

DYNAMIC DEVELOPMENT OF INTELLECTUAL CAPITAL AND INTANGIBLE ACTIVITIES: A MODEL OF KNOWLEDGE MANAGEMENT FOR KNOWLEDGE INTENSIVE FIRMS

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ABSTRACT

The paper addresses the strategic aspects of knowledge management and presents a model that helps in the detection of those activities that may lead to an increase of an organisation's intellectual capital endowment through an adequate knowledge management strategy. The model developed analyses the epistemological and ontological transformation of knowledge, and the strategic actions and agents involved in the transformation of information and data into competitive knowledge for knowledge intensive firms. Starting from the internal development of new knowledge and, following a dynamic conception of knowledge development within existing trajectories (feedback learning process) or creating new cognitive trajectories (feed forward processes), we aim to understand how knowledge is created internally and exploited externally in knowledge intensive firms. Additionally, the differences in knowledge management between exploratory and exploitation strategies are set clear.

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1. INTRODUCTION

Knowledge -of whichever sort: human, organisational, technical or relational or, of whichever nature: tacit, individual, explicit or collective- is the building block of intangible assets and input of intangible activities and organisational capabilities. Organizational processes, systems and culture are embedded in people and knowledge artefacts, which create the intangible asset endowment of an organisation. Contrary to tangible assets, that are valued according to physical dimensions, intangible assets are valued according to their knowledge content and, being non-measurable, they are seldom reflected in the balance sheet (Itami and Roehl, 1987). However, the incidence of intangible assets on competitiveness is important because they differentiate organisations, set up barriers to competition and create sustainable capabilities due to their heterogeneity, to build *ex-ante* and *ex-post* information gathering limits and to the existence of barriers to their replication (Peteraf, 1994).

Knowledge management and intellectual capital represent the trend to focus on intangible assets and dynamic capabilities as the main source of sustainable competitive advantages; therefore it is important to analyse their relationships. The paper presents a model to understand the activities involved in organisational development and knowledge innovation. It takes into account the epistemological and ontological transformation of knowledge, incorporating the diverse strategic actions and agents involved in this transformation in knowledge intensive firms.

2. THEORETICAL BACKGROUND: FROM DATA TO INTANGIBLE ACTIVITIES

The dynamic dimension of intangible assets is set clear in the concept of intangible activities. These are the strategic and organisational processes that, being based in knowledge in action, create wealth in organisations (Bueno *et al.*, 2001). They enhance manufacturing activities – which tend to be tangible- and develop essential capabilities (Eisenhardt and Martin, 2000). Intangible activities accumulate and interact on resources and capabilities that are neither unique, valuable, non-easily replaced nor imitable (Barney, 1991). Core intangible activities result from organisational learning processes and are linked to: innovation processes and to the acquisition of competitive information (internal R&D, benchmarking); to the structuring of organisational procedures through norms and canons (total quality control, environmental standards, labour, health and safety regulations...); to a more creative labour force (human resource training and development, organisational development, creativeness and leadership stimulation....) or to the attainment of external positive reputation (relational marketing, public relations....) (Pérez-Bustamante and Sáenz, 2003). These processes are part of the intellectual capital of an organisation. Intellectual capital is the outcome of dynamic processes of selection, reduction and absorption of the knowledge complexity of the environment directed to gain knowledge, practical experiences, technologies, relationships with customers and business contacts that may lead a firm to an advantageous position in the market; and thus to increase its economic value. If these processes are institutionalised into norms and routines they become static patterns of behaviour that allow for reiterative strategic and operational action.

Organisational routines are explicit knowledge in the form of operational techniques that embody the tacit knowledge needed for strategic and operational decision making (Nelson and Winter, 1982). Routines allow for the recurrent creation, development, deployment, exchange and implementation of ideas and their transposition into products and services which, once in the market, enhance the competitive development of an organisation. Therefore, they are essential in the learning consideration of the firm, which is a process of knowledge creation built upon personal or collective perspectives (Argyris and Schön, 1978; Kolb, 1984). As a result, routines provide an organisational dimension to individual knowledge, though at the cost of destroying the necessary adaptive dynamism of competencies (Mahoney and Pandian, 1992) because routines drive the organisation away from chaotic dynamic environments towards ordered regimes, which may have paralysing effects on innovative behaviours and, therefore, on competitiveness. Contrary to knowledge management, intellectual capital is a stock variable and does not represent a flux evolving overtime. It deals with what has been learned and forms part of the cognitive critical mass of an organisation. This static dimension of routines is too narrow to provide a wide scope for knowledge development and sustainable competitiveness. Routines are also defined as the use or alteration of the actual knowledge stock and operational characteristics (Nelson and Winter, 1982) that deal with behaviours about cognitive stocks and how they evolve over time. According to this dynamic perspective they are part of the synergetic addition of four cognitive components or business intangible functions of intellectual capital: human capital, organisational capital, technological innovation-capital, and relational capital. Therefore, knowledge management may be conceived as the organisational capability to appropriate individual knowledge and incorporate it into the organisation's knowledge stock, creating the capability to match organisational resources to the ever-changing environment. That is to say, the capability to analyse the environment and scan it in search of data and information, incorporate them and deploy their potential internally and, at the same time, exploit in the marketplace new knowledge bases in the form of cognitive assets.

This challenging environment demands for an adaptive revolutionary or evolutionary strategy that may help in the search for new information, process it, embed it into cognitive assets and protect it to get rents in the market (Fernández and Pérez-Bustamante, 2003). This competitive development is linked to the strategic renewal of a firm, which is connected to the learning processes arising from the tension between exploration and exploitation of new knowledge bases supporting specific products and technologies and organisational inertia. Accordingly, organisational learning occurs overtime and across levels (individual, group, organisational and inter-organisational), but it also creates a tension between existing routines or processes to assimilate new knowledge (feedforward) and exploit and use what has been learned and accepted in the organisation (feedback) (Crossan *et al.*, 1999).

However, as it was stressed above, cognitive assets result from the global and synergetic addition of the knowledge of individuals, organisational design, customer relationships, external networks and connections, and of the technological innovative capabilities of a firm that lead it to an advantageous and sustainable position in the market (Pérez-Bustamante, 1998a). That is to say, cognitive assets create intellectual capital, in any or several of its four dimensions: human, organisational, innovation and relational (Brooking, 1996; Bueno, 1998). The different components of intellectual capital may be classified in internal and external intellectual capital. The former refers to organizational and human capital and sustains the development of value in the long term, transferring knowledge internally in the individual

collective dimension through processes of knowledge intuiting, interpreting, integrating and institutionalizing (Crossan *et al.*, 1999) or: socializing, externalizing, combining, internalizing and assimilating knowledge (Nonaka and Takeuchi 1995; Pérez-Bustamante, 1999). The latter, refers to innovation and relational capital and reflects the effects of the external diffusion of knowledge and the feedback of external information. The model presented in the final part of this paper will deal with this process.

3. KNOWLEDGE STRATEGY FOR KNOWLEDGE INTENSIVE FIRMS.

Knowledge innovation is more clarifying for the dynamic conception of knowledge management. It refers to new or traditional activities of creation, alternative use or rejection of knowledge that, once embodied in new or existing cognitive assets, may lead to a positive market performance that produces economic and social value; therefore increasing intellectual capital. Knowledge management pays a special attention to innovation processes, since they are information based activities that create tacit or explicit knowledge through organisational learning (Lundvall, 1999). Innovation processes are also necessary to both adapt the organisation to its environment and, as an outcome of innovation externalities and competitive upheaval, change it. Knowledge intensive and learning organisations should then be skilled to create, acquire and transfer knowledge and to modify their behaviour reflecting new knowledge and insights. As a result, knowledge intensive firms are characterised for their use of dynamic knowledge based competencies and routines, which are frequently based on tacit, difficult to observe and hidden knowledge.

The cognitive bases of intellectual capital in knowledge intensive organisations should reveal the existence of successful innovative research activities and patterned human interactions in which knowledgeable people act and interact and the effective co-ordination of interactions, which are key to accomplishments (Nelson and Sampat, 1999). They should also act as a signal to the stakeholders of the organisation and to other influential groups about actual or potential intellectual capital development. In this sense, the intellectual capital and cognitive critical mass of an organisation have to be made visible and tangible in assets such as:

- a) The products, services and publications launched onto the market -technological capital;
- b) The intellectual property rights applied for -technological capital;
- c) The collaborative agreements and business contacts established to perform R&D activities -relational capital; and
- d) The quality and past performance levels attained by their workforce and the external perception of their excellence -human and organisational capital.

In knowledge intensive firms, knowledge management becomes an essential tool due to:

- 1) The dynamic conception of these firms as a knowledgeable entities that must incorporate the capability to adapt, integrate and reconfigure organisational skills, resources and operational competencies in changing environments.

- 2) Available knowledge paths and assets are linked to cognitive irreversibilities, switching costs, customer lock in, standardisation and organisational inflexibility and inertia;
- 3) The importance of Intellectual Property, external relations, strategic alliances and endowment of technology in the current position of an organisation and in the protection of its knowledge base.
- 4) The role played by human capital, both individually and working in groups.

4. INTELLECTUAL CAPITAL AND KNOWLEDGE ASSETS IN KNOWLEDGE INTENSIVE FIRMS.

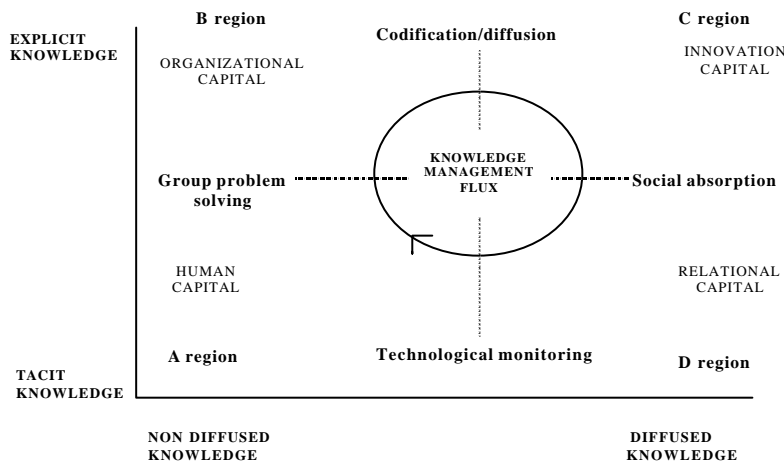
The goods and services created by an organisation allow for the achievement of economic resources once the knowledge they incorporate has been codified, abstracted and diffused (Boisot, 1998) in a process that takes into account the accumulative contributions of the different components of intellectual capital (from human to relational). Boisot's social learning space (1997) is the basic framework to understand in which context the most skilled activity of the organisation is -or should-, be performed and what strategic action should be implemented. It considers both the epistemological sphere of knowledge codification or tacitness and the external diffusion of cognitive assets.

The link between social learning cognitive regions and intellectual capital elements is shown in figure 1. Intellectual capital elements perform specific roles in each of the regions, being thus the source and foundations of dynamic knowledge-based competitive advantages. Human Capital resides primarily in A region, Organizational Capital in B region, Innovation Capital in C region and Relational Capital in the D region. The synergetic addition of these roles will lead to intellectual capital or sustainable economic value added procedures.

Initially, knowledge -in the form of human capital- lies in the most secure A region (it is not codified, nor diffused, so it may be kept secret). The ideas about new products and processes fuelled from cognitive introspections are altered through an epistemological and institutionalizing process that makes them tangible, standardized and tested becoming individual information and knowledge. This knowledge becomes collective within the boundaries of the firm when it is transposed to the B region. The space between both regions is the area of internal problem solving and, ontologically requires knowledge to be socialised into groups. This process integrates in a coherent and systematic way new knowledge developed by individuals -Human Capital- with the knowledge base of the firm in the form of routines, and a clear mission and culture -Structural Capital-. The codification and organizational institutionalization of knowledge reduce environmental uncertainty and complexity, allowing for its future reiterative use. This knowledge has a non-diffused and codified nature and, only if the pressures towards its diffusion to the region C could be controlled, there are possibilities to build upon it a sustainable competitive advantage, exploiting the scarcity of the resource. The transversal properties of knowledge, its more tangible nature and the possibility for alternative and simultaneous uses at reduced costs, end up leading to its expansion to new markets. In the C region, lays explicit and diffused knowledge under the form of marketable goods and services or Innovation Capital. Once the new asset reaches the C region, it sets a technological dominant design or standard that

attracts new customers and competitors into the industry. Knowledge bases have been structured and standardized, reducing the technological and commercial risks associated to its commercialisation. This provokes a competitive upheaval. As technology evolves, entering its maturity stage, this knowledge will reach the D region, where lay the common assumptions and knowledge of the Society that does not provide any distinctive competitive advantage on its own because it is accessible to any competitor. It is a basic common competence for industrial performance but, if intrinsic and specific alterations on the diffused knowledge can be made, new knowledge that creates a new differential advantage and the basis for future innovations may be achieved. The exploitation of technological and market monitoring, with the internal knowledge creation capabilities of the firm, may lead to the creation of new knowledge and perspectives in the A region; that would re-ignite the process (Pérez-Bustamante, 1998b).

Figure 1: Social Learning Space and Intellectual Capital



5. A MODEL FOR KNOWLEDGE INNOVATION

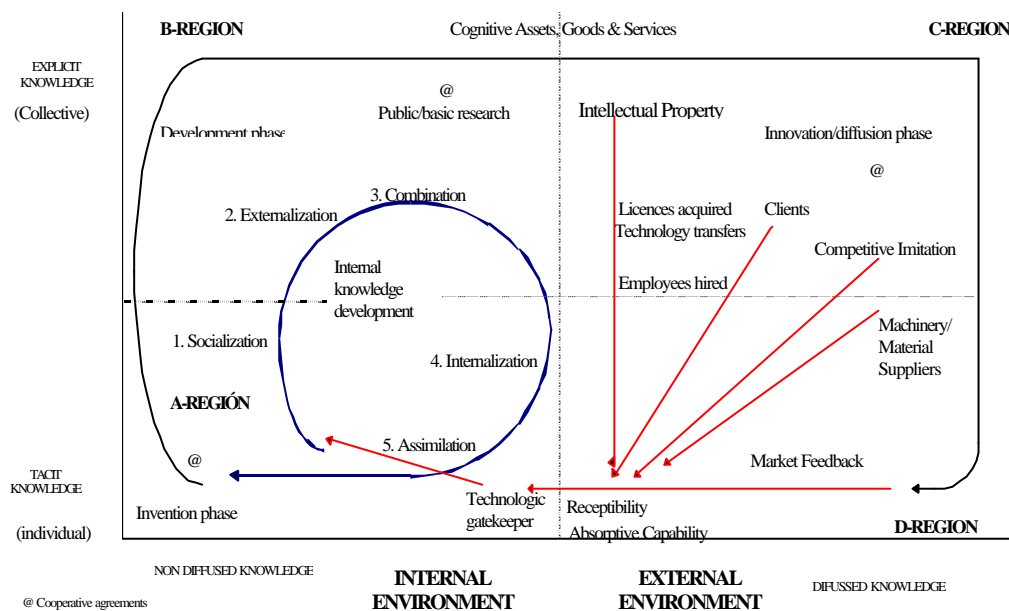
5.1 Description of the model

Building up on Boisot's social learning cycle and different models of internal transmission of knowledge a model of knowledge management (for the dynamic knowledge creation, diffusion and rent acquisition) can be developed. The model links the epistemological and ontological transformations of knowledge, adding the external information links (figure 2). Knowledge networks involve the mutual exchange of economic resources and information

(human, organisational, technological and relational capital) between the pioneering inventor and one or more improvers or commercialises, where clear property rights are critical to create effective co-ordinated transactions.

The evolution of knowledge and its transfer into cognitive assets is conceived as a dynamic double loop process –internal and external-, which is necessarily tied to the existence of gatekeepers or intelligent agents (Allen, 1977). These agents both incorporate and disseminate information out and into the organization and encourage employees to develop cognitive introspections upon the absorbed information. Once the process of internal dissemination of knowledge is achieved, the process of external diffusion initiates. The double learning loop reflects the tension between feedback and feedforward information strategies that either enhance the existing technological trajectory (cognitive inertia, learning exploitation strategy) or develop a new one (creative destruction, technological discontinuity and learning exploration strategy).

Figure 2: A framework model for knowledge innovation



This knowledge management model adds to the internal loop of innovation and knowledge development, the access through cooperation to other resources, the imitation strategies and the capabilities needed to absorb and adopt external information. These are important activities to be performed in the innovative activities that follow the invention phase.

The model starts with the internal transmission of knowledge in the A region that is performed by the technological gatekeeper (if knowledge is externally developed) or by the knowledge innovator, otherwise. Both innovative and learning loops will be continuously

interacting due to the need for internal and the external information transfers and feedback in the creation of new knowledge innovations. Therefore, the model itself should be understood as a spiral in which there is a continuous transformation of knowledge bases between the individual-collective and tacit-explicit dimensions (ontological and epistemological dimensions respectively). Once knowledge has been disseminated internally (A-B regions), it reaches the market (C-D regions) generating economic resources (rents and new or feedback information), which will be reincorporated into the internal dissemination spiral (Pérez-Bustamante, 1998b).

To remain technologically updated and to protect their sources of intellectual capital, knowledge intensive firms should:

- 1) Develop an internal environment to enhance the contribution of their researchers towards the development of new knowledge and to communicate it internally.
- 2) Create the infrastructure and conditions necessary to access to the knowledge developed by other basic research organisations –recalling, for example, on co-operative agreements or setting specific human resource management policies to hire and retain scientists-; and
- 3) Try to limit the uncontrolled market diffusion of their inventions -their imitation- with the combination of tacit/explicit embodiment of the cognitive asset and its degree of appropriability determining if it is more important for a firm to concentrate on controlling:
 - a) The particular knowledge embodying asset,
 - b) Intellectual property rights protecting the underlying knowledge (patents, trademarks, authorship...),
 - c) The complementary assets needed for its commercialisation -either owned or accessed through co-operation- (Pitkethly, 1998)
 - d) Exploit diverse business mechanisms such as first mover market advantages; create resource and knowledge dependencies among their users, lock-in effects or setting a networked community of practice based on a firm's technological primacy, or social technology.

5.2. The ontological dimension: the internal spiral of knowledge creation

The internal development spiral performs a key role in the transformation of human into organizational knowledge, avoiding the negative outcomes of knowledge leaks and losses due to employees quitting the organization. Leadership, autonomy and freedom for action, are essential to create human capital. To transfer it into the structural capital are key a strong culture and mission and social learning mechanisms such as communities of practice. (Stewart, 1997). The transformation of individual and tacit knowledge into collective and explicit knowledge is facilitated if the organization follows a spiralling process of interrelated activities: socialization, externalization, combination and internalization (Nonaka and Takeuchi's SECI model). A final stage, assimilation by individuals, may be added. Nonaka *et*

al. (1996) and Nonaka and Noburo (1998) have synthesized the way the SECI model operates and the characteristics of the knowledge sharing *milieu* or *ba*.

1) Socialization processes create tacit knowledge through sharing common experiences and mental models. Brainstorming processes, Quality circles, direct experiencing and observation, guided learning, imitation and sharing ideas with clients and users promote the socialization process by encouraging harmony among different knowledge models.

2) Externalization processes articulate through metaphors and analogies tacit knowledge into explicit concepts creating new concepts and models because different thoughts are supported by single words or images that provide a new meaning to the reality derived from its interaction. Metaphors and analogies are the basis for inductive and deductive thinking in the search of structural and functional similarities between two realities and hence, their differences.

3) Combination processes systematise existing concepts into a knowledge system, integrating different sources of explicit knowledge through sorting, adding, combining and categorizing explicit knowledge. This task is facilitated by the use of databases and computerized communication networks.

4) Internalization processes embody explicit knowledge into tacit knowledge in the forms of shared mental modes of know how. Knowledge should be documented in manuals, oral traditions, diagrams, papers or the organizational culture.

5) Assimilation processes refer to the effective incorporation of knowledge and the understanding of the causal relations that underlie the actions and results, to the cognitive sphere of the individuals. When knowledge is assimilated, individuals master the new concepts and expand their cognitive mass and capabilities to a higher level in the spiral of knowledge creation, which allows for the development of new insights and perceptions (Pérez-Bustamante, 1999).

5.3. The epistemological dimension: the external spiral of knowledge diffusion, rent securing and information perspectives

Once the knowledge has been developed internally, a decision has to be taken regarding its codification, abstraction and diffusion levels, trying to avoid an excessive uncontrolled diffusion of the asset in the market but, at the same time, trying to facilitate its commercialization. These sub-processes have an important impact on the protection, information and rent seeking strategies of innovative firms. As intellectual capital assets become less tacit (they are codified, diffused and abstracted), the control of their supporting knowledge base is less relevant, while the control of either the innovation-linked complementary assets or the intellectual property rights that protect the knowledge, gain importance.

The model shows the different links that should be used by an organization or its individuals

in order to increase its cognitive base and protect its market diffusion, though not all the links have to be activated. The external information incorporated into a firm may derive from the cognitive asset developed by the innovative firm or from cognitive assets developed by other competitors. In the first case, feedback information processes about product performance are set, whilst in the second case, forward mechanisms and imitation procedures are activated. If this information enhances the existing knowledge trajectory, the strategy performed is a monopolistic one that aims to protect the existing market positions through setting up barriers. If the knowledge trajectory is altered, the strategy is an innovative Schumpeterian one, searching for new innovations in dynamic settings.

5.4 Strategic actions towards getting rents and information from knowledge assets

Knowledge intensive and innovative firms may perform several strategies to secure rents from the knowledge diffused in any of the four social learning regions or from the exploitation of competitive advantages arising from the different intellectual capital components. They may use the protection of legal monopolies of exclusion, such as those developed by intellectual property rights, or they may keep secret the novel technological knowledge hiding the underlying information bases of the product, incorporating them into complex products, while exerting a tight control of several business variables, other than patents. Thus, innovators may use as protection mechanisms the exploitation of strict secrecy policies based on the quality and confidentiality of the research performed by their human capital, the business advantages linked to being the first to market or to the possession or access to the complementary resources necessary to commercialize the cognitive assets, the tacit nature of the knowledge bases that support their competitive advantage and that are not visible for competitors (Levin *et al.*, 1992).

In the control of human capital, the organization should encourage the internal dissemination of knowledge, developing a flexible organizational structure that leads to a creative and information transmission friendly environment. It should also stress the importance of institutionalization of information and knowledge. Tacit knowledge is transmitted within the organisation at great cost, very slowly and with a lot of ambiguities. Interpersonal face to face relations and personal communications become essential to correct errors of interpretation. That is the reason for the importance of the internal spiral of knowledge transformation, but also for the establishment of external information links. A clear mission supporting a strong communicative and knowledge sharing culture, as well as leadership and enhancement of individual creativity and learning spaces are essential to develop a learning organisation.

In the practical implementation of an innovation, the innovator always has a natural advantage derived from the time needed by its competitors to analyze the product, to discover the manufacturing practices of its production process and to build up the infrastructure needed to produce and commercialize it successfully. This time lag allows for the achievement of scale economies, learning and experience effects, the generation of asymmetric information about the quality and price of the product, a positive goodwill and reputation among consumers, technological leadership and priority in the access to scarce resources (Dierickx and Cool, 1987). These activities may be performed in a go-alone strategy or within collaborative agreements.

The joint exploitation of secrecy and lead time also allows for a continuous development of technological knowledge bases to which imitators have a late access. Economic rents are

developed exploiting the information gap between innovators and imitators. A *Schumpeterian* market structure is then built on the basis of a continuous innovative research that evokes a wide range of solutions from the past experiences of the innovating firm, where new insights are incorporated into the organization in feedforward learning processes. On the other hand, the exploitation of monopolistic positions arising from patents also gives time to innovators to develop first mover advantages that limit the capability of imitators to reduce the economic rents accruing to innovators. A monopolistic position is achieved through enhancing the existing research patterns and procedures in feedback learning processes and exerting a tight control on all sources of knowledge.

Without specifically addressing the influence of appropriability regimes, we could differentiate between those firms that tend to get economic rents protecting the results of their innovative activities by means of patents and those that do it commercializing a continuous flow of new products or improvements in their productive processes that, *extra-murus*, remain secret and tacit. Liebeskind (1996) names the first firms monopolistic rent generators and the second ones *Ricardian* rent generators or, according to Boisot (1995), *Schumpeterian* innovative firms.

The possibilities to incorporate external knowledge to a firm, and to get feedback from the market are shown in the model in the links between the regions B, C, D and A. These links represent different mechanisms to transfer knowledge that either reduce the problems to imitate and adopt knowledge through collaborative technological transfer and alliances or either reduce the problems associated to the diffusion and commercialization of a cognitive asset, if the innovator does not perform it on its own due to a lack of, or access to, the necessary complementary assets or capabilities. Imitation problems are related to the characteristics of the accumulation process of knowledge in order to replicate it. Among these characteristics are causal ambiguity, the need of a critical research and cognitive mass, the tacitness of the knowledge base and the existence of technological and knowledge gaps. The links of the model also represent sources of information for imitation or improvement such as reverse engineering, Benchmarking, normalization procedures and standardization norms, government requirements, product performance, customers' opinions, collaborative research agreements, advanced subcontracting, patents granted scientific publications, trade expositions, external consultancy, employee turnovers or information from the distribution channels. The importance of these sources of information as building blocks of a competitive sustainable advantage are set clear in the increasing importance of Unfair Competence, Labour, Punishment and Intellectual Property Laws, that prosecute the illicit access or disclosure of managerial, commercial or inventive information.

However, in any information acquisition strategy there is a need for receptibility that, taking into account the results of diverse learning processes (internal or external to the firm and individual, group, organizational or interorganizational) will allow for the application and use of information to those new situations and areas, diverging from their original source (Lippman and Rumelt, 1992). Hence, these information links also reduce the impact of several problems arising in the innovation process such as diseconomies of time compression, legal barriers or access to complementary resources (production capability, reputation, distribution channels or lobbying capacity, among others). All sources of information should be channelled to the intelligent agents or technological gatekeepers in the A region, who should review new knowledge and transform it in order to diffuse it internally.

Intelligent agents are specialized in the acquisition of information and in its internal and external diffusion. This new knowledge puts the organisation into a dynamic environmental position and, if it enters into conflict with the existing cognitive models institutionalized by the organization, new validation double loop learning processes should be initiated. As a consequence, the organization will develop new knowledge, either leading to incremental innovations that enhance the existing research and commercial activities or to radical innovations that will imply the development of new research lines and products, breaking with institutional inertia.

6. FINAL CONSIDERATIONS AND MANAGERIAL IMPLICATIONS.

As a conclusion, the complexity of the economic environment (the risks associated to launch new products), the greater need to disclose information in order to commercialize the product (the need to codify knowledge bases), and the tradition, past experiences and historical performance of the firm are variables that condition the strategic behaviour of a firm when an innovation is launched. Two generic innovative organizations may be described.

Schumpeterian innovative firms can only survive in the market if they perform continuously new innovation research processes, and exploit their knowledge bases through cooperative agreements, avoiding to exploit the advantages that arise from the artificial monopolistic positions associated to products that remain unchanged or protected by intellectual property rights or their exclusive access to complementary assets. Precisely, the competitive advantage of these *Schumpeterian* innovative firms lies in their capability to remain updated, exploiting an inventory of past valuable ideas that help to define the innovation-linked problems that they have to face. The knowledge abstraction sub-process becomes essential and so does the control of the codified and diffused knowledge. The firm will concentrate on controlling the tacitness of the knowledge base in the A and B regions of the social learning space. Cooperative agreements will be set to access to information and economic resources from other organisations.

Monopolistic firms will tend to develop internally a larger base of knowledge and diffuse it exploiting the protection granted by monopolies of exclusion or its market power. Therefore, the knowledge codification sub-process becomes less relevant as a source of competitive advantages. It is more important for the firm to control the process of diffusion of the cognitive asset. They will tend to be placed in the final stages of the b region and the C region of the social learning space.

The main implications for future research and management of the model presented lie on the necessity to establish how many social learning spirals will a firm be interested in monitoring and in which regions it will be operating.

First, some organizations will specialize in the invention process, exploiting thus Human Capital and technological knowledge bases in the A-region, with the tasks performed by intelligent agents becoming essential. Then the invention would be marketed or exchanged as part of collaborative agreements with other organizations.

Second, other firms will also or exclusively exploit the development process. Hence, Human

and Organizational Capital are important, as well as the development of intelligent agents. Other firms would be in charge of the market expansion and diffusion of this product in the C and D region.

Third, some organizations will also expand their innovative activities from the A or B region into the C region, exploiting the interactions between Human Capital, Organizational Capital and Innovation Capital along with Relational Capital.

Fourth, other organizations will follow a market niche innovative behaviour and will exploit their presence in the D region, where Relational Capital should play an important role in the differentiation strategy.

Therefore, firms should decide in what learning spiral or areas they prefer to compete strategically, taking into account the possibility to derive a competitive advantage from any of the intellectual capital elements and their protection strategy.

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