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Innovation networks in the learning economy

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Abstract

This paper presents the results of an ongoing research about a framework to develop innovation networks supported by Information and communication technologies (ICTs). Fragmented approaches have predominance in literature, for this reason we want to close that gap somehow, within the framework of a systemic, dynamic, organic, and transparent approach. The framework values the already existing contributions, from which new elements have been added, specially the support of Information communication technologies (ICTs).

We consider that innovation in networks must transcend spatial frontiers, thus considering virtual links since they turn the organizations faster and more flexible, therefore facilitating a more efficient access to information and knowledge.

The research methodology was bibliographical, documental, and exploratory.

Key words: innovation networks, innovation networks methodologies, virtual innovation networks.

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1. Introduction

The innovation networks appear more often as a contemporary way of competitiveness. (Pyka, 1999; Preissl 2001) In this sense, facing the intense competitive pressures, and also a greater use of Information communication technologies (ICT), there is a consensus that innovation in local innovation networks (innovation clusters) must surpass spatial frontiers and must be independent from physical distances in order to increase the access to all types of innovation resources; that is why the use of links (interactions), not only physical but also virtual, is indispensable (Preissl, 2001; Romano et al, 2001; Passiantte et al 2000, 2002).

In this context our paper aims to present a framework proposal for the development of innovation networks with virtual links, contributing in this way to fill an existing gap in literature since in our opinion the current views are fragmented and do not value the role of ICT. This work is based on common elements, it rescues the contributions from works written previously but including new elements that contribute to enrich it. An organic, flexible, integrated (systemic) model is proposed, valid for large and small companies.

Regarding the structure of the paper, following we present section 2 where the research methodology is approached; in sections three and four we carry out the literature review about innovation networks and the issue of virtuality, as well as the advances of our framework, respectively. In sections five and six we present the final remarks, future research and the bibliography.

2. Research methodology

It is important to clarify that what we are presenting in this article is just a preview of the investigative process up to this date, corresponding to the project called “Towards a framework of innovation networks in the digital age”. The framework, according to Vergara (2000) it is a bibliographic, documental, exploratory research.

Regarding the data collection for this paper, it was conducted through secondary sources in this first stage. In this way we used data collection techniques such as specialized databases, existing dissertations or theses, consulting papers done by authors in the conformation of clusters in Latin América, and others available in scientific reviews, congresses proceedings, and technical reports from research centers, and information sources on the internet. Otherwise, considering the treatment of collected data, qualitative techniques were used for the analysis of found data. Likewise, the use of two criteria was combined: the descriptive (since there was a preoccupation to add data to the problem under research) and Interpretative (since the problem was situated in an abstraction level compatible with the analytical and conceptual dimension required by the project). A link was established with the theoretical foundations used, with the aim that such analysis dimension produces considerations and arguments pertinent to the problem’s formulation. Data obtained in the bibliographic and

documental research (about different models, approaches, and best practices at the international level) was subject to a critical analysis based on the concepts stated previously.

As a result of these investigations, a better comprehension of innovation networks regarding the need of their virtuality is expected, as well as the generation of a framework for the formulation of the ongoing methodological proposal. Among the limitations, we point out that the literature regarding innovation networks and the issue of virtuality is scarce.

3. Literature Review

According to Quant et al, 2001; Pyka, 1999; Sánchez 199, 199a; Mittelka, 2000, the innovation networks, emerging as significant tools of social change, expanding opportunities for information & connectivity and erasing the boundaries for research, education and business. In this sense they are a significant tool to: promote development, growth, reduce spatial & social inequalities, activate, diffuse and expand locally generated knowledge, promote technology innovation (new products, services) & regional competitiveness, etc. Otherwise, De Bresson, 1999; Dobreux, 2003; Gulati, 1999, explain that the innovation networks has more relevance each time since there is a growing mobility of intangible assets and coded knowledge. They highlighted that the organizations that make part of these clusters may reach synergy, access to information and knowledge, to knowledge networks, supply chains, markets, marketing intelligence, etc, always involving social networks that are inherent to such clusters.

□With regard to the networks local benefits (clusters) we will start by mentioning their importance, through the works of Porter, 1990, 1998, 2004; Enright, 2000 and Roelandt, 1999, We only highlights that developing an innovation system, which requires an intense group work.

According to Preissl (2003), the central elements in the innovation networks are knowledge creation, generation and absorption, and learning, which do not come from routine. They imply besides that achieving different competence levels (technological, organizational, management, etc). Unlike industrial clusters based on the value chain, innovation clusters are based on the knowledge chain.

Otherwise, there is in the literature, different classification for innovation networks, Castells, 2003;, Lastre, 2001; Nelson, 1992; Marceu, 1999; Chiesa, 2000 ; Den Hertog, 2001; Enright, 1996; Gulati, 1998; Saxenian, 1991, 1996, Walters, 2004 and so on, but só only for purpose of this work, we will analyze them according to their scope (Lundval, 1999; Nelson, 1993, Porter, 1990. Let us see briefly what they are:

a. - National Innovation systems

According to Lundval, 1999 and Nelson,1992, the most fundamental reason for academics to start thinking about innovation as a system was the fact of considering innovation as an interactive process, where market *feedbacks*, customer's knowledge *input*, etc, interact with the creation of knowledge and entrepreneurial initiatives.

b. - Geographical regional-local innovation systems (SIR) (clusters)

□ According to Doloreux et al (2003) there is a lot of confusion in the terminology, in their limits, etc. According to these authors, some people consider the SIR as a subsystem of the SNI and among these the clusters as dynamic agents of the SI. In this context, let us consider with more detail the issue of clusters and their relationship with innovation.

The most widespread approach for analysis flows within innovation systems is the cluster theory developed by Michael Porter (1990), on the other hand we have the OECD (1999, 2000, 2001) which made a great emphasis on the knowledge dimension of clusters. For them the clusters approach may be seen as part of a national innovation system. Even industrial clusters may be thought as a mini innovation system.

Now, according to Bititci (2004) the clusters are frequently vertical and lateral networks that include different and complementary companies around a specific industry. In this sense the clusters, being considered inter entrepreneurial networks, make possible the collective learning and the generation and diffusion of innovation through a coordination pole, once each participant in the network contributes with its specialty in attributions that generate value. According to Harris (2000) the clusters are networks of interdependent companies, knowledge-providing institutions, technology-providing firms, etc, connected in a network that generates value.

Bititci et al (2004) examine the interaction among collective capabilities, competences, and transactions of value in collaborative environments. They define a classification for networks based on the analysis of the theory of creation of value (internal and external value).

On the other hand, Feser (2000) conducted several researches regarding clusters and the topic of innovation. In a recent research (2002) he made contributions regarding innovation clusters in Latin America and the Caribbean, where he pointed the need for the definition of science and technology policies in high-tech sectors, the replication of successful elements from innovation clusters around the world taking into account the particularities of the local culture, the need to develop frameworks for the analysis of innovation clusters in order to promote their development within a participative strategic focus; and efforts to elevate clusters to the issue of innovation and entrepreneurs.

Now, we are going to summarize some authors that have approached the issue of virtuality in the innovation networks as follows:

Preissl (2001, 2003) proposes a new definition for the local networks (clusters):

A cluster is a set of interdependent organizations that contribute to the realization of innovations in a given economic sector or industry.

□ In this definition there is not any geographical orientation, the decisive criterion is that relevant actors take part in the same activity. The definition is industry-specific. Clusters in

this definition include all the actors that contribute to innovation. He also, highlights that innovation is an interactive process of social construction. This author also shows the results of the study of virtual links in the automotive and spare parts sector in Germany. Emphasis on the need for clarification in the use of the cluster concept, for instance distinguishing between a production clusters based on the value chain vs. Innovation clusters, based on the knowledge chain, since their components vary. Specifically in the innovation clusters, the central elements are the creation, generation, absorption of knowledge, and learning and they are not originated from routine.

Quandt (2001) carried out an analysis about how virtual links may help to improve effectiveness of the so called techno polis in Latin America. The author stated that facing the requirements of a globalized economy, there are pressures for new business models that favor rapidity, speed of innovation response and that a way to achieve this is in the innovation clusters through virtual links..

In one research, Bastos Tigre P, Dedrick J (2002) proved that electronic commerce, initially dominated by virtual companies, has become a complementary element of transactions adopted by most of the companies around the world. Thus, the synergy among physical and virtual operations is being revealed as something extremely important.

Otherwise, Bovet et al. (2001) tells us about networks and the role of ICTs. He calls them value networks. He shows examples such as Cisco, Dell, Zara, etc. Elia (2002) define an analysis *framework* of regional innovation clusters in the context of the new economy, thus exploring the changes that ICT are originating in organizations at the level of organizations, firms, scale economies, the focus on services, the locational effects (where the production or generation of goods, services, etc. is more and more integrated. Passiante (2002) explain us that virtual clusters come as a consequence of the digital economy. They are defined as the systems of dealers, services providers, and customers, which use Internet Technologies as the main way to cooperate and compete. These virtual forms of clusters have also been defined as *b web* communities (Tapscott, Lowy & Ticoll, 2000). Passiante also states that a virtual cluster (VC) is the result of an integration process of different core competences from each one of the partners, supported by the need of facing risks, costs, and innovation complexities.

In other studies, Ronmano et al (2001), and Passiante (2000, 2002) also introduced the concept of Virtual Innovation Systems (VIS) which means to rethink the role of the geographical aspect in clusters through the inclusion of virtual links with the aim of accessing in a more efficient way to knowledge and information, considered key aspects of the innovation process. Finally he states that in this vision, the notion of geographical space has been replaced by the virtual spaces, or that many times it has taken a complement from physical interactions.

Jhonston (2003) defines two generations of clusters; the first generation clusters are commerce-oriented while second generation clusters are oriented towards innovation clusters. They are oriented to learning and knowledge. He considers virtual clusters, which according to him come from the advances in telecommunications, particularly from the Internet and global distribution systems.

Kaufmann et al (2002) explains that the destruction of the distance by the Internet is not going to happen since the construction of trust and tacit knowledge. Exchange needs physical proximity and personal contact, this being one of the greatest hurdles of the Internet.

For Bititci (2004) clusters continue to be important, only that the development of information technology has reduced their impact. Interconnectivity costs have modified their importance. The use of EDI, Internet, and web-based communications has reduced the transactions time and costs, thus making possible to expand the manufacture and supply bases through international borders.

Geographic Innovation network	Virtual Innovation networks
Development is conducted through commerce	Technological development and innovation are fostered.
It is focused on exports.	They are focused on knowledge and the generation of physical learning and e-learning.
It is more difficult to adapt to changes, they require a whole structure demanding much more time for this.	More flexible, therefore they adapt more quickly to the dynamics of modern innovation.
Little or no use of ICT	Strategic use of ICT
The competitiveness focus resides on localization and the spatial issue.	The focus resides on the interactions with physical and virtual links.
Facilitate Exchange of tacit knowledge	Exchange of tacit knowledge is not possible
Many restrictions for the access to innovation resources	Greater access to innovation resources.
They are not necessarily Developer in an innovation environment and mostly do not form new technological, human capacities, etc.	They require an adequate innovation environment to develop and some capacities are required such as technological, knowledge, and management capacities are required
Slow responses to current competitive requirements and pressures.	Respond more quickly to demands of the current competitive dynamics.
There is interest in internationalization, although not necessarily achieved, and increase export offer.	They favor internationalization and consequently the export offer.
	They require modern innovation policies.
	They imply a cultural change and permanent learning.

Table N° 1. Comparison: geographic clusters vs. Virtual innovation networks

Source: elaborated by the authors

4. Towards a framework of innovation networks with virtual links.-

Following, we present progresses of the framework in question. This framework aims to order efforts so that initiatives are not lost, as well as the rational use of integrated resources. We intend to make our contribution to close some of the gaps existing in literature previously mentioned.

The framework has been constructed from strengths and common elements existing in current works and based on the best practices of innovation networks with virtual links; and in our participation in studies for the development of three clusters in Colombia (apparel, poultry and shoes). Our intention is to have a framework which will be applicable to small and big companies. The framework is not a straight jacket; the necessary adaptations according to the requirements of each particular innovation network can be done.

4.1. Characteristics of the framework.

- **It is integrated and systemic-** since it aims to show in an integral way the diverse components of a network's development process in a single framework. It also shows its interdependence and interrelation among diverse components where the behavior of one affects the others. It also shows inputs, processes, and outputs.
- **It is organic** – not linear because it does not follow the formal patterns of analysis-strategy-recommendations. It seeks to surpass the linearity of current approaches. The different stages of the framework are not conceived anymore as a linear process but as something organic, that comprises the result of a complex set of interactions among different actors, institutions, and strongly interdependent agents.
- **It is dynamic** – because it wants to reflect the current and changing nature of competitiveness and of the highly interactive innovation process.
- **It is flexible** – because continuous adaptations are required, due to the nature of competitiveness and innovation, as well as the diverse interactions that the process implies. The aim is to adapt the framework to the context of each network.
- **It is transparent** - because the study of innovation networks implies that the goals, objectives, indicators, data sources, limitations, etc. must be clearly defined and explicitly discussed among the diverse actors.

4.2. Contributions of the framework

Regarding the contributions on the existing approaches, we propose to reassess some existing elements and include other new elements because the framework has bases from different disciplines, as follows:

- **We revalue the strategic thinking.** We emphasize that the clear definition of an innovation networks vision is fundamental since it orients all the process; the cluster-based strategy is emphasized, it must not be seen as something instrumental but as a permanent way of acting inherent to the management work at all level and as management philosophy. All of this is united to an effective strategic leadership that generates

commitment, leads change, and that generates permanent processes of dialog and learning at all levels which are considered fundamental to generate commitment. Strategic thought supports all the methodology

- **Dialog and sensitization platforms.** This is the starting point and is a key in the process to capture the commitment from different stakeholders. We also promote the use of different social interaction tools (social networks).
- **We revalue the ICs-supported analysis.** The analysis is a key element in the formation of networks since it implies to comprehend the environment in which innovative activities are developed in the companies, as well as its development patterns over time. It also seeks to have a better understanding of the results of innovative experiences in different contexts. Besides, in order to realize this premise, it is necessary to manage a lot of data and many interactions; this is why an exhaustive analysis is valuable and important to support all the process. It is fundamental to define the strategic agenda of the innovation network. If we do not count on an adequate analysis, we risk aiming to an addressing and vision that can not correspond to the competitive reality and the stakeholders expectations. Several internal, regional, and international studies are proposed about the best practices, competitiveness, economy, the industry situation, etc. These studies are supported by contemporary management tools, statistical techniques, contemporary competitive analysis techniques, social interaction techniques, etc. The analysis will be seen as a starting point for reflection upon the development of innovation in industry rather than simple statistical instruments or technical models.
- **It includes a process to define a strategic agenda, valuing the formulation of the knowledge strategy, supported by virtual links.** The construction of the strategic agenda for innovation networks is privileged with emphasis in the formulation of a knowledge strategy with the inclusion of virtual links and not necessarily limited to physical interactions to promote knowledge creation, absorption, dissemination, etc. Electronic networks are fundamental in this point.
- **Systematized process for the implementation of a network, supported in the Balanced Score Card. Management of change techniques and Information Technology (IT).** A network is a process that implies to compete, cooperate; that is why it is required that its implementation be managed carefully in order to avoid that initiatives are left on paper.
- **Process for follow-up of the network's performance, supported in Balanced Score Card and IT.** We intend to contribute on this aspect since there are few papers that show the way to evaluate the performance of a cluster's competitive dynamics. We intend to use here the Balanced Score Card to facilitate the process.
- **We included the strategic alignment component.** We consider a priority the definition and construction of an infrastructure in the country and the region, since the cluster's strategic agenda must be aligned to them.

4.3. Description of the framework.

It has four components, which act in an interrelated and integrated manner. The first one refers to the dialog and analysis platform; the second, to the strategic design; the third to the implementation; and the fourth to the follow-up of the network's performance. Let us see briefly each component and the elements that integrate the.

The first component regarding dialog and analysis is fundamental to guarantee the continuation of the innovation networks' development process. Thus, factors such as committed leadership, and an adequate sensitization plan are fundamental to establish the foundations of the process. If the attention and commitment from different local and national stakeholders is not gained, the process hardly makes any progress. This component is also associated to a whole comprehension of the current and future situation of the industry and successes of the best practices which help very much to overcome the skepticism, hopefully supported by a platform of public policies that contribute to facilitate the process.

4.3.1 Component I: Sensitization and analysis platform.-

In general the process of formation of innovation networks is begun with a dialog platform among the different actors and includes several techniques and forms such as: forums, regular meetings among companies and organizations about strategic information, for instance, studies of technological prospective and study of successful innovation networks are often used as input in the dialog process. This beginning may vary from a country to another depending on national traditions, different cultural factors, the form of dialog among industries, research centers and government, the scale or field of action of each country and the level of interference of the State in the industries, the specific composition of economic and technological activities relevant in a country's economy, etc. Let us consider each one of the elements to be taken into account:

- **Stakeholder's sensitization.** - The participation and commitment are indispensable in the process of conforming local innovation networks. Key stakeholders must be included from the region, the companies, the government, education, etc. Well informed stakeholders will have enough knowledge to select the priority issues in the cluster's development, since if stakeholders do not understand the importance of association and there is no trust in the model the process does not advance and it may even be extinguished (Leguizamón, 2000). The intention is also to generate motivation for the development of a long term vision of the industry by the entrepreneurs. This dialog and sensitization process is constant and implies a permanent learning process. Association is a process predominantly subject to values.

Our western culture is reluctant to these types of models; therefore the process becomes slower and more conflictive. Many initiatives have not even been initiated due to the stakeholders' skepticism. The process requires strong leadership, capable of committing people, capable of keeping them united. On the other hand, the political will of different actors, politicians specially, is valuable to thrust the process. These must have a total comprehension of the associative process, so that they support the process in terms of, for instance, financial support, legal infrastructures, contacts, etc, since they are the direct spokespeople with the government. In the development of the dialog platform, there must be the support of technical studies on: the economic context, the industry's position, best practices, and a sensitization and training program on clusters.

- **Definition of the network's leadership team.** - It is important to start defining a leadership team, which thrusts the process. This team will become consolidated as the

cluster is developing and must be elected by consensus of at least the most representative stakeholders.

- **Training program.** - This must be designed according to the industry's nature and must gather the different statements suggested by different stakeholders. It is a permanent activity. The academic sector has a protagonist role here, since it must provide the guidelines for this training and sensitization process. Guest national and international experts are also very valuable in this stage of the process.
- **Innovation networks best practices.**- Revision of the best practices on similar clusters in order to obtain lessons from these experiences on the local, regional, national, and international levels, and that they serve as a reference framework and motivation in order to overcome skepticism.
- **Technical studies and analysis mechanisms.** - We will see separately the analysis mechanisms and then the technical studies. Such studies are carried out at different levels and with different techniques, which depend on the type of industry, and must agree the policy guidelines and admitting that a cluster is a multidisciplinary concept. These studies will allow to be defined and measured in different way depending on their existence, emergence, potential, industrial nature; that is to say, they are subject to what is intended with the cluster. The methodology through the analysis seeks to count on a well documented effort to describe trends, business location patterns, industrial interdependence (regional and interregional), local support of infrastructure, necessary institutions, programs, and knowledge to set the regional foundations of the industry; and it considers the skills and capabilities from the region to respond to those needs (Feser, 2002)

- **Analysis mechanisms.** - Some of the traditional analysis techniques are reassessed and some more innovative are included. We highlight techniques such as focus group, statistical analysis, social interaction techniques, creative conditional interviews, competitive analysis techniques, Balanced Score Card, etc. These techniques always need support from information technology and may be combined.

The objective of these techniques is to obtain key information from different stakeholders, that is to say, especially from those who know the region's industry in terms of basic products, supply chain, current investment patterns, potential opportunities for new products, etc. It must be taken into account that primary data are always necessary to assess stakeholders where secondary sources are not so valuable. However, for obtaining the experts' opinion, we have to consider that it is time consuming and that many times the desired information is not obtained. Likewise, a wide set of experts must be involved in the analysis, such as citizens, business elite, economists, technologists, and every person necessary to identify and classify potential and emerging innovation networks. The participation of experts and different stakeholders must be given in the different stages of the process, in a systematic manner.

- **Technical studies.** – This includes a series of necessary studies that allow having a global comprehension of industry and its role in the national and regional levels. In our proposal we consider the following studies:
 - **Economic studies and industry's characterization:** Those allow having a total understanding of the industry and must be accompanied by different indicators.

- **Definition of productive chain, and knowledge chain** (depending on the size of the industry, sometimes it is begun with mini productive or knowledge chains) involving different actors. This implies a hard work to summon different actors with the aim that different links of the productive chain are defined, hopefully by consensus, for the current and for the proposed chain. This productive or knowledge chain will be the base to form the innovation network.
- **Analysis of the industry's competitiveness on the international, sectorial, and local levels:** The tools to conduct this analysis may vary. We will use the works by Porter (1990, 1995, and 2000), based on case studies in several countries and the use of his diamond, value chain and sectorial analysis (these are the most used worldwide, despite many of their limitations); the works of Dessler et al. (1998); and the SWOT tools, among others.
We will also carry out prospective analyses in the industry with the aim of appreciating the future competitive scenarios. The intention is to have a deep study of the industry's competitive position and its trends.
- **Analysis of the political, social, and economic environment.** - This is fundamental to understand better the context in which the innovation is developed.
- **Partner selection:** This activity is critical since it implies to define the key actors. It is a process intensely supported by dialog, sensitization, and social networks.

4.3.2 Component II. Strategic design of the innovation network. This implies to design the network's strategic agenda, with its corresponding work plans. Let us see this with more detail:

Develop the network's vision and strategic agenda. This defines the desired future for the innovation network, the strategic axis on the long term, the immediate action plan, and the institutionalization and resource allocation. All of this implies the definition of a knowledge strategy with the inclusion of virtual links. The intention is to promote the valorization of a more modern role for innovation networks where interactions are not just limited to the geographical aspect but they also include virtual links to promote innovation. Following, we will describe the process:

- (a) **Definition of the innovation networks' vision.** What is intended with the cluster's development in the long term is made explicit. This definition comes from the dialog among diverse stakeholders, having achieved a previous consensus and commitment.
- (b) **Definition of the network's long term strategic axis.** This means to define the strategic projects that will guide the network. There must be only a few and must attend to the network's critical factors. The strategies that allow giving attention to the projects are chosen from them. The strategic logic that is suggested mainly is the contemporary for creation and innovation in value, against the traditional costs and differentiation strategic logic. Contemporary strategies are stated, such as technological strategies to create value, optimization of supply chains, Customer Relationship Management, knowledge and learning based strategies, human capital based strategies, etc. All of these with their respective responsible and indicators. This responsibility will be in charge of the group that leads the networks, elected by

mutual consensus, (it may be structured as a consulting committee) but with the commitment and participation of most participants.

- (c) **Short term action plan (immediate):** This includes several programs such as: investors' attraction program, advertising program, etc.
- (d) **Network configuration.** Based on the competitive analysis, especially on the international level, and the interaction of such components, the network design is proposed. The intention is that it is constructed by the different actors and that it be a discussed process, and that a consensus emerges, at least a majoritary one. The design will be perfected as the competitive dynamics strengthen. Key actors are identified here and the size, type of network, and scope are dimensioned. However, it is worth to clarify that networks lack a clear authority structure. That is why negotiation and decision-making mechanisms are required, some of those may incorporate routinized structures and processes; a level of sharing in the decision-making may be seen as a key element of networking.
- (e) **Mechanisms to deal with risks and benefits.** The nature of risk and benefit sharing may vary according to the type of collaboration. In the context of innovation networks, mutual risk and benefit sharing has been shown to be critical to achieve sustained collaboration. Some authors show the significance of establishing a basic contract to ensure the long term commitment of all parties during both product development and operation, and to allow sensitive information and knowledge to be exchanged.
- (f) **Network's institutionalization:** It implies to formalize the network's agreements.
- (g) **Resource integration program.** This refers to the integration of resources by the stakeholders, such as entrepreneurs, guilds, government, and external financing sources if possible.

An emphasis is made that the network's strategic agenda must be aligned to the national strategic agenda and the regional agenda; the same must happen to all the stages of the methodology. Let us see in brief detail these agendas.

- **National strategic architecture (design of public policies with their respective instruments, development of the cluster's vision).** It is indispensable that the government formulates a series of Public Policy mechanisms that allow facilitating the innovation process. The government has a very relevant role as facilitator and orientator of the process, never as a protagonist, since the latter would imply an intervention in the network economy (Porter, 1990). Politics instruments are indispensable to facilitate the process. The government's role in the strengthening of the competitive diamond would allow the consolidation of the process. The policies are reflected in: the country's competitive agendas, National Innovation System, export strategic plans, National Productivity and Competitiveness policy, Regional Centers for Support of Clusters (CARCES), related institutions and sectors for technological-research support, regional development plans, deregulation and diverse policies that favor the competitive dynamics, foster research centers, dialogs, and public consultation mechanisms.
- **Strategic regional design.** This implies the definition of strategic axis and different programs to orient the regional development, such as local innovation systems, regional exporting strategic plans, diverse incentives, etc.

4.3.3 Component III. Implementation / Operation. This implies to capture the dynamics of the networks and their consequences, it also implies to manage several interactions and knowledge flows.

In this point, we have considered three aspects:

- **A plan of change and diffusion.** Since the network implies a different work process, it is intended to state a program to carry out this process, especially in a planned manner. It also includes and intense marketing program to attract actors on the local, international levels as well as funds for the network. The intention is also to promote strongly the technological diffusion.
- **Implementation of a KM strategy to facilitate managing knowledge flows and interactions.** We highlight that the exchange, and more importantly, the capture of knowledge is a central activity of a network; this is why it is valuable to count on a KM strategy. In this context, organizational learning is considered imperative (Argyris and Schon, 1996) especially in an environment of collective entrepreneurship (Lundvall, 1992) that ultimately should be translated into innovation it its different levels. The use of several mechanisms to facilitate learning must also be privileged here, for instance network learning. (Powell, Kogut, et al 196).
- **Use of Balanced Score Card.** This management tool will be used to facilitate the network's implementation process.
- **Intense use of information technology.** Exchange and processing of information between the different network's actors is critical to the creation and operation of successful networks, this is why ICT will be privileged to support the processes.
- **Diverse mechanisms of social coordination, conflict resolution, etc.** Social coordination is recognized as enabling the development of good personal relationships. Noria, 1992, has argued that all organizations are in some instances social networks and this was highlighted as being important at the organizational level. The intention is to strengthen the trust, information and knowledge transfer, and facilitate mechanisms to achieve agreements in case of conflictive situations, since the conflicts are greater in networks. These mechanisms include all phases of the methodological process.

4.3.4 Component IV. Follow-up.

This seeks to define metrics for evaluating the networks performance (Vasconcellos et al, 2004), as well as their impact in the economic, social, and competitive levels. This also allows defining the feedbacks inherent to the good performance of the network. It is a highly dynamic and non-linear process. A series of performance indicators will be proposed as well as techniques to evaluate the competitive dynamics of such networks. The process will be supported by ICTs.

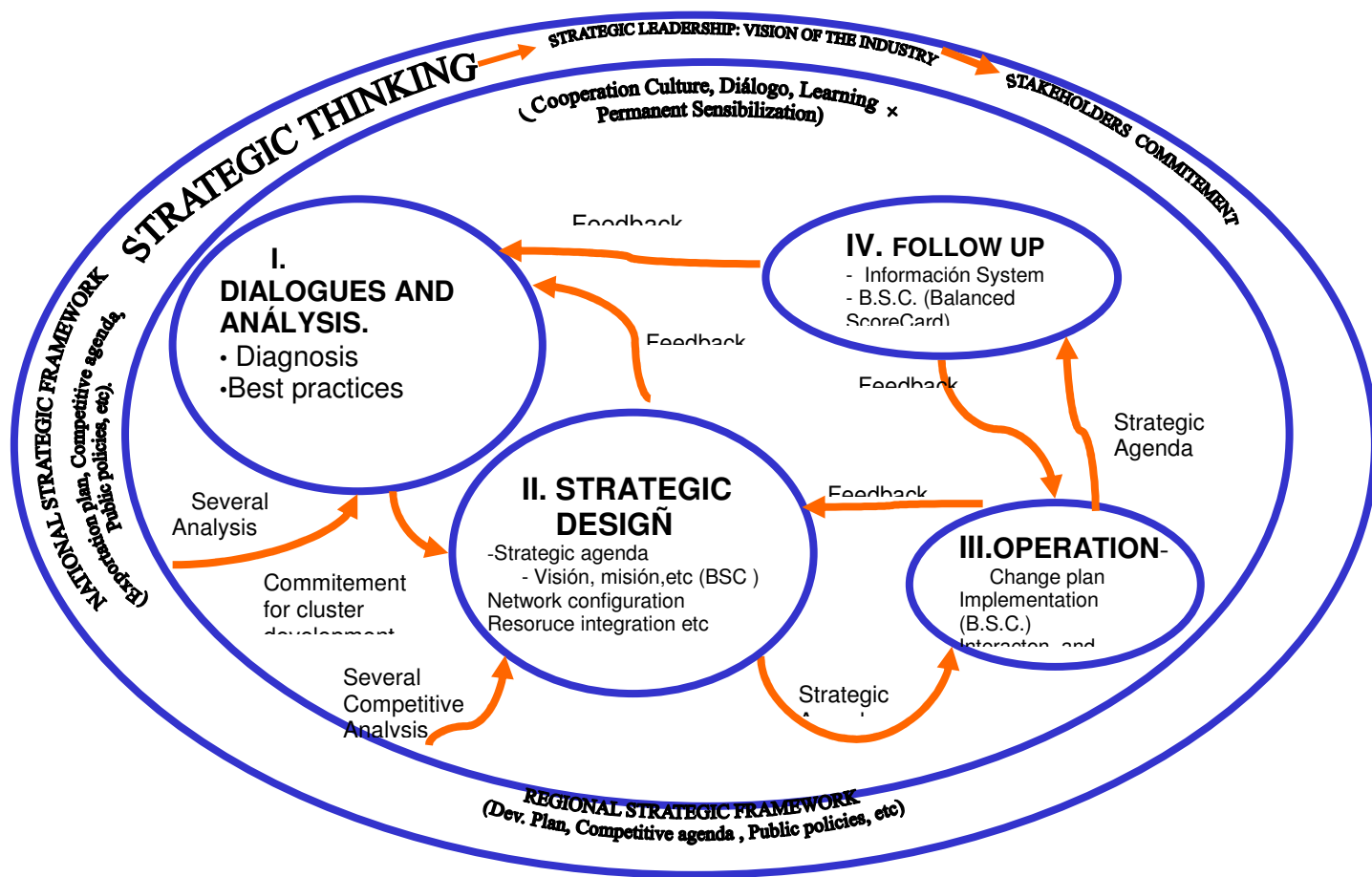


Figura No 1. Innovation networks supported by ICTs.- toward a framework

Finally the success in the framework's application is conditioned to different factors, principally to the degree of commitment that is generated in the development of the different stages by the stakeholders. It is also subject to the use of previously mentioned techniques and a greater use of participative and social interactions techniques, and support software. It is also necessary that technical studies are conducted in a thorough, rigorous manner with the aid of mentioned data and tools. All of this is fostered by a team that leads the process, always taking as north the network's vision. To implement innovation networks supported in electronic networks is a complex process and is a cultural change.

We also want to clarify that besides the methodology, an information and analysis system will be generated which may be accessed by means of a user-friendly computing program. (This will be possible by a joint research that is being carried out with researchers in the area of computer science). Likewise, a training program will be designed with several workshops and

discussion forums to analyze the methodology and its scope. We want to clarify that in our methodology, the innovation networks analyses will be taken as the space to question about the local and regional network, and not just as a technical methodology (Feser et al, 2002). In figure 2, the progresses of the proposed methodology are presented graphically.

5. Final remarks

Nowadays innovation networks are being used with intensity as an analysis tool to formulate and analyze public policies of science and technology in different industrial sectors and governments around the world, and as a fundamental factor to raise the innovative potential at all levels constituting in many countries the keystone for their competitive agendas. However, and parallel to this, there is also a claim for the modernization of roles, since innovation networks only limited to the geographical aspect – physical interactions, are not enough in the current competitive environment. There are also claims for a need of flexibility, agility of such networks. The intention is that hopefully all of this is given within a systematized methodological process, organic and non linear which facilitates the development of such networks, since up to this date there are fragmented approaches about it that besides minimize the value of a strategic focus of networks, the roles of ICTs and social networks.

With the intention of contributing to fill this gap existing in literature, some advances of the ongoing Project “Towards a framework of innovation networks in the digital age” have been shown, where the intention is to propose a reference mechanism and methodological construction to orient, facilitate the process for different stakeholders. The proposal framework is a hybrid model with physical and virtual interactions. This hybrid model is proposed, since the construction of trust and tacit knowledge exchange needs physical proximity and personal contact, being this one of Internet’s largest hurdles, and also for the cost of knowledge codification which is still very high, and there is still a lack of incentives so that people share their knowledge (Kauffmann, 2000). There is also the intention to value the inclusion of E-business in the innovation networks since the former is considered an important tool for helping companies and countries to develop economic trajectories of high impact at all levels.

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