

THE EVOLUTION OF BUSINESS NETWORKS ALONG INNOVATION LIFETIME CYCLE: A LONGITUDINAL STUDY

(WORK IN PROGRESS PAPER)

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ABSTRACT

In the last years many studies evidenced the contribution of networks in innovation, especially in terms of knowledge creation. Moreover recent studies analyzed deeper the features assumed by the innovation network, trying to understand which are the features of the network contributing to create innovation.

Even if the literature about innovation network seems to focus in particular on the role of the network in generating a new idea, no many studies analyze the evolution of the network in the following steps of the innovation lifetime cycle. In particular, there are no many studies explaining how the companies strategies within the network can influence the evolution of innovation along its lifetime cycle.

So, the aim of this paper is to analyze – using a longitudinal case study – how the strategies adopted by the actors involved in the network, in particular their goals, influence the evolution of innovation during the different steps of its lifetime cycle.

The longitudinal case study reported in this paper refers to a mechanical company operating in the knitting machineries industry. This company, about ten years ago, launched on the market a new technology, which enabled to create the so-defined “seamless” clothes. The creation of this new technology was thanks to a network. The evolution of the innovations launched by the company along the time reveals that innovation is strictly related to the features of the actors belonging the network and in particular to their strategies, that changed over the time.

KEYWORDS

Business networks, business strategies, innovation, lifetime cycle, longitudinal study, textile sector

INTRODUCTION

Innovation represents from many years an interesting topic for an increasing number of researchers. Among the reasons of this high interest, one is associated to the complexity of this phenomenon that, although deeply studied, today seems to be so wide and articulated.

A part of this complexity is obviously related to the strategic impact that innovative processes have on the competitive advantage of the company, while a part of it surely depends on the high number of operative instruments generally used for its management.

On the other hand the most interesting feature of innovation derives from the belief that it is a crossing activity, crossing in relation to the company's departments and crossing in relation to the company's boundaries. So, innovation management often implies the involvement of different departments – in addition to the R&D one – and often needs to go beyond the company's boundaries, looking for the contribution of external actors.

To develop successful offerings and to maintain, thanks to innovative ability, long-term strategic advantage, companies have to adopt a general approach, involving, in innovative projects, every entrepreneurial department and, most of all, allowing to capture weak signals coming from the environment, integrating them with internal knowledge.

As a result, it is possible to state that the main point of new product development processes today is knowledge. However this is not a new concept in literature about innovation.

Starting from the original study of Nelson and Winter (1982), indeed, it is evident how the evolutionary theory, focuses its attention on knowledge, on dynamics related to research processes and on the learning company, holding knowledge and specialized competences. Within this theoretical approach, the attention moves towards behavior, organization and performances of the companies used to act in dynamic contexts, characterized by fast and unpredictable events.

Starting from eighties and for all the following decade, the knowledge management perspective developed. The changes in the competitive context and the increasing complexity of the organization of the large managerial company, evidenced the limits of rationalist approach to new product development, claiming the importance of considering innovation as a continuous process of generation, usage and dissemination of knowledge (Leonard Barton 1995) (Nonaka, Takeuchi 1995). The approaches developed in these years, defined as "Fourth and Fifth generations' models" (Rothwell, 1994) are so based on System and Network Integration: specific and fundamental elements of this approach are the knowledge sharing and the creation of relationships' networks within the company and with external actors.

In spite of the advantages reachable by innovation, the need of managing so complex activities, aimed to build the knowledge basis necessary to develop new products, emerges. The main elements of a really innovative company, in fact, are based on its knowledge background, on its technological knowledge, on its ability to comprehend and to internalize market's needs and on its propulsion to face the "new" (Castaldo, Verona, 1998). So, to create the capabilities necessary to develop a new product, companies have to enlarge their internal knowledge. Knowledge complexity brought to a specialization of "knowledge work" (Rullani 1992), requiring to bring into action relationships with external and specialized sources of knowledge.

The case study reported in the paper gives a picture of the network as it was in the initial steps of the innovation of the lifetime cycle and then it describes the evolution of this networks along the years. The aim of the paper is to understand if the goal of the actors within the network changed over the time, how the innovation in itself evolved and which was the impact of the evolution of actors' goals on the innovation.

According to the relevance of networks in innovation, the next paragraph reports a literature review about business networks.

THE BUSINESS NETWORKS: A GENERAL FRAMEWORK

For many years literature about new product development identified knowledge management as the key of innovative processes. In particular, the studies dealt with dynamic capabilities (Eisenhardt, Martin 2000) (Vicari, Verona 2000) (Danneels 2002) (Helfat, Peteraf 2003) (Winter 2003) (Verona, Ravasi 2003) (Zahara, Sapienza & Davidsson 2006, Wang, Ahmed 2007) identifies in the ability of knowledge acquisition, integration and dissemination, the main feature of the company which wants to launch new successful offerings in the short time and has the necessity of maintaining this ability in the long term too.

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The approaches defined as "Fourth and Fifth generations' models" are so based on *System and Network Integration* (Rothwell, 1994): specific and fundamental elements of this approach are the knowledge sharing and the creation of relationships' networks within the company and with external actors.

Other models (Castaldo, Verona, 1998), basing on the resource-based theory, identify in the internal and external network the instrument useful to obtain the access to the resource of knowledge.

Also in the so-defined "Open Innovation" approach (Chesbrough, 2004) what is emphasized is the benefit for the firm from using external sources of knowledge.

If the literature cited above focus on the general advantages for innovation coming from the network, more recent studies analyzed deeper the features assumed by the innovation network, trying to understand which are the features of the network which contributes to create innovation

The study of Ahuja (2000) evidence that direct and indirect ties have a positive impact on innovation, but that the impact of indirect ties is moderated by the number of a firm's direct ties. Here structural holes are proposed to have both positive and negative influences on subsequent innovation. The longitudinal study reported by the Author indicate support for the predictions on direct and indirect ties, but in the interfirm collaboration network, increasing structural holes has a negative effect on innovation.

With reference to how network characteristics influence on performances in the field of innovation, Tsai (2001) found that the business units' connectivity in the network was positively correlated with the innovation and performance of the unit, while Burt (2004) evidenced how managers' likelihood to come up with good ideas depended on their position within a network.

Björk, Magnusson in their recent study (2009) explored the interrelationship between innovation idea quality and idea providers' network connectivity, using social network analysis. The analysis they conducted reveal that there is a clear interrelationship between the network connectivity and the quality of the innovation ideas created.

Corsaro and Snehota (2011) in their study about alignment and misalignment in business relationships find out that there are no patterns in how alignment changes, but they identify a slight tendency to misalignment over time. Their longitudinal study evidences that when parties are aware of misalignment and when there are no external constraints to action, the effort to align practices produces a positive effect on business relationships, even when misalignment exists.

Another interesting study about the impact of learning mechanisms and of information from supply chain partners on innovation processes is the one of Berghaman, Matthyssens & Vandembemt (2012). Analysing survey data of 182 industrial firms, they examine how information provision by upstream and downstream supply chain parties moderates the effect of internal deliberate learning mechanisms on value innovation. Results of the PLS analysis suggest that internal learning mechanisms and external information exchange do not always work symbiotically.

In addition to the business network literature we have to evidence that also technology life cycle studies recently focused on the role of interactions of producers, users and institutions in the development of new technologies. The study of Kaplan and Tripsas (2008) represents a significant contribution in this sense, applying a cognitive lens to understanding technology trajectories across the life cycle by developing a co-evolutionary model of technological frames and technology.

Even if the literature about innovation network seems to focus in particular on the role of the network in generating a new idea, no many studies analyze the evolution of the network in the following steps of the innovation lifetime cycle. In particular, there are no many studies explaining how the configuration of the network should change after the introduction and the diffusion on the market, in order to support the following steps of the innovation evolution (growing and maturity steps).

So, the aim of this paper is to analyze – using a longitudinal case study – how the network supporting innovation evolved over the time and which was its contribution during the different steps of the innovation lifetime cycle.

THE METHODOLOGY

In the empirical part of this paper a longitudinal case study has been preferred to another qualitative methodology. First of all, because the longitudinal approach was considered to be suitable for the research question. By using longitudinal field studies, the researcher can get close enough to the studied phenomena to discover the forces most crucial to the object of inquiry – the impact of network actors' goal on the innovation. Moreover, this methodology allows the researcher to remain close to the studied phenomena for long enough to discover the causal links among events and constructs, so to create a fertile basis for generating theory (Miller, Friesen 1982).

Secondary, because the benefits of longitudinal real-time studies make them particularly useful for studying processes of change and development in organizations (Barley 1990) (Van de Ven 1993). As we said before, some time passed from the introduction of the innovation we decided to study, so this enables us to understand – by a retrospective view – how the network and its actors' goals evolved during the years and, at the same time, analyzing the

evolution of the innovation by a longitudinal perspective allows us to follow step by step the change process.

Although the general fit of longitudinal study with our research questions, gathering longitudinal data on business to business relationships implies serious challenges (Anderson, 1995): “Researchers need to collect data about the same set of relationships with identical partners over several periods. In many instances, this is a virtually impossible task and may partly explain why longitudinal research is still an exception even when we deal with dynamic phenomena such as business relationship” (Eggert, Ulaga & Schultz 2006).

In order to overcome this limitation in the use of longitudinal study we decided to apply a triangulation method integrating multiple data sources in a multi-method design as recommended by Jick (1979).

So, for the retrospective analysis formal interviews and document analysis were used to collect data, while, in the real time analysis, participant observation, informal interviews and documents were preferred. The informal interviews were preferred in this second step in order not to interrupt the trust relationship the researcher developed over the time.

The data collection involved people employed within the observed company but also the main actors operating within the network. This was in order to get a better understanding of their goals and of their evolution along the time.

So we can state that a part of the longitudinal study involved directly the company: the different kinds of data were collected in the most critic stage of the innovation lifetime cycle in order to get information mainly about the evolution of the innovation in itself. The analysis of the goals of the network actors based, partly on the information emerging from the longitudinal observation of the company and mainly on the direct involvement of the main strategic actors operating in the network. Also this investigation based on the formal and informal interviews of the involved actors during the most critic stages of the innovation lifetime cycle.

The choice of this case study was not a chance: the innovation we decided to focus on was generated within the network – in particular thanks to the cooperation of a lead-user – and its diffusion on the market was thanks to the contribution of the network. Along the years the market evolved rapidly and this impacted on the actors goals. So this so complex context gave us the opportunity to see how the goals of the actors belonging to the network evolved and how this influenced the innovation generated from the introduction to the maturity stage.

With reference to the topic, the selected case study revealed to be very interesting. This made the change process transparently observable and the phenomenon of interest most likely to appear (Eisenhardt 1989).

Studying, only one organization obviously leads to disadvantages in terms of generalization. So, in this case, we decided to select an organization that could be considered representative of the specific type of the studied phenomenon, as we reminded above, and where the process could be observable (Åhlström, Karlsson 2009). The involvement of the different subjects acting within the network, then, brought to a sort of multiple case studies within a longitudinal one.

In the end, we have to precise that using longitudinal case study implies significant researcher commitment and organizational access. So, one of the most important steps in the research design is to find a suitable vantage point from where to gather data. Data gathering is of course easier when the aim of the research is a contribution both to the advancement of knowledge and to the practical concerns of the organization. In this specific case study the need of the company to find out which were the goals of the network actors, especially of the strategic customers, was crucial in order to invest in new technologies. As we will see after, the limited financial resources, related to the high investment that a textile technology requires, create many difficulties in the new product development stage. The risk of

developing unsuccessful products is so high, that the company refuses to do it without having the grant that someone will adopt the new technology when it will be ready.

THE LONGITUDINAL STUDY

The longitudinal case study reported in this paper refers to a mechanical company operating in the knitting machineries industry. This company, originally operating in manufacturing of circular hosiery and knitting machines, about ten years ago, launched on the market a new technology, which enabled to create the so-defined “seamless” clothes.

Thanks to the usage of a new technology, the new machines enabled to create external clothes and underwear characterized by the absence of seams very fast, passing in few minutes from the yarn to the finished product. This simplified the manufacturing process and, consequently the entire supply chain. The introduction of this new technology implied economic advantages related to the production costs savings and market advantages too, related to the well fit and fashionable content of the clothes realized with the new machines.

Hereby we will describe the different stages of the seamless lifetime cycle illustrating for each stage: the innovation launched, the addressed market and the articulation of the network.

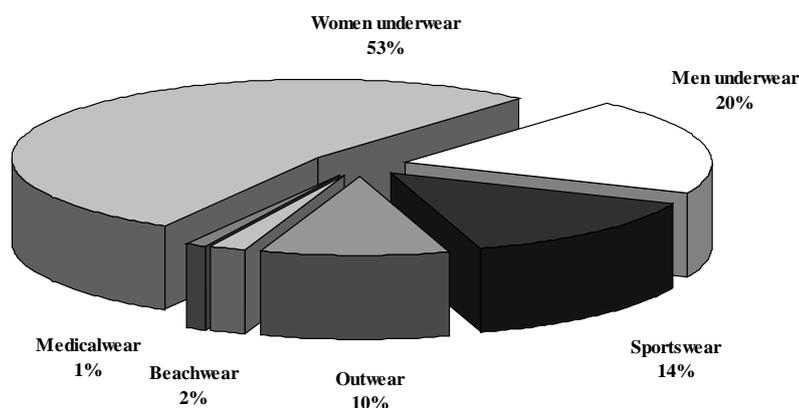
The introduction stage

What is very interesting of this new technology was the development stage. In fact, the concept was born from a lead-user idea. This was a customer operating in the hosiery manufacturing who suggested to the company to enlarge the diameter of the machines traditionally used to produce hosiery in order to create body-fit tubular. The cooperation with the customer brought to improve the new technology and to create the first seamless machines.

The introduction of this new technology on the market gave to the company the opportunity of enforcing its leading position on the hosiery market and to get into new markets too, such as the underwear.

The penetration on the underwear market of the seamlesswear was amazing. Within only three years the penetration of seamless in underwear market passed from 2% in 1998 to 9% in 2001. So, even if the new technology allowed to realize different finished products and so to get into different businesses such as the *sportswear*, the *outwear* and the *medicalwear* too – initially the great success of seamless was in underwear, as suggested by the data reported in the figure 1.

Figure 1 – Penetration of seamless on the final market in the introduction stage

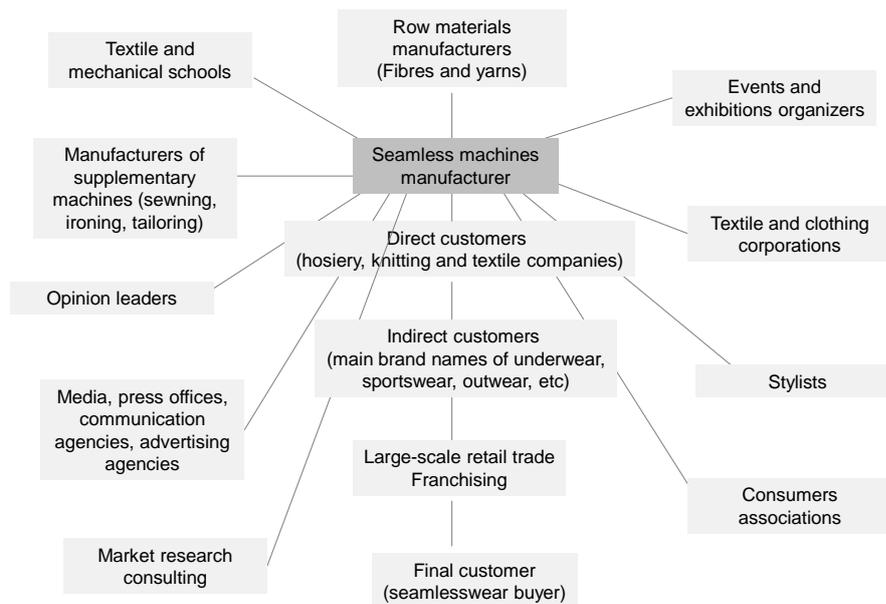


Source: our elaboration on company's report

This was not a chance: first because the seamless technology is technically very similar to the hosiery technology and so its introduction was easier for the hosiery manufacturing companies who didn't need to invest so much in the acquisition of new know-how. Secondary, this was a mature market that needed to reposition their commercial strategies on their mature market. The introduction of seamless technology gave them the opportunity of diversifying their production not focusing only on hosiery, but starting to produce underwear and, in some cases, outwear too.

The initial success of seamless on the market was mostly related to the ability of the company to create a network. In order to communicate the benefits of this new technology the company and to support the launch of this technology and its diffusion on the market, the company decided to involve different actors. The network was composed of: direct customers (knitting companies), final customers (the final brands of underwear, sportswear, prêt-a-porter, medical wear), suppliers, fashion schools, universities, research centers, stylists, associations, event organizers and so on.

Figure 2 – The network around seamless technology



Source: our elaboration

The growing stage

After the launch on the market the following years were characterized by a general contraction of demand. Hence, in this period the company decided to invest in new technologies development and in the search of new market opportunities.

In particular, in this period, the first models of seamless machines were improved. The new models launched on the market were so able to create more fashionable clothes compared to the first ones with more variety and a higher quality in the finished products.

So, during the growing stage, the company moved along two main directions: first it consolidated its leading position on the underwear market and, secondary, it tried to get into new market, such as sportswear and prêt-a-porter thanks to the strengthening of the partnership with many famous brand names of these markets.

Another main goal of this stage was the strengthening of the relationship with distribution, that represented the main linkage with the final consumer. Many promotional actions were planned in this stage in cooperation with some underwear brands, in order to give more visibility to the seamless products within the point of sales.

The maturity stage

In the last year the seamless technology approached to its maturity stage. The heavy economic crisis hit the global market during these years reflected on textile sector too. So in these years many of the marketing actions realized in the past were revised and cut. Actually the company decided to focus on the specific tools of business to business communication (specialized reviews and the most important exhibition of the sportswear and knitting sectors) and to revise the articulation of the network.

This doesn't mean that the articulation of the network changed, but that among the many relationships developed in the years of the launch on the market – aimed to create awareness of the new technology – the company decided to enforce the most strategic ones.

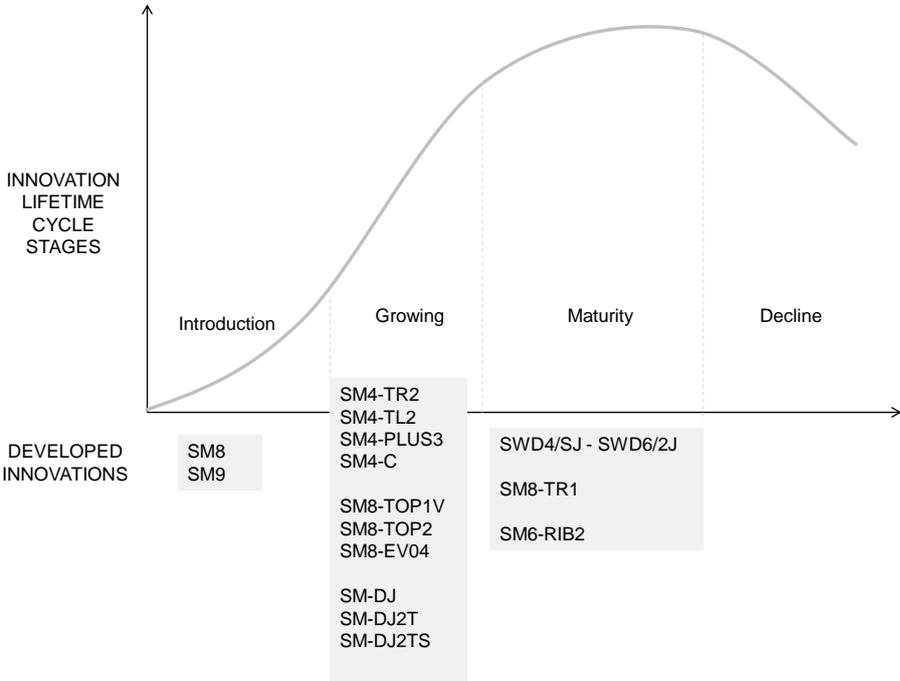
In the realization of new technologies, the co-production with the main customers operating in underwear, sportswear and knitting is critical. Because of the limited financial resources in this

period new technologies are developed only when the customer asks for it. Without a clear interest by the customer the new product development would be too expensive. Referring to the served markets, it is important to stress that in this period the underwear doesn't represent anymore the main market, because of its low margins and that the company decided to invest mostly in sportswear and partly in knitting.

FINDINGS AND DISCUSSION

As reported in figure 3 the innovations launched on the market starting from the seamless introduction till today, in the maturity stage, were so many. Looking at this figure and analyzing in depth the features of the different machines models launched on the market over the years, we notice that these were very influenced by the market dynamics and, in particular, by the customer goals.

Figure 3 – The evolution of innovations along the seamless lifetime cycle



Source: our elaboration

The first models launched on the market were defined as a “radical innovation” by the company, because of the economic and commercial advantages they had. However, from an external point of view, we can define these as “marginal innovations”, because of their similarity with hosiery technology. What moved the company in this innovative process was the customers need – especially of hosiery manufacturers – to diversify their production in order to get into new markets with an increasing demand compared to the hosiery one. As a result, the main feature of the first models launched on the market was the similarity with previous technology. The new machine had a high potential in terms of costs saving and in terms of diversifying the business, but the finished products they realized were not so radically new for the market. The first underwear realized were “seamless” but this was not an advantage that the market particularly appreciated.

Only in the following steps the company realized that the new technology could have a higher market potential investing in the improvement of finished products' quality. During the growing stage, other potential applications of the technology emerged: sportswear and outerwear in particular. Although, in these businesses, the customer goals were different. What the sportswear and the outerwear customers needed in those years, were the opportunity of realizing new products, fashionable and with particular knitting. This was the direction oriented the second step of R&D efforts. The new machines were so able to realize sportswear and outerwear of higher quality (using new yarns, improving the knitting of the finished products inserting for example transpiring and compressive areas).

Approaching to the maturity stage, innovations launched on the market changed again. In this new context all the served customers – underwear, sportswear, knitting and outerwear – seem to be particularly cost oriented. The global economic crisis and the hard competition characterizing many of the cited businesses brought them to look for innovations ensuring increasing margins.

So, the innovations developed in the last years were: *i*) new models specialized in the knitting of thinner yarns and able to do various knitting such as laces (these are innovations especially addressed to underwear, in order to create higher quality products with higher margins, compared to the basic seamlesswears); *ii*) new models specialized in the realization of seamlesswears with transpiring and compressive areas using innovative yarns suitable for the sport activity; *iii*) new models able to realize more “traditional” clothes, in terms of design and in terms of yarns (these are knitting seamless machines able to create cord, plait using cotton and wool).

What is interesting referred to these new technologies is that they are “customer-driven”. This is particularly evident in the machines realized for knitting and outerwear. In this case, the main features of technology point on the two main sources of competitive advantage in fashion today: variety, on a hand, and speed, on the other. While in the introduction stage of seamless technology, the company thought to reach the prêt-a-porter market, actually the fashion market considered to be suitable for this technology seems to be the mass market. Anyway, the entrance on the market of new brands – such as Zara, H&M, changing radically the mass market approach pointing on the continuous introduction of new collection along the year – brought the company to address its technology to the mass market, mostly because only with high volumes the high investment in the seamless machines can be paid off.

Table 1 – The evolution of the customers objectives and the features of the innovations launched along the different lifetime cycle steps

Lifetime cycle stage	Customers involved	Dominant goals	Innovation features
Introduction	Hosiery and underwear Sportswear Knitting	Diversifying the business Launching new products Increasing margins	First seamless machines using a technology similar to the hosiery one
Growth	Underwear Sportswear Knitting	Improving the finished product quality Improving the finished products quality Increasing margins	Improved versions of the first seamless machines specialized in the realization of more fashionable finished products

Maturity	Underwear Sportswear Knitting and outerwear	Increasing margins Increasing margins Increasing margins, reducing production time, improving variety	Improved versions of the first seamless machines specialized in: the usage of high quality yarns the realization of different knitting the realization of traditional knitting the usage of traditional yarns (cotton, wool)
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Source: our elaboration

CONCLUSIONS

The longitudinal case study reported is actually going on. Data collection, especially with reference to the different subjects acting within the network, is not completed yet.

Although data collection in case studies shouldn't be driven by pre-formulated propositions (Eisenhardt 1989), in the next steps of the empirical research we will consider the pragmatics of literature on networks in order to interpret the results emerging from the longitudinal observation and to formulate our hypothesis.

As suggested by literature, indeed, the theoretical framework was here used only like a telescope (Berg 1974) pointed toward the organization to direct the researcher's attention towards some aspects of the actors' goals evolution and of the consequent innovation dynamics. What we expect as the main contribution of this paper is the formulation of an hypothesis referred to the existence of a pattern in the evolution of the innovation along its lifetime cycle related to the evolution of the goals featuring the subjects acting within the network.

Maybe the change in the actors' goals could impact innovation in terms of content (more or less radical innovation evolved depending on the actors' goals) or in terms of lifetime cycle (we could formulate some hypothesis about how the change in actors' goals could influence the extension of the lifetime cycle of innovation making it shorter or longer according to the specific case).

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