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Organisational innovation as part of knowledge management

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ABSTRACT

The objective of this paper is to contribute to a perspective on economic performance, i.e. the interaction between norms specific to a company, the knowledge basis of the company and innovation.

The questions we will try to shed light on in this article are: what is the connection between norms specific to the company, the knowledge basis of the company and innovation?

We will argue that norms specific to the company, knowledge development and innovation strategies are closely linked, in order to promote competitive advantages at the company level. We will present and discuss a model in this connection. At the end of the article we will integrate this model and develop policy implications. We will see norms specific to the company in the light of social autopoiesis theory. It is this theory which will be used when evaluating the importance of knowledge development and innovation.

The main thesis in the article is that a company's capabilities are primarily developed on the basis of social norms and values already existing in the social relations of the company. This in turn influences how the company develops and applies the knowledge basis, thus influencing innovation strategies.

1. Introduction

Norms specific to the company, development, integration and the use of knowledge is supposed to correlate strongly with value generation in the individual companies and the economy in general (see Barton, 1995, pp. 24–26; Lundvall, 1992, pp. 1–23; Nonaka & Takeuchi, 1995). Innovation in this context is seen as the core of value generation, and in the positioning by the company in an increasingly internationalised and globalised economy. The connection between innovation and economic growth is made visible in "the new theories of growth" (see Scott, 1989) and has also been made pointed out in the "Green Paper on Innovation" (1995). Abramovitz (1989) explicitly expresses the connection between knowledge development and economic growth: "… the advance of knowledge lies at the core of modern growth process". Archibugi and Michie (1995) argue that contemporary economic systems have become more "knowledge-intensive" than in the past. That knowledge intensity and knowledge growth influence productivity improvements as well as quality improvements has been documented by Thompsson (1996, p. 95). The management of knowledge is also critical at both the strategic and operational levels of the companies. Quinn, Anderson, and Finkelstein (1996, p. 8) says: "The strategy consequences are profound. Once a firm obtains a knowledge-based competitive edge, it becomes ever harder for competitors to catch up".

Continuous changes in the state of knowledge produce new disequilibrium situations and, therefore, new profit opportunities, and they do so at an increasing pace. Thus, as the competitive process eliminates an opportunity, changes in the stream of knowledge produce other opportunities. This is in line with Schumpeter's vision of competition as "a process of creative destruction", rather than as a static equilibrium condition (Mahoney & Pandian, 1992). Consequently, there is an increasing emphasis on a knowledge-based economy (Barton, 1995; Drucker, 1993; Lundvall, 1992; Lundvall & Johnson, 1994; Nonaka & Takeuchi, 1995; Quinn, 1992; Quinn et al., 1996). Or with Quinn et al. (1996, p. 7): "… by the year 2000, 85 percent of all jobs in America and 80 percent of those in Europe will be knowledge based". This unending stream of knowledge which keeps the market in perpetual motion, calls for companies to execute continuous innovation, and at the same time limit imitation.

Knowledge about the possibility of innovation, as well as innovation being linked to competitive advantages and greater earning power, is a type of knowledge which is important, in order to elicit innovation activity. If this type of knowledge is not accepted in the company context, innovative activities will most likely not be prioritised. Knowing that something is possible has proved to be extremely important to facilitate initiation of action, according to Collins (1990). This is a type of knowledge which is critical for the development of action norms in the social system. Not knowing that innovation is possible, and not knowing conceivable consequences, one is likely to act in a system with a tendency to focus on "business as usual", rather than innovative processes.

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Hart (1995, p. 988) argues that competitive advantage can be sustained only if capabilities creating the advantage are supported by resources that are not easily duplicated by competitors. Competitors are delayed from imitating innovators actions when, for example, knowledge available to them about these actions are ambiguous, and hence are "invisible". Winter (1987) argues that such resources are difficult to replicate because they are tacit (causally ambiguous).

Tacit resources creating invisible assets are skill based and people intensive (Hart, 1995). This implies that as a resource, people are important, not just as participants in the labour force, but as accumulators and producers of invisible assets (Bonoma, 1985; Itami & Roehl, 1987; Reed & DeFillippi, 1990). The importance of tacit knowledge, competence specific to the company, and organisational learning for entry barriers and competitive leadership, has been pointed out by Cohendet, Heraud, and Zuscovitch (1993).

As invisible assets are the unobserved factors creating knowledge in the organisation, they do, in addition to limiting imitation, also "help to position a firm to exploit new opportunities" (Jacobson, 1992, p. 796), hence, enhancing continuous innovation. Jacobson (1992) argues that invisible assets are key success factors because they are difficult to obtain. Itami and Roehl (1987) argue that invisible assets are often the only source of competitive edge that can be sustained over time. Also Nonaka and Takeuchi (1995) emphasise the role of tacit knowledge as well as the interaction between tacit and explicit knowledge. McGrath, MacMillan, and Venkataraman (1995) also argue that the most potent of such assets are posted to be intangible or tacit.

A firm's capabilities are developed primarily on the basis of social norms and values already evident in social relations in the firm. This in turn impacts how the company develops and integrates knowledge, thus putting the company in a position to develop in an innovative direction. These elements will in turn affect the competitive position of the company. It is this context Fig. 1 aims to illustrate, and which this article is related to.

The questions we will try to shed light on in this article are: what is the connection between norms specific to the company, the knowledge basis of the company and innovation? We will see norms specific to the company in the light of social autopoiesis theory. It is this theory which will be used when evaluating the importance of knowledge development and innovation.

The article is organised as follows: first company-specific norms are debated in an autopoietical perspective. Then we will discuss company development and knowledge integration in organisations. We will then have a discussion on the innovation concept. Finally, we will integrate the entities of the model to underline how they can improve a company's competitive position.

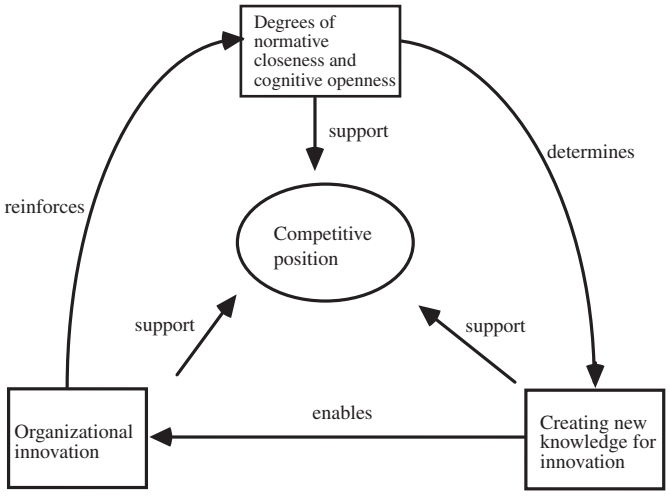

Fig. 1. A general model for norms, knowledge creation and innovation.

2. Degrees of normative closeness and cognitive openness

The importance of a company's norms and values pertaining to the development of the knowledge basis and for innovation activity, has been described by Barton (1995). Barton clearly expresses: "Values and norms: These determine what kinds of knowledge are sought and nurtured, what kinds of knowledge-building activities are tolerated and encouraged".

Turner (1993, p. 3) defines norms as: "a generally accepted way of thinking, feeling or behaving that is endorsed and expected because it is perceived as the right and proper thing to do. It is a rule, value or standard shared by the members of a social group that prescribes appropriate, expected or desirable attitudes and conduct in matters relevant to the group". Parson (1967, p. 155) defines norms as: "Norms thus have, above all the function of integrating the needs of operating units with each other and reconciling them with the needs of the system as a whole … Norms spell out expectations for collectives and for persons acting in roles, and in doing so, may bring to light discrepancies among these expectations" (Parson, 1967, p. 155).

Norms can also be understood as "cognitive maps" (Axelrod, 1976), "interpretative schemes" (Batunek, 1984), "cause maps" (Bougon, Weick, & Binkhorst, 1977), "organizational ideologies" (Brunsson, 1982), "cognitive frameworks" (Cowan, 1986), "frames of references" (Deshpandé, 1986), "shared perspective" (Ginter & White, 1982), "implicit thought structures" (Løwstedt, 1993), "organizational schemes" (Poole, Gioia, & Gray, 1989), "dominant logic" (Prahalad & Bettis, 1986), "perceptual filters" (Starbuck & Milliken, 1988), or "belief structures" (Walsh, 1988).

Autopoiesis means self-producing systems. The autopoiesis theory was developed by Maturana and Varela (1980), Maturana (1981), Varela (1984). Luhmann (1975) introduces the distinction between normatively closed and cognitively open systems at the social level. An autopoietic social system with this distinction is simultaneously closed (normatively) and open (cognitively). The normative and the cognitive are also structurally linked, generating interaction between these two subsystems. A crucial point here is: "closure is a condition for openness" (Luhmann, 1986, p. 183). It is among other things the link between the normatively closed and the cognitively open which is Luhmann's contribution to the autopoietic theory for social systems. The cognitive openness is a form of awareness or knowledge link to the environment of the system.

For the individual system, there exists a system-specific normative basis. At a superior recoursivity level there is also a normative superstructure in evidence, influencing the normative basis for the subordinate recoursivity level, i.e. the system in focus.

The study of social systems as autopoietical systems, according to Luhmann (1986, p. 186): "is a theory of self-referential systems, to be applied to observing systems as well". This links social autopoiesis theory to second-order cybernetics, as expressed by Von Foerster (1981), Geyer and Van der Zouwen (1978, 1992) among others. For the individual researcher it becomes just as much a question of self-observation as observation of the social system. It is self-reflection which Luhmann and Foerster bring in as a point. This is also a central point with Bourdieu (Broady, 1991). Luhmann (1986, p. 187) says: "To combine these two distinctions (between autopoiesis and observation, and between external observation and self-observation, our inclusion)

is one of the unsolved tasks in systems theory". The core of the problem as we see it is that an observer observing a social system constitutes an autopoietical system in his own right, i.e. when we gather information about social systems we cannot avoid collecting information about ourselves. Luhmann (1986, p. 188) points out that in order to solve this problem (paradox) a sort of exchange between external observation and self-observation is required.

The system-specific normative basis, regardless of its being based on a model-weak foundation (Bråten, 1984), generates an attention focus in the system. It influences and sets standards for signals, symbols and the information to be selected, in addition to expectations on the part of the individual actors in the system. This in turn produces certain experiences in the system, which then reinforce or sustain the system-specific norms.

Luhmann emphasises communication as the very foundation for social systems. Luhmann's conceptual pairings (normatively closed and cognitively open) make it possible for a social system to be simultaneously self-producing in terms of social norms, and still maintain the capability of learning, through the cognitive openness of the system. Luhmann (1990, p. 12) points out: "the concept of autopoietic closure has to be understood as the recursively closed organisation of an open system". The point is the extent to which normative closure and cognitive openness exists in a specific system. It is, according to Luhmann (1990, p. 13), communication which constitutes the evolutionary potential for the construction of systems able to "maintain closure under the condition of openness". Even if the system is closed normatively, it does not follow that it is not subject to influences from the outside world. An autopoietical system is openly cognitive, and can therefore both influence other systems and at the same time learn and adapt to the outside world.

An autopoietic social system is, in other words, both open and closed at the same time. There is openness towards the outside world, starting as internal reflection, redefinition of situations and generation of communication for the purpose of changing the system-specific normative basis. This normative closure is secured by means of a number of mechanisms preventing information and communication from the outside from penetrating the system. Examples of such mechanisms could be: laws, rules, regulations, routines, tribal language, i.e. the concepts, theories and axioms of various professions. In turn these mechanisms can be constituted by standards, i.e. expectations and notions from economic, social, political and cultural systems of the outside world.

There is not any agreement as to whether social systems can be regarded as autopoietical systems. Luhmann (1982, 1986, 1990, 1992, 1995) and Robb (1989a, 1989b) argue in favour of the contention that the theory can be adapted to social systems. Maturana (1981), Varela (1979) and Mingers (1989) have more doubt about the fruitfulness of this analogy. Our view is that autopoietic processes can be disclosed as parallel processes, not identical, in social systems and organisations. By this we mean that knowledge based on the autopoiesis theory at the cell level with Maturana and Varela can be adapted for the purpose of acquiring knowledge of social processes in organisations regarded as social systems. This we also interpret as Luhmann's (1986, p. 173) point of view. Luhmann's application of the autopoiesis theory can be used to describe, explain and possibly predicate change or lack of change in social systems. Luhmann's autopoiesis understanding is neither a conflict model nor a consensus model, but an evolution model.

The normative elements have as their specific purpose to reproduce system behaviour, while the cognitive elements are supposed to balance the normative development in the environment, putting the system in the position to reproduce its behaviour continuously with regard to a mutual evolutionary development, i.e. the system itself is instrumental in creating its environment, and simultaneously adapting to what other systems create in the environment.

The system-specific normative basis constitutes the starting point for the development of identity on the part of the system, i.e. what separates it from the environment, and, i.e. how the system understands itself.

Through self-observation in the system, and reflection on itself and in relation to the environment, learning can take place. This reflects the cognitive opening of the system. The link between the cognitive opening and the environment is an opening for learning.

The normative superstructure and the system-specific normative basis have a mutually conservative effect. The cognitive openness on the other hand, adds requisite variety to the system.

Selection processes (signals, symbols and information), the expectation mechanism and the experience dimension, reproduce the system-specific normative basis. It is basic experience which to a great extent determine the selection mechanisms we utilise and the expectations determining our behaviour. The selection processes and the expectations then reinforce and sustain the basic experiences and the system-specific normative basis. Small differences pertaining to the starting point for basic experiences can through dynamic and self-reinforcing processes, generate great differences both in terms of selection processes and expectations. It is the system-specific normative basis which functions as a damper mechanism on these potentially self-reinforcing mechanisms and thus stabilises the system.

The reflection possibility and the variation potential are both firmly rooted in the cognitive openness. The internal variation potential is contingent on the actors reflecting on their own value basis or the system-specific normative basis. We here make a distinction between the value system and the system-specific normative basis. The value system is constituted by the needs and legitimate wishes on the part of the actors. "Values, …, I understand to be conceptions of the desirable, applies to various objects and standing at various levels of generality" (Parson, 1967, p. 147). The values being ingrained in needs and legitimate wishes are also explicitly expressed by Bunge (1989). The system-specific normative basis is the norm of the system in relation to the function the system is meant to fulfil. The norms have their functions in terms of sustaining the system of relations between positions in the field.

The purpose of the cognitive openness is to increase the sensibility on the part of the system towards the world, and thus establishing a link to selected parts of this world. Through communication with the environment the awareness of the actors in the system is developed. When the actors in turn reflect on this awareness and introduce it communicatively to the system, irritation and/or tension towards the system-specific normative basis is easily generated, further reinforcing the communication in the system. The system identity is the distinction in evidence when differences between the systems and their environment are displayed.

The normative superstructure and the system-specific normative basis generate a certain habitus (Bourdieu, 1992), i.e. patterns of thought and action dispositions on the part of the actors. The thought and action dispositions are contingent on how the actors have organised their knowledge. Their experiences are generated through the use of knowledge and reinforce the suppositions of the actors, due to expectations seen in the light of signals, symbols and the information being selected in the system. The selection processes to a certain extent precipitate the events to be expected (Thomas theorem).

When using the concepts the normative superstructure and the system-specific normative basis, there are no unambiguous definitions to be deduced from the concepts. In order to clarify

these concepts, we shall borrow three concepts from Bourdieu: social field, symbolic capital and habitus.

By social field is meant a system of relations between positions occupied by special agents and institutions fighting for what they have in common (Broady, 1991, p. 17). The field concept is a system of relations between positions (Broady, 1991, p. 462). The position is indicated by means of position and location in the social room. The field concept can be seen as a breakdown of the role concept. While the role concept focuses on expectations directed towards certain roles, the field concept focuses on relations between positions. The field concept of Bordieu becomes a tool suitable for the disclosure of the normative superstructure and the system-specific normative basis. Every system becomes aware of its norms, according to Bordieu, by relating them to the norms of other groups (Broady, 1991, p. 463).

Symbolic capital is everything recognised as valuable by the social group (Broady, 1991, p. 462). Habitus is the system of dispositions permitting human beings to think, act and orient themselves in the social world (Broady, 1991, p. 12). The habitus concept tries to interlink the subjective and the objective in the social room (Broady, 1991, p. 453).

To disclose the normative superstructure and the system-specific normative basis the focus will have to be put on relations between actors in central positions. The question will then be: what system of relationships exists? Systems of relationships can, e.g. revolve around: dominance relationships, access to resources, opinions regarding social problems, investments in knowledge, types of conversion strategies, networks available, relations to other fields, instances of symbolic access and material access, value hierarchy, access rules and geographical location of the positions. It is in particular the relation properties pertaining to Bourdieu's concepts which make them conducive to systemic thinking. Systemic thinking emphasises relations between elements more than the substance of the individual elements. This is also one of the basic prerequisites for the study of social systems. The precedence of relations is also rooted in all cybernetic understanding of phenomena and problems. This is stated in Ashby (1961, 1968, 1970, 1981), Bateson (1972, 1988), Bunge (1983a, 1983b, 1985a, 1985b, 1992). This is where systemic thinking and Bourdieu's project display close parallels (see Broady, 1991, pp. 387–544). The relations and their system character is a central aspect of Bourdieu's sociology, according to Broady (1991, p. 464). On the basis of this line of thinking isolating single factors and, e.g. establishing connections between them would give the wrong idea. It is the entire system of relations generating a phenomenon which should constitute the ambitions in terms of disclosure on the part of research, or alternatively patterns of interactions over a period of time (see Broady, 1991, p. 540).

On the basis of the previous discussion, we can enlist certain criteria for the study of the normative superstructure and the system-specific normative basis:

1. Patterns: social relations between actors generate certain patterns of thought and action positions in the social field.
2. Distinction: the thought and action pattern differs from other social systems.
3. Unity: the thought and action pattern is shared by the actors in a specific social field.
4. Autopoiesis: the thought and action pattern reproduces itself through the norms.

The normative superstructures and the system-specific normative basis can be depicted as shown in Fig. 2.

The norms are institutionalised through the development of the system of relations between the actors, who in turn constitute the stability of the social system. The systems of relation are critical, as they develop a reciprocity between the actors and thus penetrate the entire system, or major parts of it.

One major purpose of the normative superstructure as regarded in this context, is to ascertain that the change in the individual system is not carried out more rapidly than what will allow for the complete structure to make the necessary adjustment. If this should happen, the entire field could collapse. One such change could be regarded as a morphogenetic change, i.e. as change affecting the entire system and possibly the fields, and generating new relations between the elements allowing new structures and power constellations to occur. Changes not affecting the whole system, allowing new relations, structures and power constellations to occur, are here called morphostatic changes. The normative superstructure is to ascertain that morphostatic changes take place, while preventing morphogenetic changes.

Structural transformations happen

1. through the normative superstructure undergoing morphogenetic changes, or
2. through the cognitive open system influencing the system-specific basis in a manner conducive to the normative superstructure undergoing morphogenetic changes.

The normative superstructure influences the system-specific normative basis, among other things, through its model power (see Bråten, 1973, 1984, 1986). Bråten (1986, p. 193) defining sociocultural system as: "a meaning processing system interacting participants who maintain and transform the identity of themselves and their network through a more or less shared understanding of both themselves and of their network through a more or less shared understanding of both themselves and the world". Under certain circumstances, according to Bråten (1986, p. 193), the shared common notions are "closed to a degree that rules out any rival view …. Such a system state may be called a model monopoly". Bråten's concept model monopoly is here linked directly to the normative superstructure. The normative superstructure in one field differs from the other normative superstructures in other fields by virtue of its values, identity and model monopoly.

While we here use Bourdieu's (1984, 1988, 1992) focus on the system of relations between positions to describe the normative

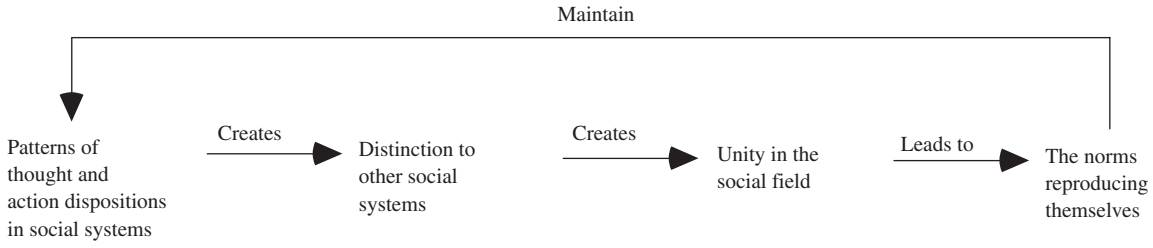

Fig. 2. The normative superstructure and the system-specific normative basis.

superstructure, Bråten (1973, 1984) in his model monopoly concept focuses on the concrete actors in the field, who by virtue of being model-strong also induce other actors to reflect their interests and perspectives. There is no contradiction between Bråten's perspectives and ours; only a disclosure of different aspects of the normative superstructure.

Morphostatic changes are necessary in order to maintain the stability and flexibility of the total system. This stability and flexibility is constituted through a constant disorganising process (see Johannessen, 1994). This is also expressed with Robb (1992, p. 156) who states that morphogenetic changes: "involve redefining the models of reality held in view in the organisation…".

The normative superstructure has direct and subtle evaluation patterns for control of the individual systems. The subtle instrument is constituted by values and norms transferred and maintained in various ways, e.g. through ceremonies, education, ideas, symbols and the formation of opinion. The direct control system is more linked to rules and regulations. Both the direct and the subtle control mechanisms are differentiated and vague and thus relatively difficult to catch sight of for an observer of such systems.

The system-specific norms are carriers of the normative superstructure in the same manner (analogy) as a context conveying messages, where the superstructure is analogue with the context.

Every system-specific normative basis in a social field to a certain extent reflects the normative superstructure. I.e. the normative superstructure is recursively present in all system-specific normative bases, like a holographic representation. Through the norms the system reproduces itself.

The normative superstructure or the system-specific normative basis can rarely be disclosed through the study of individuals and their influence, despite the fact that such case studies do exist (see Rød Larsen, 1976). It is the system of relations between positions which constitutes the superstructure, and the interaction between the persons which occupies these positions. The relationship between the normative superstructure and the system-specific normative basis represents two different logical orders, where the normative superstructure takes precedence over the system-specific normative basis.

From the discussion in this part of the article, the following conclusion can be made: normative closedness and cognitive openness have impact on thought and action positions in a social system. Thought and action strategies indicate and influence the type of knowledge emphasised by the company. In the next part of the article, we will discuss the development of a company's knowledge basis and how it can be used to create innovation.

2.1. Creating new knowledge for innovation

Barton (1995, p. 8) says: "knowledge building for an organisation occurs by combining peoples distinct individualities with a particular set of activities". This presupposes that interactive learning can take place in the system.

The importance of interactive learning in companies has been discussed by Teece (1986, 1988), Lundvall and Johnson (1994), among others. Tusman and Nadler (1986, p. 75) explicitly point out that innovative organisations have one thing in common; they are: "highly effective learning systems". To achieve this, according to the aforementioned authors, an organisation aimed at "both stability and change" is required. Understood in this way the concepts normative closedness and cognitive openness become indicators of the performance and innovation level of the company.

Nonaka and Takeuchi (1995) elaborate Knowledge management too: "create new (task-related) knowledge, disseminate it throughout the organisation and embody it in products, services and systems".

Lundvall (1995) says: "Perhaps it is not at all fruitful to regard tacit versus codified knowledge as two different pools where there is a flow from one to the other. The relationships are much more complex and symbiotic". This is also emphasised by Nonaka (1991) and Nonaka and Takeuchi (1995).

There is a world wide agreement that knowledge and innovation is the competitive strength needed for successful companies. Quinn (1992, p. 439) says: "Increasingly, …, developing and managing human intellect and skills—more than managing and deploying physical and capital assets—will be the dominant concerns for managers in successful companies". The same is stressed by Nonaka (1991), Nonaka and Takeuchi (1995) and Green Paper on Innovation (1995).

Tacit knowledge (Polanyi, 1962) creating invisible assets are skill-based and people-intensive (Hart, 1995). This implies that as a resource, people are important, not just as participants in the labour force, but as accumulators and producers of invisible assets (Bonoma, 1985; Itami & Roehl, 1987; Reed & DeFillippi, 1990). This is also in line with Jacobson (1992) who argues that invisible assets are key success factors because they are difficult to obtain, and Itami and Roehl (1987) who argue that invisible assets often are the only source of competitive edge that can be sustained over time. Also Nonaka and Takeuchi (1995) emphasise tacit knowledge as a main source creating new knowledge and continuous innovation.

McGrath et al. (1995) also argue that the most potent of such assets are posited to be intangible or tacit. An example of a successful company, where the active use of tacit knowledge on the part of companies has generated performance and innovation in Scandinavia, is the Swedish company Ramnæs. Their knowledge basis is tacit, and: "Largely acquired through on-the-job and organizational learning" (Eliason, 1996, p. 179).

As a result of the more complex nature of work, the composition of the workforce will shift away from employees who have a traditional, practical training background and towards an ever-increasing number of employees who have had a higher education and are theoretically well equipped. This type of employee must possess methodological strength, be capable of working in a problem definition and problem-oriented manner and possess skills for both analysis and synthesis. Nonaka and Takeuchi (1995, p. 237) says about this: "… the essence of knowledge creation is deeply rooted in the process of building and managing synthesis". However, also applied skills such as realism, initiative, ability to innovate and willingness to run risks will be in demand. Barton (1995, p. 75) refers to this type of knowledge as T-shaped skills. The persons possessing this type of knowledge have a combination of theoretical and practical knowledge, and simultaneously have the ability to see how their branch of knowledge interacts with other branches of knowledge to function as a whole. These are persons with systemic knowledge, as a contrast to branch knowledge (Iansiti, 1993, p. 193), who understand the language of all branches. These persons have usually expanded their competence across several functional branch areas, and thus developed the skills of synergistic thinking.

Participation and organisational learning actually demand that the middle managers or the project leaders (or both) take risks. These are also the lessons from Japan which Nonaka and Takeuchi (1995, p. 233) teach us: "… in our view, middle managers play a key role in the organizational knowledge-creation process". They continue, however, "… in the West, where middle managers have been portrayed as "cancer" and a "disappearing breed"".

In contrast, in a knowledge-creating company they are positioned as the "knot", "bridge" and "knowledge engineers".

Based on the above discussion, we will propose a categorisation of knowledge, which could be used for knowledge creation and knowledge integration aimed at innovation.

The main distinction in Fig. 2 is knowledge which is easily communicated to others, and knowledge which is difficult to communicate to others. A distinction of this type can be detected with Winter (1987) and Quinn et al. (1996).

Meta-knowledge is the knowledgebase structuring explicit knowledge, i.e. know why. Meta-knowledge is also a sort of knowing how we know, appearing when reflections are made on the basis of our normative basis: meta-knowledge is both a process and a product. As a process it is expressed by Maturana and Varela (1987, p. 24): "Reflection is a process of knowing how we know". As a product it is knowledge on how we think. Meta-knowledge has bearing on the perspectives of individuals, i.e. what is seen and how this is perceived. When a person in a company works within the framework of a particular perspective, e.g. a technological-economic paradigm, he is likely to set greater store by some methods than others. The perspective generates meaning in terms of how the work is perceived and interpreted, in addition to adding input as to what a person is looking for in a job context. Meta-knowledge is thus a form of split interpretation competence among the persons sharing the perspective. In this way, meta-knowledge directly influences these persons as to what type of explicit knowledge is relevant and meaningful for the company. The more uniform this perspective is among the most important actors of the company, the more influential this perspective will be as to what knowledge type (e.g. explicit versus tacit) is critical to the competitive position of the company. The persons in the company who have various degree of meta-knowledge or different basis perspectives, will be able to view the same phenomenon, but interpret it differently, giving it various meanings relative to the opportunities and challenges of the company (Czarniawska-Joerges, 1992;Knorr-Cetina, 1981).

Explicit knowledge is the part of our knowledge base which can be easily communicated to others as information, i.e. know what. Explicit knowledge can be objective and intersubjective. Bunge (1983a, p. 80) defines objective knowledge in the following way: "Let p be a piece of explicit knowledge. Then p is objective if and only if (a) p is public (intersubjective) in some society, and (b) p is testable (checkable) either conceptually or empirically".

Tacit knowledge (Polanyi, 1962) is a form of skill, ability or "techne", i.e. know how, which is difficult to communicate to other as information, but: "much of what Michael Polanyi has called tacit knowledge is expressible—in so far as it is expressible at all—in metaphor" (Nisbet, 1969, p. 5). Drucker (1993, p. 24) says about tacit knowledge: "the only way to learn techne was through apprenticeship and experience". David and Foray (1995) also stresses that no knowledge is tacit by nature, what has to be done is to create incentives to make tacit knowledge communicable. Polanyi (1962, p. 54) says that this sort of knowledge also can be regarded as connoisseurship, and his example is the good wine-taster.

Hidden knowledge, i.e. knowing how we know, is the premises, prerequisites and motives influencing our thoughts and action positions. Hidden knowledge influences the way we think and act, as a sort of personal paradigm, or the technical-economic paradigm in the business world, a trajectory which leads our way of thinking and acting when expressing and interpreting, among other things, new ideas. Hidden knowledge organises the development of mental models, the nature of the abstraction we make, the choice of "variables", the facts we choose to focus on, our underlying metaphysical positions, our theoretical "tastes", etc. Hidden knowledge can be divided in two parts: disposition to think and disposition to act. In this way hidden knowledge is linked to company-specific norms. We find support for the concept "hidden knowledge" in Schutz' (1990, Vols. 1 and 2) "epoche" concept.

Relationship knowledge, i.e. know who: "involves the social capability to establish relationships to specialised groups in order to draw upon their expertise" (Lundvall, 1995). In a time where turbulence and change are accelerating it is decisive for organisational survival to invest in relationship knowledge.

As a basic rule all knowledge (in Fig. 3) is mutually complementary and not reciprocally preclusive.

Meta-knowledge and explicit knowledge are learned and shared in the formal education system an in the business world. We are so good at it in the West, that we have "forgotten" knowledge which we not so easily can communicate to others. But, as shown by Nonaka and Takeuchi (1995), this knowledge may be how Japanese companies create the dynamics of innovation.

Tacit knowledge is learned by using and doing. It could be shared by "brainstorming camps", using metaphors and analogies, in the education system and in the business world. This is done at Honda where they "set up brainstorming camps, informal meetings for detailed discussions to solve difficult problems in development project" (Nonaka & Takeuchi, 1995, p. 63). Keep in mind, however, that these meetings are focused upon tacit knowledge, not the brainstorming we usually are involved in, focusing upon explicit knowledge.

Hidden knowledge is learned by socialisation and could be shared in the business world, first of all by focusing upon its existence, and second by using focus groups (Morgan, 1988, 1993). It is the willingness to question underlying assumptions, (Johnson, 1996), which in practical settings has to be focused. The use of focus groups gives access to uncodified knowledge, the language, mental models, the opinions, the meanings, the presuppositions, the world view of the participants. Focus groups also give the opportunity to make synergy of the individuals' way of thinking as part of a collective.

Relationship knowledge is learned by interaction, and could be shared by systematic work in teams complementarily composed, both in the educational system and in the business world. An example developing relationship knowledge is Japanese firms bringing their supplier partners along with them visiting European customers (Nonaka & Takeuchi, 1995). Both the firm and the supplier develop and strengthen relationships this way, in addition to the relationship with the customers. In these contexts hidden knowledge also will be made explicit.

Based on the previous discussion, we propose a scheme for knowledge management.

In the West, we are good at creating and using knowledge which is easy to communicate as information. In Japan according to Nonaka and Takeuchi (1995), they emphasise tacit knowledge for the innovation process. If it is possible to make knowledge which is difficult to communicate to others (tacit, hidden and relationship knowledge) explicable, then we could speed up learning, transfer and innovation processes in organisations.

In order to create knowledge for innovation we have to organise the process to make the knowledge which is difficult to communicate, understood by the people involved. This could be looked upon as a system integration and networking model, which Rothwell (1995, pp. 265–282) calls the fifth generation innovation models. To make this happen we have to make tacit knowledge, hidden knowledge and relationship knowledge explicable in some way, in order to share it with other people. It is difficult to transmit knowledge whose importance eludes you. To understand of what type of knowledge is essential in achieving, e.g. innovative success, reflection on the company's normative

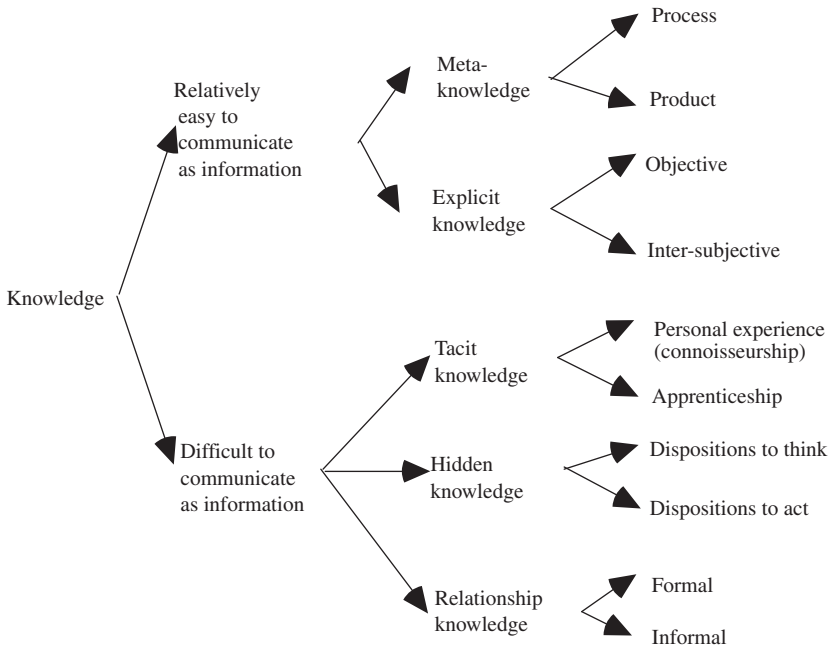

Fig. 3. Categorisation of knowledge.

basis is critical. The importance of the normative basis for the innovation process has also been denoted as "the encultural model of skill transmission" (Pinch, Collins, & Carbone, 1996, p. 164). This model has been contrasted to the transfer of knowledge as bits of information, or the algorithmic model. The enculturational model has had a strong impact on innovation research (see Nonaka & Takeuchi, 1995; Von Hippel, 1994;Von Hippel & Tyre, 1995). Lundvall (1992, pp. 8) says: "Almost all innovations reflect already existing knowledge, combined in new ways". The question to be analysed in the next part of the article is: how can we categorise innovation in companies. It is important to clarify this to see the connection between the company-specific norms, the knowledge basis of the company and innovation.

3. Organisational innovation

Basically there are two types of innovations: product and process innovations (Dosi, 1988; Teece, 1989; Utterback & Abernathy, 1975). These are not mutually preclusive, but depend on each other in a major degree. Process innovations can furthermore be divided into organisation and technology, organisation meaning new market organisation and internal company organisation. By technology is here meant human artefacts. These can be classified as three entities (Gehlen, 1980, p. 19): instrument, machine and automaton. This concept of technology separates us from Johnson (1992, p. 28), among others, where he makes the following statement: "knowledge used in the production process is called technology". The concept of knowledge will in our opinion be too undifferentiated in such a concept of technology, and the very concept of technology will be too much removed from every-day understanding. The question to be asked to Johnson will then be: what about "tacit knowledge"? If "tacit knowledge" also makes up part of the technology concept, technology will in our opinion easily lose a lot of its analytical purpose. This also applies if all explicit knowledge is included in the technology concept. We have omitted these distinctions in Fig. 3, in order not to increase the complexity in the figure. In practical contexts these distinctions will, however, be of great importance.

Innovations can also be seen as incremental, i.e. small step-by-step improvements, i.e. continuous innovations, or radical, i.e. something qualitatively new (Dewar & Dutton, 1986; Ettlie, Bridges, & O'Keffe, 1984; Freeman, 1992; Mansfield, 1968; Mokyr, 1990; Zaltman, Duncan, & Holbek, 1973). Continuous- and radical innovations can also be autonomous, i.e. what is new can be kept separate, or systemic, i.e. the new is dependent on changes taking place in the process/product linked to the new product or process. One example of autonomous innovation is "snowboard". One example of systemic innovation is IBM's OS/2, which presupposed change in other systems in the value chain. Fig. 4 offers a schematic depiction of these distinctions. Systemic innovations are, among other things, described by Jagger and Miles (1991), Fleck (1993) and Kodama (1992). The importance of various types of organisation forms for various types of innovations (autonomous and systemic) has been discussed by Chesbrough and Teece (1996) (Fig. 5).

We have now examined norms from an autopoietical perspective, knowledge development and types of innovation. In our conclusion we will integrate these three entities, in order to develop an initial effort to construct an integrated model, later to be further developed by means of empirical studies, for the purpose of giving policy implications both for the individual company, as well as the public support system.

4. Conclusion: integrating the general model

The initial question of this article was: what is the connection between norms specific to the company, the knowledge basis of the company and innovation? We presented a model for this context, and have reviewed the individual elements of the model. We will now integrate the discussion so far, in order to answer the question more precisely. We will do this by presenting an if-so model, expressing policy implications at the company level (Fig. 6).

Types of knowledge	Learning by	What is learned	How to share it	Media
Meta-knowledge	Reflection	Know why	Communication	Books, lectures, databases etc.
Explicit knowledge	Listening/ reading	Know what	Communication	Books, lectures, databases etc.
Tacit knowledge	Using/ doing	Know how	"Brainstorming camps" structured as apprenticeship	Practical experience; Apprenticeship-relationship
Hidden knowledge	Socialization	Knowing how we know	Focus groups	Questioning underlying assumptions and mental models
Relationship knowledge	Interacting	Know who	Partnership and teamwork	Social settings

Fig. 4. Knowledge management.

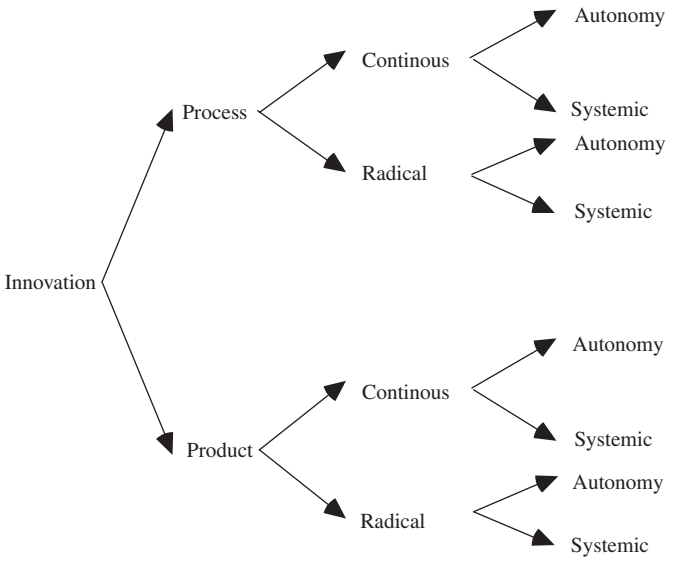

Fig. 5. Classification of innovation.

4.1. Policy-implication of the model

If continuous product innovations are wanted, then the company must stress the development of the part of the knowledge basis engrained in tacit-, hidden- and relation-based knowledge, while ensuring that the system has a major degree of cognitive opening.

If radical product innovations are wanted, then the company must stress the development of the knowledge basis based on meta- and explicit knowledge, while maintaining a great degree of normative closedness.

If continuous process innovations are wanted, then the company must stress the development of the knowledge base area emanating from tacit-, hidden- and relation-based knowledge, while maintaining a relatively low degree of cognitive opening.

If radical process innovations are wanted, then the company must stress the development of the knowledge base which is based on meta- and explicit knowledge, while maintaining a relatively little degree of normative closedness.

Lynn, Moore, and Paulson (1996) found that radical innovations presuppose another type of management than continuous innovations: "what may be sound practice for the development of incremental improvements may be inapplicable or worse, detrimental to the development of discontinuous innovations". It is fair to assume that various types of knowledge are utilised in relation to the various innovation types.

While customer closeness has proved critical for continuous innovation (Lynn et al., 1996; Nonaka & Takeuchi, 1995), it is more dubious whether this also applies to the development of radical innovations, since the customers do not necessarily know the technical opportunities, and the companies do not know who can be future buyers of radical innovations. One example that the customer directly resisted radical innovation has been shown by Lynn et al. (1996, p. 13). Corning wanted to develop optical fibre for ITT. They interviewed the customer about this possibility and ITT argued strongly against this development, proposing that Corner rather help ITT resolve current problems. Corner: "ignored the voice of its lead customer" (Lynn et al., 1996, p. 13), and, despite the views of their customer, developed optical fibre, which turned out to be a great success on the market. Further Lynn et al. (1996, p. 13): "MCI, a customer that did not even exist when Maurer conducted his interviews, proved to be the pioneering customer". Lynn et al.'s (1996) article is unequivocal in terms of radical innovations: customer closeness is more a detriment to the development of radical innovation than a help. The companies examined by Lynn et al. (1996) used several types of classic market analysis to test the future need for radical innovations: concept testing, consumer surveys, conjoint analysis, focus groups and demographic segmentation. But, according to Lynn et al. (1996, p. 15): "Fortunately for Motorola, like Corning and GE, it did not base its decision on the results of these analyses".

Radical innovations and continuous innovations appear to require qualitatively different knowledge bases in the company, and various normative bases, i.e. cognitively open and normatively closed.

Radical innovations appear to require less or even no customer contact, but a firm belief in ones own ability and values and norms, i.e. a great degree of normative closedness in the system. Continuous innovations, on the contrary, require very close customer contact and an active use of the part of the knowledge base not easily communicated to others, as this will, among other things, prevent swift imitations by the competitors. The normative basis is here a cognitively open system, which also protects itself against the competitors by emphasising tacit, hidden, and relationship knowledge, reducing the chances of imitation and maintaining the competitive position over a longer period of time.

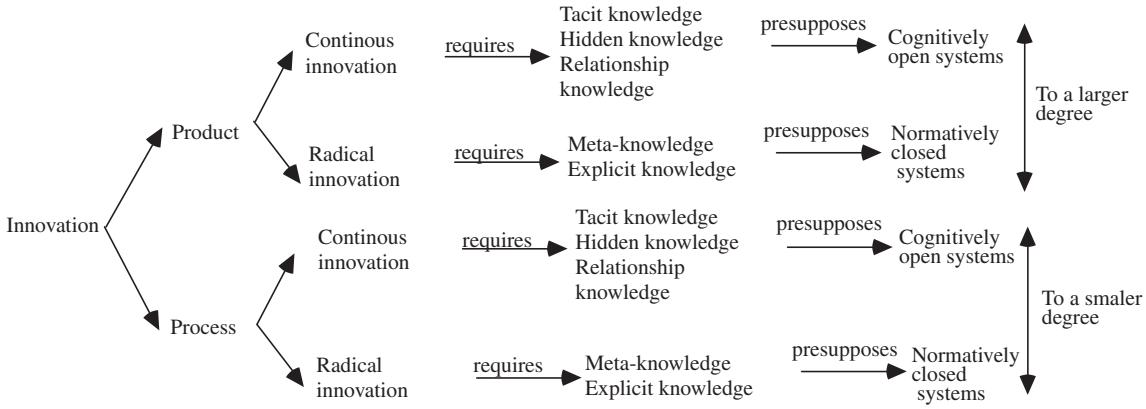

Fig. 6. The if-so model.

Schumpeter's (1928) line of argument, that companies in a monopoly or oligopoly are better suited for taking care of innovation, holds true only as far as product innovation is concerned, according to the argumentation of this article. These companies are in the position to monopolise the knowledge basis through a great degree of normative closedness. For continuous process innovations, the implication of the article is that these are best tended to by companies with a considerable degree of normative closedness. This also indicates that companies which are market-oriented and exposed to stiff competition are better suited for taking care of these kinds of innovation.

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