Social Capital as a Mechanism: Connecting knowledge within and across firms

Cristina Chaminade
Department of Economics
Autonomous University of Madrid
Crta. Colmenar km. 15
28049 Madrid
Spain
cristina.chaminade@uam.es

Hanno Roberts
Department of Accounting, Auditing and Law
Norwegian School of Management
Elias Smiths vei 15
N-1302 Sandvika
Norway
Hanno.Roberts@bi.no

Third European Conference on
Organizational Knowledge, Learning and Capabilities (OKLC)
Athens, Greece, April 2002

Contents

1. Introduction

The existing bodies of literature about the knowledge-based firm and the resource-based theory of the firm (micro-level) and the economics of technical change (macro-level) have evolved concurrently but with few interactions. However, during the last decade, knowledge-based theories of the firm have been leveraged by an increasing body of literature about social capital while, simultaneously, the economics of technical change have begun to focus on the meso-level, i.e., networks of firms and their impact on innovation.

This paper attempts to link both bodies of literature around the concept of social capital and systems of innovation, and not around routines, as has been attempted in the past. For this purpose, the paper is structured as follows. First, we describe how our interpretation of innovation has evolved in the last four decades. A large number of interpretative models have accumulated over time; from the linear model of innovation, which puts R&D at the centre of the innovation process, up till the most recent models based on networks and innovation systems. We will describe and briefly discuss the main features of these models. Second, we will discuss the main characteristics of what we have called the sixth generation innovation model, which places knowledge and learning at the centre of its argument. We will focus our discussion on the underlying strategic elements of the sixth generation innovation model as well as its enabling factors.

We argue that the enabling factors in this sixth generation innovation model are linked to the sources of social capital at firm level. As a result, we suggest integrating the two bodies of literature. The practicalities of this integration are illustrated in the final section, using empirical evidence from a Norwegian project on how social capital contributes to radical innovations.

In the final section, we will provide the paper's main conclusions, shortcomings and suggestions for further research.

2. Understanding innovation processes – From the linear model to the network model

Economists have longer tried to grasp the foundations of economic growth. Until the sixties, innovation was considered a residual factor in models of economic growth. It was not until the empirical evidence provided by Solow that the economists started to re-think their model and embarked on a search for the sources of economic growth. Since then, we have come to consider innovation as a major source of economic growth, industrial development and firm's competitiveness (Dosi, 1988).

Not only the relative importance of innovation in growth has changed over time, but also our understanding of how innovation processes take place. Following Rothwell (1994), we can distinguish five generations of innovation models:

- **First generation: technology-push**

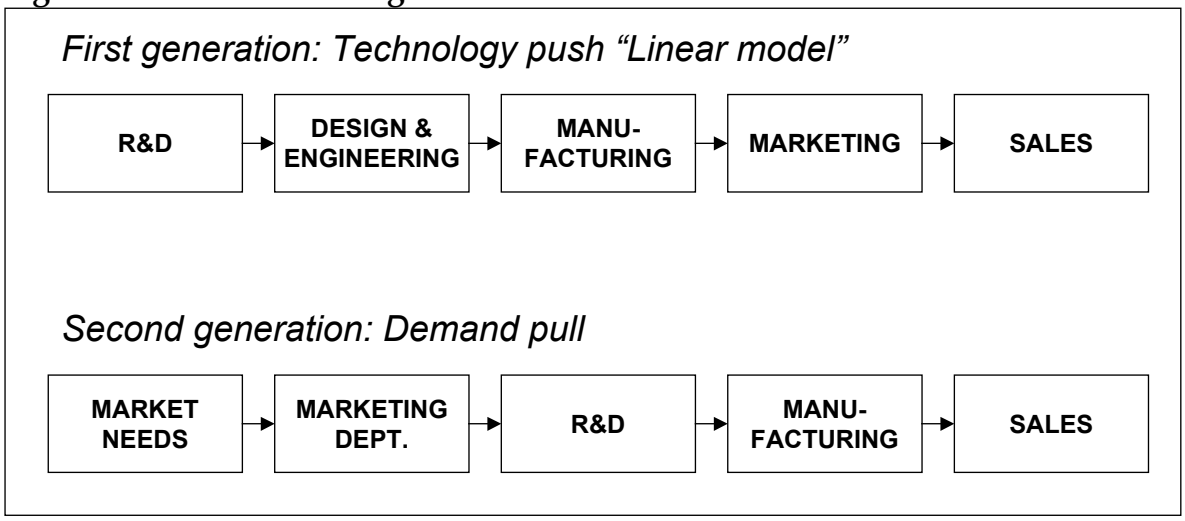
From approximately the mid-fifties till the late sixties, the prevailing model of innovation was the so-called "linear" or "neoclassical model" (Arrow, 1962; Nelson, 1959). As pointed out by Smith (1994: 8), this model considered the process of innovation as a "*process of discovery in which new knowledge is transformed into new products via a set of fixed sequences or phases*", as shown by Figure 1. According to this argument, it was sufficient to concentrate all efforts on the first stages of the process, namely R&D activities, to obtain the expected technological results (new products and services).

In fact, how R&D precisely transformed into new products, processes or services was not relevant for the neo-classics: they assumed this was an automatic process. It was, what Rosenberg (1982) called, the "black box". As a result, much attention was focussed on establishing R&D laboratories and facilities at firm level, developing policies to promote R&D, and provide statistics for R&D activities.

♦ **Second generation: the demand pull**

From the mid-sixties till the early seventies, economic theories and organizational studies paid an ever-increasing attention to the role the market played in manufacturing and innovation processes. Innovation became linked to customer needs; in contrast to the previous model, innovation was no longer the result of new ideas coming out of the R&D department, but it became the mean to satisfy the demands and needs coming from the marketplace, as shown in Figure 1.

Figure 1. First and second-generation models of innovation



Source: Adapted from Rothwell (1994)

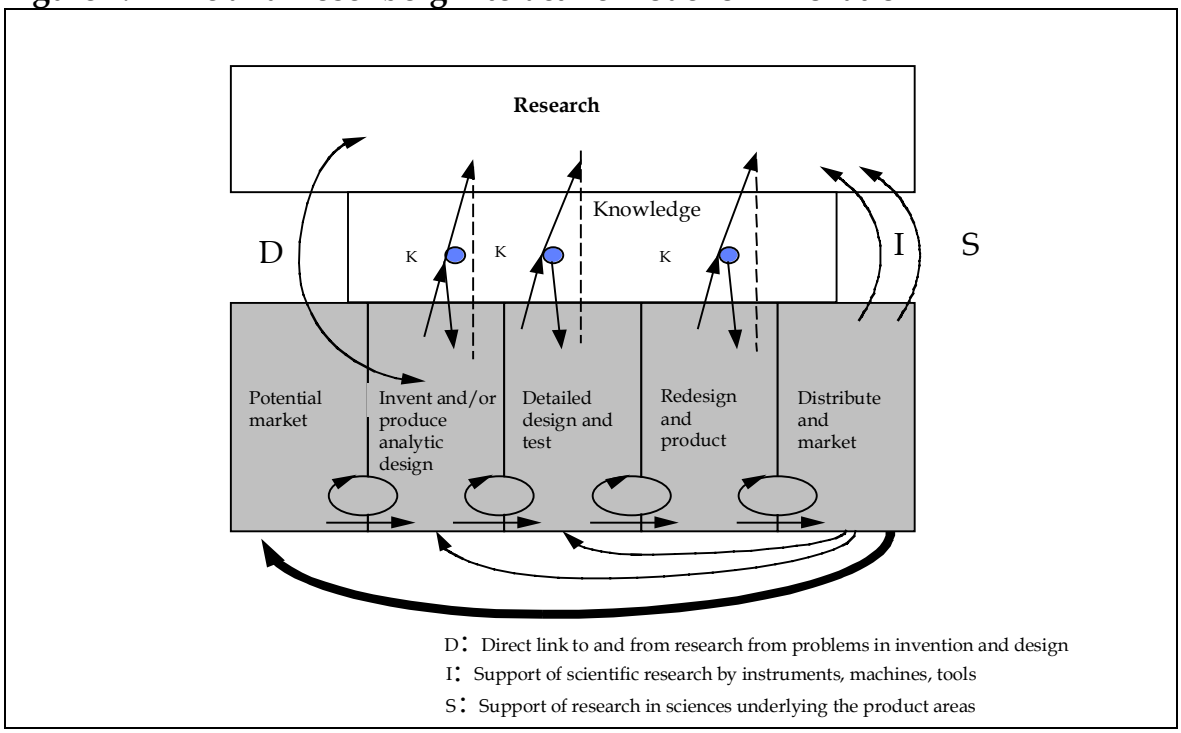
In a sense, the second generation model of innovation could be qualified as "re-active" to the market while the neo-classical model was market "pro-active".

♦ **Third generation: the interactive model**

Only from the publication in 1982 of Nelson and Winter's *"Evolutionary Theory of Economic Change"* and Kline and Rosenberg's *"Interactive Model"* in 1986, innovation started to become understood as a combination of demand pull and technology push. Innovation was described as an "interactive model" in which the generation of new knowledge (through R&D activities) was combined with

the use of existing knowledge, as Figure 2 shows. The intensification of linkages between the different departments of the firm was accentuated. It was believed that new ideas could emerge in any part of the firm (from the marketing department, till the R&D department) and, consequently, the interaction between the different units was essential to innovation.

Figure 2. Kline and Rosenberg interactive model of innovation



Source: Kline and Rosenberg (1986)

The main line of argument was that, when looking for technological solutions, firms would first turn to the existing sources of knowledge. Only when none of these suited their technological demands, the creation of new knowledge (through R&D activities) would be considered.

- **Fourth generation: the integrated model**

Nevertheless, the previous interactive model somehow remained sequential, with R&D activities now being located at the end of the search process instead of at its beginning. During the mid-eighties, the novel production organisation

of Japanese firms led to a new generation of innovation models, which have been called the "integrated models" (Imai et al., 1985).

Different activities (R&D, marketing, product development, manufacture, etc.) were overlapping for new product development, allowing the firm to dramatically reduce its product lead-time cycle while simultaneously reducing costs. This model was particularly helpful to explain new product development time reductions in manufacturing industries, such as in the automotive industry from which this model originated.

- **Fifth generation: systems integration and networking (Rothwell)**

During the nineties, the focus moved once again, this time from integration to networking. It appeared that, in order to be innovative, firms needed not only to integrate their different units and activities around the innovation process, but also to reinforce their networks with users, suppliers and other institutions that formed the so-called 'system of innovation' (Lundvall, 1985, 1988). This decade witnessed the emergence of the so-called systems of innovation theory (Freeman, 1987; Carlsson and Stankiewicz, 1991; Lundvall, 1992; Nelson, 1993; Edquist, 1997).

The main idea was that not only the interaction and knowledge sharing between the different units of the firm was necessary, but also the linkages with other "sources of knowledge" (firms, universities, research centres, users, suppliers) were essential. Freeman (1992) defined an innovation network as *"a closed set of selected explicit linkages with preferential partners in a firm's space of complementary assets and market relationships, having as a major goal the reduction of static and dynamic uncertainty"* (1992: 99). Although the relevance of informal and tacit network relationships is acknowledged, it is almost non-existent in the literature of this time as *"it is hard to classify and measure"*.

Rothwell (1994) best described this fifth generation model at firm level: A number of transformations in the managerial, organizational and technological spheres were allowing the firm to shift the speed of change and the efficiency of innovations. Rothwell mentioned underlying strategic elements and primary enabling features as key parts of the fifth generation model; these are summarised in the below table.

Table 1. Main features of the fifth generation innovation process

Underlying strategic elements	Primary enabling features
• Time-based strategy • Focus on quality and other non-price factors – Total quality management • Emphasis on corporate flexibility • Customer at forefront of strategy • Strategic integration with primary suppliers • Strategies for horizontal technological collaboration • Electronic data processing strategies	• Greater organizational and systems integration • Flatter organizational structures to gain flexibility • Fully developed internet data-bases • Effective external data links

Source: Rothwell (1994)

The fifth generation models especially emphasized the use of electronic tools (Information and Communication Technologies - ICT) to reinforce the internal and external links of the firm; that meaning the links among the different units and departments of the firm and across firms and other institutions.

The underlying idea was that information exchange is the key process in innovation as it significantly reduces data processing, retrieving, storing and exchange. The emphasis on data and information explains why ICT are considered the primary enabling features.

The high relative importance given to information and data in the innovation process led to an increasing number of "IT solutions" to facilitate the storage and exchange of information. However, it became soon clear that information and data was only *one* of many types of knowledge required in the innovation process and that competitive advantage was increasingly based on other types of knowledge, less explicit and more tacit in nature, leading to a new generation of innovation models.

3. The sixth generation model of innovation: knowledge and learning at the forefront

The fifth generation model's main contribution is the emphasis on the networking aspects of the innovation process (Freeman and Soete, 1997). However, as has been indicated, networking embraces only *explicit* formal linkages and it is seen as the basis for information and data exchange and storage.

Although this was a valid proposition during the 1990s, the end of this decade witnessed an increased interest in fast learning as the major source of competitive advantage of the firm. This interest came up alike among practitioners as well as academics in management, organizational studies, and strategy. As a result, the creation, acquisition, transfer, integration and deployment of knowledge arose as the focus of most theories.

Knowledge-based theories of the firm (Nonaka and Takeuchi, 1995; Grant, 1996; Spender, 1996) as well as the resource-based theory of the firm (Wernefelt, 1984) are some of these new approaches.

However, these theories also have an impact on the innovation model. With knowledge being the most important resource, firms became portrayed as a unique combination of resources and capabilities. As stated by Carlsson and Stankiewicz (1991:100), firms differ in the information they have, in the intensity of use of the knowledge they have, and in how they use it and increase it, while they also differ in how they learn. The more innovative firms and therefore, the more competitive ones, are those that are able to create, maintain and use their knowledge resources in the most effective manner, allowing the firm to learn collectively. Therefore, it is knowledge and the use of knowledge what makes the difference and creates the competitive advantage of the firm.

Those knowledge resources can be internal (related to the notion of intellectual capital) as well as external (related to the role of social capital), while especial emphasis is placed on the role of tacit knowledge and, consequently, on the mechanisms to increase and integrate tacit knowledge.

Innovation continues to be understood as a networking and integrated process, but much more focus is directed at the mechanisms that allow the creation, expansion and use of all knowledge types, this in contrast to the previous model, where data exchange through ICT was the key issue.

Learning is now at the forefront: the faster the firm is able to learn, the faster it will respond to market changes with innovative products and services. The most innovative firm is the one that learns fastest. As a result, we propose that all items related to strategic learning are part of what might be called the 6th generation of innovation models.

Using the same structure as the previous descriptions, the 6th generation model could be described as follows.

Table 2. Main features of the 6th generation innovation model

Underlying strategic elements	Primary enabling features
• Time and space compression • Focus on intangibles as the main source of value of the firm • Emphasis on connectivity • Stakeholders at forefront of strategy • Strategic integration with competitors • Focus on tacit knowledge	• Flexible structures and mobility of resources • Effective internal and external knowledge-sharing mechanisms • Top-management involvement • Culture and language • Externally bridging institutions • Mechanisms for the identification, measurement, management and disclosure of information on intangibles

Underlying strategic elements

- **Time and space (de)compression**: Being the first is considered to be the most effective way to gain market share. In that sense, time-to-market and its related cost is non-proportional; 'crash programs' and accelerated learning produce less results than using a given cost amount for a given time period (Dierickx and Cool, 198. That is, time cannot be compressed by spending more. However, the time dimension allows compression when considering digital space; for example, in the immediacy of order placing and delivery in electronic commerce where the order cycle is completed in a matter of minutes. Typical knowledge products such as software and education are becoming digitised and provided at no or very small marginal costs, while the dislocated immediacy is priced at a premium (Shapiro and Varian, 1999). Electronic business models specifically incorporate this time compression factor and are only partially dependent on physical space for completing the order cycle (Afuah and Tucci, 2001). Innovation, thus,

migrates to dimensions that allow manipulation as such; by moving into cyberspace, time consumption can be reduced while speeding up the learning curve.

- **Focus on intangibles as the main source of value**: In this new model, the focus is on the intangible resources of the firm as a strategic asset for sustainable advantage. Intangibles are defined as *"non-monetary sources of probable future economic profits, lacking physical substance, controlled (or at least influenced) by a firm as a result of previous events and transactions (self-production, purchase or any other type of acquisition) and which may or may not be sold separately from other corporate assets"* (MERITUM, 2002).

  The combination of intangible with conventional tangible resources allows the firm to create and maintain its competitive advantage in the market. Long-term benefits are clearly associated with the exploitation of the intangibles basis of the firm. Intangibles have been discussed in the framework of accounting (Cañibano et al., 2000), management (Johanson et al., 2001a, 2001,b; Roberts, 1998, 1999; Sánchez et al., 2001), disclosure (Mouritsen et al, 2001a, 2001b) or the impact on capital markets (Lev and Zarowin, 1999).

- **Focus on tacit knowledge:** related to the previous strategic element is the focus on tacit knowledge as the firm's most distinctive asset. Tacit knowledge is defined in terms of its attributes, *"it is non-codified, disembodied know-how that is acquired via the informal take-up of learning behaviour and procedures"* (Howells, 1996:92).

  Tacit knowledge is difficult to imitate and to capture, to identify and to measure; it is usually embedded in people (human capital), the organization (structural capital) and its networks (relational capital). Tacit knowledge generates distinctive capacities in the firms vis-à-vis their

immediate competitors (Eisenhardt and Martin, 2000). The acquisition and leverage of the tacit knowledge of the firm becomes a core part of the firm's strategy. Tacit knowledge is related to the learning capacity of the firm and it is acquired through *learning-by-doing*, *learning-by-using* and *learning-to-learn*. Therefore, it is directly related to the firm's ability to innovate and respond to the market in terms of time and cost.

- **Emphasis on connectivity**: Tacit knowledge (skills, experience) is mainly stored within the human resources of the firm. Innovation and new ideas emerge when this tacit knowledge is transferred to other knowledge carriers and integrated with explicit knowledge. The strategic objective of the innovative firm is to put this tacit knowledge to work. It has to create the conditions that support tacit knowledge flows, i.e., it has to promote the connectivity between people within the firm and across firms. Howells (1996) argues that a firm can possess tacit knowledge through its workforce, but it will only be useful for the firm's strategic goals if the firm is capable of finding the right connections between the employees within the firm, and between them and other firms, users, producers and other types of knowledge suppliers (consultants, researchers, etc.).

  Therefore, the mere existence of tacit knowledge in the firm does not make the firm more efficient or more innovative. Only if it is able to put its knowledge to work by creating the right connections, it will develop competitive advantage. Finding the right connections between the intangible assets of the firm can accelerate the launch of new products and services.

- **Stakeholders at forefront of strategy**: In the preceding 5th generation model, customers were at the forefront of the strategy. It was argued that demanding users could speed up the product development process and reduce costs if they participate actively in the innovation process.

However, in this 6th generation, knowledge-based model of innovation, the interactions with other stakeholders are also considered essential in the innovation strategy. "*If the primary productive resource of the firm is knowledge and if knowledge resides in individual employees, then it is the employees who own the bulk of the firm's resources*" (Grant, 1996). It is plausible that the most efficient innovation model is the one that integrates all the potential sources of ideas and possible solutions (customers, suppliers, but also employees). Moreover, the disclosure of information to a wider set of stakeholders about the strategy of the firms, the portfolio of resources and how they are used to accommodate the strategy, is becoming a crucial element to capture the necessary stakeholder inputs in the innovation process (human resources, capital, alliances, etc.).

- **Strategic integration with competitors in the long term:** One of the characteristic features in the strategy of innovative firms in high-tech sectors is the strategic integration with competitors in the long term. Innovation is becoming a much more complex process, involving a larger amount and variety of knowledge and resources. The levels of uncertainty are becoming increasingly higher, thus hampering innovation. Establishing strategic alliances with competitors in the long term helps to reduce this uncertainty, spreads risks and, at the same time, contributes to the clustering of resources needed for large innovation projects.

Primary enabling features

In conclusion, the 6th generation innovation model is based on knowledge (as opposed to information) and connectivity (as opposed to explicit formal networks). The strategic elements are focussed on exploiting the existing resource pools of mainly tacit knowledge as a means to increase the firm's learning ability. In this context, primary enabling mechanisms are those that help the firm to identify their critical knowledge areas, create the opportunity to connect and integrate that knowledge, and increase the motivation to share

knowledge. Opportunity, motivation, and networked competences and resources are the critical sources of **social capital**. (Adler and Kwon, 2002).

The term social capital is used to refer to both the social ties within the firm or internally among individuals and to the external relationships across firms. Social capital is defined as the *"goodwill that is engendered by the fabric of social relations and that can be mobilized to facilitate action"* (Adler and Kwon, 2002:17). Social capital at firm level is created through the connectivity or relatedness between the human resources of the firm and the creation of knowledge value, sometimes phrased as the creation of *Intellectual Capital*. But social capital is also used to refer to the network of social relationships across firms. In this case, social capital is created through the connectivity across firms and even across institutions (universities, firms, government etc.). In this respect, Adler and Kwon argue that the differential success of firms can be explained by the intensity of their linkages with other actors in social networks. **This is highly plausible because these linkages are the enabling mechanisms to connect and integrate tacit knowledge, speeding up the learning process and, therefore, reducing the time and cost required to develop new products and services**.

Creating social capital implies creating the opportunity, the motivation and the ability for (tacit) knowledge transfer and exchange.

When returning to our core discussion of the 6th innovation model, this social capital framework is extremely useful to discuss its primary enabling features: having the networks (no matter whether they are explicit and formal or implicit and informal) only creates the opportunity for transactions. But individuals and firms have to have a clear motivation to share their knowledge, and, furthermore, they have to have something to share, which is valuable for the community (in this case, the firm or network of firms).

The enabling mechanisms for the 6th generation model have to tackle with these three issues: creating the opportunity, developing the motivation and having something to share.

a) Create the opportunity

- **Flexible structures and mobility**: the consideration of the firm as a knowledge-based firm and the innovation process as a network process, based on tacit knowledge has also implications for the role of hierarchy and the locus of decision-making. Tacit knowledge (knowing how) is embedded in people, it is difficult to codify and it is only transferable through personnel interaction. If innovation is about the integration of relevant knowledge, the mobility of the human resources as well as the interaction between workers becomes a key issue (Grant, 1996). The organisation has to allow mobility and teamwork by removing all existing internal boundaries, whether organisationally or managerially. Fairlough (1994) states that when a high degree of innovation and speed is needed, then the most effective organisation is the one that avoids precise job-descriptions, seeks flexibility and initiative and encourages self-motivation.

  In addition, this 6th generation model has also implications for the locus of decision-making: it shifts from managers to shareholders and employees, the latter being the owners of the tacit knowledge and, consequently, the most important resource for innovation. The issue of employee shareholding plans thus becomes less a matter of compensation and reward systems and more of a knowledge strategy issue, being part of a wider set of managerial tools for the knowledge-based firm.

- **Effective internal mechanisms to share knowledge**: As posited by Grant (1996), transferability is a critical issue between firms but, more importantly, within firms. Howells (1996) also argues that intra-firm and

intra-organizational flows are fundamental to the creation of tacit knowledge and, therefore, the development of the learning ability of the firm and its innovation process.

The organisation has to leverage the connectivity of the different pools of knowledge in the organisation or, in other words, it has to create the linkages between the human capital, the structural capital and the relational capital and align them with the innovation strategy of the firm. Typically, these linkages require an orientation towards internal communication. The creation of information access ("open book management"), the use of a variety of internal reporting forms and formats (management dialogues, narrative formats and visualizations), and the creation of incentives for timely communication ("intellectual communication rights") are all part of this new coordination of linkages.

- **Effective external mechanisms to share knowledge:** Tacit knowledge can also be acquired through inter-firm connectivity of flows. If tacit knowledge is embedded in individuals, it is plausible that its integration and transferability is a social issue. Personal contacts become the basis for tacit knowledge acquisition and development, but in order to be effective, these contacts have to be made on a regular and systematic basis while a variety of channels has to be considered (reports, face-to-face meetings, electronic tools, etc).

b) Motivation

- **Involvement of top managers**: Innovation benefits have to be seen from a long-term perspective. The most successful firms are those that maintain their innovation effort and strategy even during economic crises. The effective management of the knowledge assets will reduce costs and accelerate the development of new products and services, as it will allow

the firm to react faster and use its resources more efficiently. But its results will be apparent on the medium and long term, basically as a result of the networked reconfiguration of the firm and its contingent set of managerial tools focussing on connectivity and timeliness. Top management commitment to the knowledge-based strategy of the firm and the accompanying change in organisational mindset and internal routines will be required as the process unfolds.

- **Culture**: Culture has an important role as an inhibiting or an enabling factor for knowledge sharing and connectivity. The practical experiences with the implementation of knowledge management systems and new tools for the identification and management of intangibles, have found in the organisational culture an ally or an enemy. In most cases, the implementation of such models had to be preceded by a cultural change. This has implied, in some cases, a transformation of the rules and regulations, the routines and, in most cases, the symbols (language) of the organisation (Chaminade and Roberts, 2001)

- **Bridging institutions**: Bridging institutions, such as sector organisations, can be an enabling factor in the 6th generation innovation model. They can act as a communicator facilitator, as a switchboard that intermediates the flows and exchanges among their sector members. Sector organisations become exchange platforms and no longer act as a representative agent in industrial relations or as a regulator of sector boundaries. An example of this will be provided in the next section.

c) Identifying and developing the resources and competences

The third source of social capital is ability. Ability is defined as the competencies and resources at the nodes of the network, i.e., the substance of exchange (Adler and Kwon, 2002). These are the resources that can be

mobilized by means of the network. Three criteria apply to resource mobilization, below framed as questions:

a) What does the firm need (in terms of knowledge) to accomplish its objectives? – with the vision of the firm as selection criterion
b) Where is the critical knowledge they need located within the organization and within the external network? – Identification
c) What activities are required to mobilize that knowledge, in order to create value?

The existing tools for the identification and management of intangibles, knowledge or intellectual capital in the firm might help to answer those questions (Bukowitz and Williams, 1999). The (limited) presence of those tools is also to be considered as an enabling factor, as they allow the firm to make a more efficient use of the knowledge it has or is available to it.
Knowing what it needs in terms of innovation, where it is located, and how to use it is a firm-level dynamic capability in a rapid changing environment (Eisenhardt and Martin, 2001), which can reduce considerably the response time to market needs in terms of new products, processes or services.

The relative importance of these enabling factors will be illustrated in the next section, when describing the introduction of a radical innovation in a traditional industry using social capital (internal and external) as a mechanism.

4. From theory to practice: The Norwegian experience

The experience in Norway shows how a radical innovation (transforming traditional print shops into knowledge-based firms) was facilitated through the creation of a network of firms, using the sector organisation as a platform, and creating the enabling factors required for the implementation of this new innovation. This example is about knowledge transfer and relational capital, as a means to speed-up the learning curve.

In 1999, two year Intellectual Capital project with the Norwegian sector organisations of the graphical industry (print shops) and the newspaper industry was initiated. It involved 27 firms during two distinct stages of time, all of them SMEs and members of the two mentioned sector organisations, and was sponsored by the Norwegian Research Council (NFR in its Norwegian acronym). The initiative to start this project came from the sector organisations, for the following reasons:

1. Most of their members were and still are in a loss-making situation. The standard solution was to invest in better machinery such as digital printing and Internet products, but anyone can do that. There is no competitive advantage resulting from technology alone nor did this investment strategy produce the expected results.
2. Second, the sector organisations realised that they were missing the boat; the transformation from an industrial society to a knowledge society was not getting to their members. They continued thinking in terms of machinery and industrial output, including the pricing and market perspective related to that.

The purpose of the project was to mobilize and use the firms' Intellectual Capital to increase their value creation abilities. Innovation along new lines of thinking and acting was perceived as the only means left of surviving in the new environment. And focussing on Intellectual Capital, i.e., the knowledge resources of the firm, did fit the bill of a new way of looking at the organisation. The introduction of this encompassing organizational innovation was only possible by learning collectively, sharing knowledge and experience while experimenting with Intellectual Capital inside each firm. Innovation was not due to the exchange of data and information, as the 5th generation innovation model stated, but to the extent to which a common knowledge base was

developed through inter-firm flows. It responds, therefore, to what we have called the 6th generation innovation model.

The project was implemented in three stages. An important first stage was getting the attention and the commitment of the firms and their top managers (*culture and language as enabling factors)*. Several mini-conferences were organised by the sector organisations to create awareness and explain the concept of Intellectual Capital. These created the *motivation*.

Before entering into a second stage of company interviews and assessing the Intellectual Capital potential, the focus was on how ready the firms were to work with IC; that is, to introduce radical organisational innovations. This was done by means of a short questionnaire as part of the telephonic agreement on who to interview when. Criteria used to assess readiness were: 1) previous experience with process management, for example TQM or quality certification activities, 2) previous experience with non-financial measurement, for example the Balanced Scorecard or key performance indicators, 3) the existence of procedures or routines for service or product development, 4) the perceived competitive pressure in product markets and 5) the perceived quality of the human competence. In sum, a preliminary map of the connectivity in the overall organisation arose; including how aware one was about key knowledge areas and how deliberate these linkages were managed.

The third stage was the development stage, in which the self-assessment model developed as a result of the interviews was applied. More importantly, however, was to teach the firms to think in terms of knowledge transfer, and the exchange of experiences and insights, and not in terms of industrial machines and functional training courses. As a result of the third stage, a pedagogical model of co-generative learning emerged which created a dynamic that lasts up till today, now that the project has been formally terminated.

Some of the experiences gathered during the two last stages, led us to formulate a couple of principles, of which two are important for the purpose of this paper:

- Co-operation and knowledge sharing might not be a natural issue, and this is especially relevant for SMEs. The channels to interact might be there and the necessity to co-operate might be obvious and clear, but it is not enough to start sharing. Creating value means that you have to share information and insights, otherwise you do not come up with product innovations or new services. Education for co-operation and connectivity was needed. The slogan "sharing=producing" was used.
- Before working with Intellectual Capital, firms need to have the time and conditions in place to work with it. This has to do with pedagogies and careful preparation. Adopting Intellectual Capital as a means for creating value signifies that firms understand what Intellectual Capital is and what it can do for them; that is, they see the benefits on and in their own terms and for their own unique situation. To facilitate this 'local translation' that answers the "what is in it for me"-question, a so-called knowledge library was created, containing a large amount and variety of examples, cases, contacts, etc. It was not a database for passive storage, but a pedagogical resource and support, containing the addresses of experienced "ambassadors", videotaped cases, an implementation cookbook, several slides shows, documents, and exercises. It allowed the firm to recognise those things that applied to their unique circumstances and formulate their own benefits of co-operating and sharing.
- Sharing information with the customer and with the suppliers is something natural for SMEs. On many occasions, the founding father of the family-owned firm has a very good mental map of the sector; he knows everyone and everyone knows him (tacit knowledge). Talking with your customers - sharing tacit knowledge such as impressions and insights on machinery or paper quality - was already an existing mode of working, but it needed to be routinized. That is, the channels were there, but they needed to be used in a

more systematic way, for example, have regular Friday afternoon customer panels, use systematic debriefing sessions, teach your customers to work with certain software packages etc.

Finally, not only the project helped to implement an organisational innovation in a number of firms who are presently acting as "lead users", but also helped the sector organisation to reinvent itself. Originally, they acted as an industrial organisation, representing their members in industrial relations situations such as collective wage negotiations and labour law disputes. Now, they have adopted a perspective of themselves as a networked organisation that runs an exchange node within a larger network – the spider in the web. As a symbolic result of this project, they have changed their name - before it was the graphical industry association, now visual communication Norway - showing their realisation that they represent a knowledge activity, and not a low-priced and nicely printed piece of paper.

The newspaper publisher's association also changed its name and became the media companies association, showing that newspapers are only one sort of medium in the knowledge society.

Finally, the printing sector organisation created several network groups, actively sharing the information they have with their members at all levels. And they have embarked upon "knowledge branding"; communicating to the rest of the world the knowledge identity of themselves as sector organisation and of their members. They do no longer see themselves as representatives at a table, but as a network of knowledge that needs to be connected and transferred continuously, otherwise they do not create value for their members. They are becoming a knowledge cluster.

In summary, the (success in the) development and implementation of this radical innovation can be explained in terms of collective learning and sharing. The project is a good example of how social capital can be created and can serve as a mechanism to connect knowledge within and across firms.

Furthermore, the project shows, first, how the enabling factors were created during the project and second, how important those enabling factors were in the subsequent innovation process:

- First, the project has created a great variety of mechanisms for knowledge transfer and connectivity. Some of them being IT-based, such as the "knowledge-library" and some others being face-to-face meetings between firms and inside the firm. It has also built and is building routines upon the existing tacit knowledge sharing mechanisms.

- Second, the project worked intensively with the motivation of the different actors, first, by showing the top managers the advantages of the innovation and of co-operation, and, second, by helping the firms to formulate specific interests and benefits in their own terms and on their own terms. It helped to develop an Intellectual Capital culture and a common language among the participating firms.

- Third, it showed the firms that their experiences were also useful for other firms. In other words, it helped the firms to identify their knowledge sources in reflection of what they could tell others (tacit knowledge benchmarking). Moreover, the awareness on "what they know they know" has resulted in a further interest in developing appropriate managerial and organizational tools (e.g., pricing for knowledge, project staffing, mentoring).

5. Conclusions and suggestions for future research

The present paper showed the utility of the social capital concept in explaining the new innovation model. Social capital is about the value of social networks for the firm. It has been argued that this value can be seen in terms of

innovations; that is, social capital can be conceived as a mechanism for tacit knowledge sharing and stimulating innovation.

Being the first on the market is one of the most important sources of value creation for the firm. The organizational advantage consequentially resides in being able to innovate continuously and learn faster than the rest of the competitive pack. In order for sustainable innovation and learning to effectuate, knowledge sharing and transfer becomes a core management focus.
Specifically, the increasing variety of expert knowledge and experience that goes into learning and innovation, translates back into coordinating expertise at firm level and into providing sharing opportunities at meso-level. Key coordination mechanism becomes social connectivity, while the provision of motivational incentives and ability for sharing is the prerequisite of the firm. Typically, these are items related to the field of human resource management (incentive systems, training & development).
Being able to find and locate the right expertise before connecting it, is an issue that resides both at firm (micro) level and at cluster or sector (meso) level. The time for new product development is reducing and firms have to be fast in locating the knowledge they need for innovation. Speedy localization and accessing of expertise/knowledge can benefit from institutional and facilitating arrangements that are purposely developed and maintained. The 6th generation model of innovation addresses these mobility structures and exchange platforms. Even more so, because the tacit knowledge dimension requires connectivity between people in their context; a platform allowing a sustained range of exchanges thus is preferable over a series of point-item "hits" – facilitating continued dialogue and practising the absorption of the knowledge is likely to rank over (facilitating) the mere provision of substance material. An innovation model based on pedagogical concepts is, perhaps, the most adequate in relation to the 6th generation model of innovation.

Our paper shows that innovation is about learning collectively, and at two levels simultaneously:

a) within the firm, connecting the different sources of knowledge; and,
b) across firms, though the creation of networks.

To the extent that tacit knowledge is one of the main inputs in the innovation process, and considering that it can only be created through interaction, social capital can be an important mechanism for innovation. But some enabling conditions have to be in place: motivation, opportunity and ability.

Although this paper has focused on the role of tacit knowledge and social capital in innovation, we are aware of the relevance of other types of knowledge of a more explicit nature as well as the presence more explicit and formal transfer mechanisms. Our argument should not be understood as a plea for focussing singularly on tacit knowledge connectivity or as a suggestion to abandon attempts to optimise formal transfer mechanisms in favour or tacit ones. Innovation requires a combination of all types of knowledge. But an equal place at the table of tacit knowledge and an awareness of the full spectrum of possible connectivity, is justified.

Finally, social capital has been discussed as basically a "good mechanism". Connectivity was indicated as having positive results and benefits in terms of innovation. However, connectivity can also lead to a maximization of confusion and information overload, while networks also have downside risks of exclusion, innovation inertia, and a stiflingly homogeneous set of interpretations and norms. The issue of calibration and finding "the right amount" of connectivity while achieving a requisite variety in the openness and closedness of networks vis-à-vis their members can be conceived as the broad challenge of future research. Particularly the link between innovation systems at meso level and the management of knowledge and learning at firm level

seems to address the appropriate level of analysis. A methodology for connectivity research still is over the horizon – yet.

....

6. References

Adler, P. and S-W. Kwon (2002). Social Capital: prospects for a new concept. Academy of Management Review, 27:1, 17-40.

Afuah, A. and C.L. Tucci (2001). Internet Business Models and Strategies, Boston: McGraw-Hill.

Arrow, K. (1962). Economic welfare and the allocation of resources for invention, in: Nelson, R. (Ed) The rate and direction of inventive activity, Princeton: Princeton University Press, 609-629

Bukowitz, W. and R.L. Williams (1999). The Knowledge Management Fieldbook. London: Pierson.

Cañibano, L., M. García-Ayuso and M. P. Sánchez (2000). Accounting for Intangibles: a literature review. Journal of Accounting Literature, 19, 102-130.

Carlsson, B. and R. Stankiewicz (1991). On the nature and composition of technological systems. Journal of Evolutionary Economics, 1:2. 93-118

Chaminade, C. and H. Roberts (2001). Accounting as Contagious Unease: a comparative analysis of implementing intellectual capital in Norway and Spain. Mimeo, presently submitted for review.

Dierickx, I. and K. Cool (1989). Asset Stock Accumulation and Sustainability of Competitive Advantage, Management Science, 35:12, 1504-1511.

Dodgson, M. and R. Rothwell, (Eds.) (1994). The Handbook of Industrial Innovations, Aldershot: Brookfield.

Dosi, G. (1988). Sources, Procedures and Microeconomic Effects of Innovation. Journal of Economic Literature, XXVI, 1120-1171.

---------- (Ed.) (1997). Systems of Innovation: technologies, institutions and organizations. Oxford University Press.

Eisenhardt, K.M. and J.A. Martin (2000). Dynamic capabilities: what are they? Strategic Management Journal, 21: 1105-1121.

Fairtlough, G. (1994). Innovation and Organization, in: Dodgson, M. and R. Rothwell, The Handbook of Industrial Innovation, 325-336.

Freeman, C. (1987). Technology Policy and Economic Performance: lessons from Japan, London: Pinter.

---------- (1992). Networks of Innovators: a synthesis of research issues, in: Freeman, C. (Ed.) The Economics of Hope, London: Pinter, 93-120.

Freeman, C. and L. Soete (1997). The Economics of industrial innovation, 3d. ed. London: Pinter.

Gabbay, S.M. and E.W. Zuckerman (1998). Social Capital and Opportunity in Corporate R&D: the contingent effect of contact density on mobility expectations. Social Science Research, 27, 189-217.

Grant, R. (1996). Toward a Knowledge-based Theory of the Firm. Strategic Management Journal, 17 (winter special issue), 109-122.

Howells, J. (1996). Tacit Knowledge, Innovation and Technology Transfer. Technology Analysis and Strategic Management, 8:2, 91-106.

Imai, K., I. Nonaka and H. Takeuchi (1985). Managing the New Product Development Game, in: Clark, K and R. Hayes (Eds.). The Uneasy Alliance, Boston: Harvard Business School Press.

Johanson, U., M. Mårtensson and M. Skoog, (2001a). Measuring to Understand Intangible Performance Drivers. European Accounting Review, 10:3, 1-31.

Johanson, U., M. Mårtensson and M. Skoog (2001b). Mobilising Change through the Management Control of Intangibles. Accounting, Organization and Society, 7/8, 715-733.

Kline, S. and N. Rosenberg (1986). An Overview of Innovation, in: Landau and Rosenberg (Eds.). The Positive Sum Strategy, Washington, DC: National Academy of Sciences.

Kraatz, M.S. (1998). Learning by Association? Inter-organizational networks and adaptation to environmental change. Academy of Management Journal, 41, 621-643.

Lev, B. and P. Zarowin (1999). The Boundaries of Financial Reporting and How to Extend Them, Journal of Accounting Research, 37:2, 353-358.

Lundvall, B-A. (1985). Product Innovation and User-Producer Interaction. Industrial Development Research Series, vol. 31. Aalborg: Aalborg University Press.

---------- (1988). Innovation as an Interactive Process: from user-producer interactions to the national system of innovation, in: Dosi, G. et al., Technical Change and Economic Theory, London: Pinter.

---------- (1992) (Ed.). National Systems of Innovation: towards a theory of innovation and interactive learning, London: Pinter, 342.

MERITUM (2002). Guidelines for the Management and Disclosure of Information on Intangibles (Intellectual Capital Reports, Madrid: Airtel-Vodafone Foundation.

Mouritsen, J., H.T. Larsen and P.N.D. Bukh (2001a). Intellectual Capital and the 'Capable Firm': narrating, visualising and numbering for managing knowledge. Accounting, Organizations and Society, 26, 735-762.

Mouritsen, J., H.T. Larsen and P.N.D. Bukh (2001b). Guidelines for Intellectual Capital Statements – A Key to Knowledge Management (Copenhagen: Agency for Trade and Development, 2001 – http://www.efs.dk/icaccounts)

Nahapiet, J. and S. Ghosal (1998). Social Capital, Intellectual Capital and the Organizational Advantage, Academy of Management Review, 23, 242-266.

Nelson, R. (1959). The Simple Economics of Basic Research, in: Rosenberg, N. (Ed.) (1971). The Economics of Technological Change, Harmondsworth: Penguin Books.

---------- (Ed.) (1993). National Innovation Systems. a comparative analysis, New York: Oxford University Press.

Nelson, R. and S. Winter (1982). An Evolutionary Theory of Economic Change, Cambridge: Harvard University Press.

Roberts, H., (1998). Management Accounting and Control Systems in the Knowledge-intensive Firm. Paper presented at the 21st Annual Congress of the European Accounting Association, Antwerp: Belgium.

Roberts, H. (1999). The Control of Intangibles in the Knowledge-intensive Firm. Paper presented at the 22nd Annual Congress of the European Accounting Association, Bordeaux: France.

Rosenberg, N. (1982). Inside the Black Box, Cambridge: Cambridge University Press.

Rothwell, R. (1998) Industrial Innovation: success, strategy, trends, in: Dodgson, M. and R. Rothwell (Eds.), The Handbook of Industrial Innovation, 33-53.

Sánchez, M. P., C. Chaminade and M. Olea (2000). Management of Intangibles: an attempt to build a theory. Journal of Intellectual Capital, 1:4, 312-328.

Shapiro, C. and H.R. Varian (1999). Information Rules: a strategic guide to the network economy, Boston: Harvard Business School Press.

Smith, K. (1994). Interactions in Knowledge Systems: foundations, policy implications and empirical methods, Oslo: STEP Group report.

Tsai, W. and S. Goshal (1998). Social Capital and Value Creation: the role of intrafirm networks. Academy of Management Journal, 41, 464-478.

Wernerfelt, B. (1984). A Resource-based View of the Firm. Strategic Management Journal, 5, 171-180.