluating the performance of the EBOs tailored to the business's stage of development (Garvin and Levesque, 2004). In an EBO's early days, public relations and communication are critical, since the business has to gain acceptance and 'mindshare'. Milestones are set for the number of mentions by respected industry analysts, the number of mentions in important trade journals and newspapers, and the number of presentations at industry conferences. In an EBO's next stage, customer contacts become crucial, and on-site trials are the first step toward formal sales. Milestones are set for the number of customer pilots and design-ins. As an EBO eventually matures and begins to ramp up sales, milestones are set

for the number of design wins, first-time orders, and unit sales.

Even though the before mentioned milestones are the primary basis for tracking EBOs, financial measures are also employed. The measures are highly aggregated, consisting largely of monthly reports of each EBO's revenues and direct expenses. They help instil discipline in the business. The mere presence of financial reports and monthly financial reviews ensures that EBOs' leaders will spend at least some time on these issues, proving a set of checks and balances, ensuring that groups and divisions live up to their stated budgetary commitments. Together, the elements of the EBO system are complementary, mutually reinforced, and extremely well aligned, each element has been chosen because it helps to overcome one or more of the barriers. The result is an organizational environment far more hospitable to corporate entrepreneurship (Garvin and Levesque, 2004).

APPENDIX E: THE RELATION BETWEEN INNOVATIVE PERFORMANCE AND ORGANIZATIONAL CULTURE

As described in Appendix D: Innovative Performance, innovative performance can be measured by using the BMD as guideline. The twelve dimensions of the BMD are divided into 4 quadrants as depicted in Table 2: (1) Finance/Control, (2) People, (3) Marketing/Sales, and (4) Product/Technology. So questions asked should address these four quadrants. The questions are derived from Bell (1991).

Suitable general questions regarding the innovative performance are formulated as: For quadrant 1: (a) How does the company manage itself with respect to the objectives it has established for products, employee satisfaction, services, etc.? Quadrant 2: (b) How is the cooperation between the different team members? (c) Are there many conflicts within the team, do they respect one another? (d) Do the people have the critical experience and expertise in technology/product/market development? Quadrant 3: (e) Is there already an existing market for this product? (f) What do you think about the market potential of the product? (g) Is there already a substitute in the market? (h) Do you expect that competitors will develop a competing product? Quadrant 4: (i) What do you think of the innovativeness of the product? (j) What do you think about the innovativeness of the product compared to the products developed in other incubators/ new ventures? (k) Do you have a competitive advantage compared to your competitors? (l) Does the product consist of breakthrough technologies?

Note that it makes no sense to only assess a NV at one moment in time, as it would give no indication of its performance, it would merely give insight at which stage, according to the BMD, the NV currently stands. Therefore there is the need to collect data which covers an extended period of time, in order to assess the progress of the NV, which could give insight in its performance from start till date. This data should consist of the milestone performance history. Milestone performance history records can provide valuable insight of problems faced by the different incubators; which phases went slow or fast, how do the different incubators compare to each other. These can point out the relative performance of the different NVs.

Many companies are making use of rules based on milestones in order to assess whether or not a specific incubator should advance to a next phase. As the Table 7 below demonstrates, all the phases of the by us investigated companies are quite similar, with the only difference that the BMD method splits the first phase into two. Note that Philips has adapted the BMD slightly to serve their particular needs. The similarity in phases makes it possible to compare the milestone performance history data from the two different companies with one another.

Qualitative research, in the form of additional questions during the interviews, can further strengthen the former findings, as they can give explanations to found abnormalities in the quantitative phase (history records). Questions should address the progress and abnormalities (obstacles) of the incubator (from the past to the most likely problems in the near future). The

following list of questions should therefore be asked: (a) In which phase is the new venture currently? (b) How did the incubator progress until now? (c) What were the obstacles during the development of the new venture? (d) Which dimensions of the BMD caused the most problems until know and why? (e) What are the likely problems (from which dimension) the incubator will face in the near future?

This resulted in the following table:

Position	Rater 1	Rater 2
1	White Biotechnology (DSM)	White Biotechnology (DSM)
2	Biomedical (DSM)	Biomedical (DSM)
3	New Wellness Solution (Philips)	Skin Imaging (Philips)
4	Skin Imaging (Philips)	New Wellness Solution (Philips)
5	Personalized Nutrition (DSM)	Personalized Nutrition (DSM)
6	Care Servant (Philips)	Care Servant (Philips)

Table 18: Innovative performance of the NV.

RELATIONSHIP OC AND INNOVATIVE PERFORMANCE

In order to illustrate the relationship between OC and innovative performance, a few graphs will be presented. The first graph, Figure 49, is an overview of the distance of the score to the proposed theoretical optimum on each dimension. On the x-axis are the dimensions, and on the y-axis are the absolute distances from the proposed theoretical optimum values. The different lines represent the six different NVs.

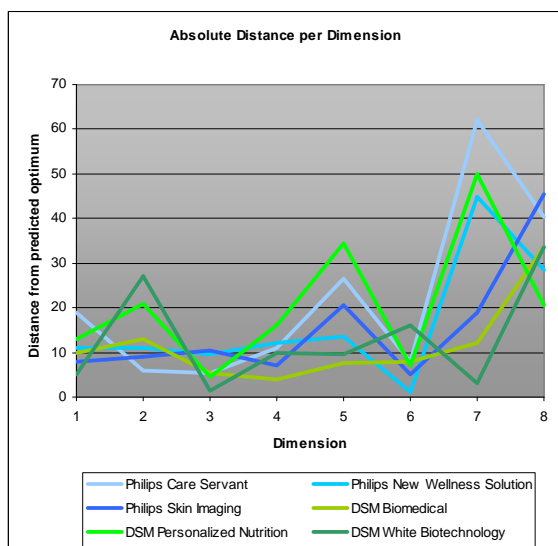


Figure 49: Absolute distance per dimension

Again, this gives an illustration of the standard deviations, but it gives an overview of the fit to the theoretical model per NV as well. The first impression reveals that Philips' NV Care Servant and DSM's NV Personalized Nutriion have the worst fit.

The next graph, Figure 50, gives the same plot, but now with cumulative distances. This figure illustrates perfectly which NVs are having the best fit and which one have, relative, not such a good fit with the proposed theoretical model. Here we can see three clusters, the two best fitting: DSM’s Biomedical and White Biotechnology. Slightly less fitting: Philips’ Skin Imaging and New Wellness Solution, and the least fitting: DSM’s Personalized Nutrition and Philips’ Care Servant.

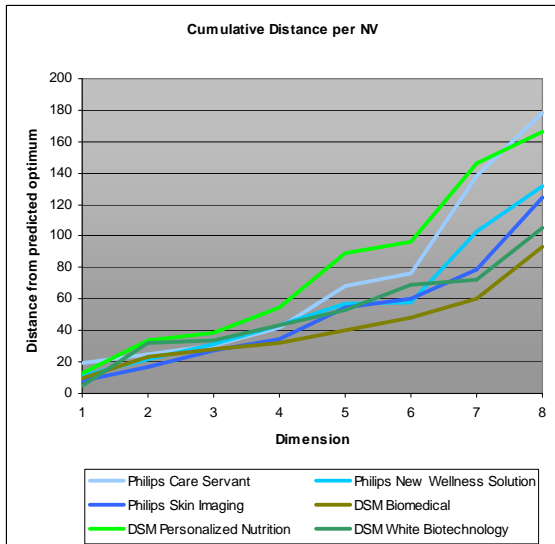


Figure 50: Cumulative distance per NV.

Plotting these findings against the findings presented in Table 18, the relative innovative performance, the following scatter plot can be presented (Figure 51). On the x-axis is the relative innovative performance as defined before. The score can either be 1; implying below average, 2; average, or 3; above average innovative performance. On the y-axis the average distance of all eight dimensions is depicted. The results show a clear relationship indicating a necessary condition as discussed in section 5.1, the research strategy.

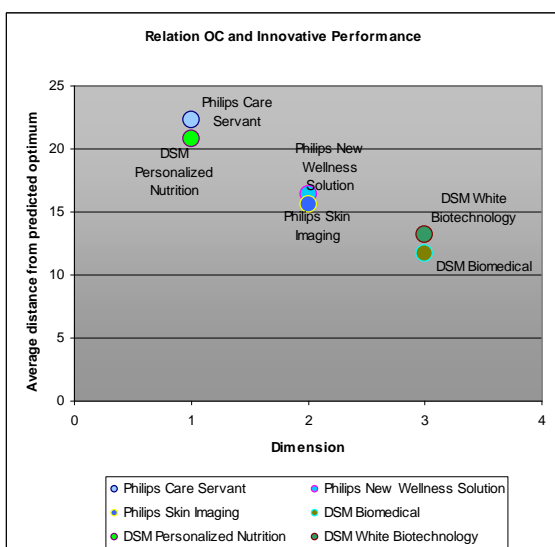


Figure 51: Relation OC and Innovative Performance.

APPENDIX F: BARRIERS FOR THE SOCIAL SCIENCES

The following discussion is based on Houkes (2006). Doing research in the social sciences is always influenced by factors like: (1) enactment, (2) priming, (3) the hermeneutic circle, (4) situatedness, and (5) sense-making. (1) Announcing the measurement of the OC, as has been done in this research, may in fact influence the OC. Indeed, the respondents could have been influenced by this and feel a social pressure to fill out the socially desired answers, leading to a self-fulfilling or self-defeating prophecy. This phenomenon is also known as enactment. (2) Something rather close to the former factor, is priming. In interviews and questionnaires, people make assumptions about what you want to know and interpret the questions accordingly. Researchers try to guide these interpretations by careful selection and formulation. This undermines the idea of 'objective data'. (3) Next to this, when interpreting, researchers always make assumptions and bring their prior knowledge and biases. Subsequently, when searching for explanations, researchers will be guided to key passages of the results because of this background knowledge. Because of this circularity, researchers will face difficulties seeing something 'as it really is'. (4) The theories about situatedness state that in every case, communication and acquiring knowledge happen in a specific situation. For example, the interviewee or the researcher is very busy, is feeling ill, etcetera. This implies that you cannot step outside of all situations and everyday concerns to collect data, construct theories, or communicate results. Next to this, you cannot know with situations affect your knowledge or behaviour, making it rather tricky factor to deal with. (5) People often act without reflecting but still need to make sense of their actions. Indeed, justifying them for others or for themselves. For this, they tell stories, coherent sets of statements to make their motives explicit and comprehensible. These stories are constructed afterwards, but strongly determine the understanding of what happened.

