

CHAPTER 2

Knowledge Management - two perspectives

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Recent years' overwhelming interest in knowledge influences both management practice and research in many ways. When the management literature focuses on knowledge, the discussion often concerns the characteristics of knowledge, the difference between information and knowledge and the categorisation of knowledge (cf. Baxter & Chua 1999). However, the literature comprises many different research traditions and points of view.

Some authors see knowledge as a resource that can form the basis for strategy formulation (Sveiby 1997), whereas others find that it is integrated in a broader strategy framework such as the balanced scorecard approach (Kaplan & Norton 2004). Others again (e.g. Bukh *et al.* 2001) perceive knowledge and intellectual capital as two closely connected terms. For example Lennon & Wollin (2001, p. 411), focus on knowledge in a learning perspective; and Sher & Lee (2003) relates it to information technology. More strands of research could be identified and all have their merits.

Even though the philosophical interest in the term knowledge and in obtaining knowledge may be traced far back in time, knowledge did as emphasised by von Krogh & Roos (1995), not become a direct part of management theories until the mid-1950s. At that time, some of the early thoughts on cybernetics and system theory were presented (e.g. Simon 1945, 1960; Minsky 1956). The starting point for these authors is often human intelligence, which were compared with rule-based computer systems (cf. Varela *et al.* 1992) that incorporated knowledge in the form of these.

When managers discuss knowledge, two widely different perspectives are often taken. The difference consists in the way in which knowledge is perceived. In other words, the basic epistemological perspectives differ. In this chapter we call the first perspective “artefact-oriented”. Focus is on information technology and it deals with ways in which technology may be applied for the codification of knowledge so that management may act accordingly. It is assumed that everything can be described, and the more data a company collects, the more knowledge it possesses.

The artefact-oriented perspective often relies on system theory and information processing theories. In practical applications, it draws on information technology. Many authors have indicated that this has become insufficient when handling management challenges in relation to the complexity of the knowledge society. The problem is not lack of documents, data, or access to information. The limitation can rather be found in the quality, content, and organisation of the material.

This has given rise to the second perspective, which we term the *process-oriented perspective*. It is most clearly exemplified by Ikujiro Nonaka’s research where knowledge is perceived as a “dynamic human process of justifying personal beliefs as a part of an aspiration for the ‘truth’” (Nonaka 1994, p. 15; cf. Nonaka & Takeuchi 1995). An essential point is that focus is on the process in which knowledge is created and not on the document or the rules which are based on the process. This implies that continuous and dynamic adaptation to ‘real life’ takes place. Thus knowledge is a continuous process and it changes gradually as the individual framework of understanding is developed.

In this chapter, we will illustrate the perception of knowledge management according to the two perspectives and its organisational role. The chapter provides an outline of the two perspectives – the artefact-oriented epistemology and the process-oriented epistemology. After a brief description of the distinctions as regards data, information and knowledge, we characterise the two perspectives based on knowledge perception and knowledge management as a strategic dimension. Finally, the last section concludes.

2.1 Knowledge Management Depends on how Knowledge is Perceived

Knowledge is a complex term as it is often not easy to agree on an exact definition. This is illustrated by Roos & von Krogh's (1995, p. 1) statement "[w]hat you see depends on who you are" which implies that knowledge should be regarded as a subjective term. Following this notion it is quite possible that knowledge can be expressed in many different ways since only knowledge but also knowledge about knowledge depends on the context. This implies that it is essential to clarify the background for the various perceptions of knowledge, knowledge management concepts etc.

The understanding of the term knowledge or at least what it means to the individual or the organisation is important because it affects the importance which management attaches to the term. According to von Krogh & Roos (1996; cf. von Krogh *et al.* 1994) this implies that successful knowledge management requires that you relate to 'the nature of knowledge' (von Krogh & Roos 1996, p. 224). Therefore, knowledge management also becomes a question of epistemological understanding.

If significant importance is attached to epistemological views, heavier demands are to a certain extent placed on the manager. It is no longer sufficient 'only' to act and make decisions because reflection on own actions becomes part of the decision process. The decision process must take due account of other possible solutions to the problems. The reflective manager must therefore be familiar with different epistemologies because it provides a far larger managing scope, and it ensures a better understanding of the limitations to the various sets of actions (see Venzin *et al.* 1998, p. 36).

More effective knowledge management may also result from adapting management tools that fit the prevailing perception of knowledge. This observation is in accordance with Marr *et al.* (2003) who suggest that knowledge management practises will be perceived as more effective if they match the personal epistemology. However, knowledge management is multi-faceted and our understanding of current practise has already been set by our choice of epistemology. This illustrates that the more an organisation focuses on knowledge, the more important it becomes to understand the epistemological implications.

No epistemology can be forced upon individuals or the organisation. By becoming familiar with the way in which colleagues, co-operators and others understand 'reality', more possibilities will result and improved co-operation is likely to evolve. An active choice can be made if you understand the alternative perspectives. As knowledge depends on both the point of departure of the individual employee and the organisational context (Lave & Wenger 1991), "[t]he conscious choice of an epistemological mode is a critical success factor for research and management" as Venzin *et al.* (1998, p. 37) conclude.

2.2 Data, Information and Knowledge

The term knowledge is used very differently in different contexts. This is particularly clear in the definition of the three terms 'data', 'information' and 'knowledge' which depends on the epistemological perspective adopted. The discussion of the term knowledge has developed over time. In a management context, it has to some degree been linked to the actual company's efforts to develop management information systems. Even though Ackoff (1967) and others in the 1960s started to question the possibility for managers to process available information, the discussion has only recently been directed towards knowledge to the same extent.

In an early contribution, Shannon & Weaver (1949) divided information into 'syntactic' and 'semantic', which seems to have had some influence on how information and knowledge have been perceived. The syntactic dimension focuses exclusively on the amount of information. This is illustrated by the number of gigabytes worth of documents which a company has on its Intranet. The semantic dimension concerns the value of the documents/information.

Several others have speculated about the meaning of 'data', 'information' and 'knowledge'. Literature contains a wide range of suggestions. Toffler, for instance, does not distinguish between the terms, but applies them at random "to avoid tedious repetition" (1990, p. 18). Simon (1993) shares this view since he does not distinguish between 'to know' and 'to be informed'. Classical literature on Decision Support Systems (see Sprague & Carlson (1982)) is also supportive: "The knowledge may be in the user's head, on a reference card or instruction sheet, in a user's manual, in a series of 'help' commands available upon request, and so on" (1982, p. 30). Toffler, Simon as well as Sprague & Carlson illustrate an

angle where the syntactic dimension is clearly dominating – the more data and information, the more knowledge.

However, Nonaka & Takeuchi (1995) as well as Davenport & Prusak (1998) find that data consist of isolated, objective or raw facts which bear no value. Data is not relevant, important or has a purpose in itself. Still it is an important basis. Data becomes information when it has been structured and brought into a certain context (Nonaka & Takeuchi 1995). When it is interpreted, it develops into knowledge or meaningful information as e.g. Metaxiotis *et al.* (2003) state.

The action-oriented and subjective aspects are emphasised when knowledge is distinguished from data or information, since knowledge results from the interpretation of an information flow. From this perspective, knowledge is a mix of elements: experiences, framework of understanding, values etc. Davenport & Prusak (1998) formulates it as follows:

[i]t originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms (Davenport & Prusak 1998, p. 5).

Both information and knowledge are thus context-specific terms as they are created from dynamic interaction between people. In practice this implies that data may lose relevance when transferred to other contexts.

2.3 Knowledge in the Artefact-Oriented Epistemology

The early interest in knowledge from a management perspective was driven by an interest in supplementing or maybe even replacing human intelligence with computer systems. By means of computer facilitation and artificial intelligence, Decision Support Systems should be able to amplify the knowledge embedded in the systems or create new knowledge, so that more people would be capable of reaching an identical high-quality decision on a given background. These authors may therefore be seen as exponents of a cognitive epistemology. This implies that companies are open systems which create knowledge by formulating increasingly precise representations of the surrounding world (cf. Varela 1992). People and organisations are capable of representing ‘the world’ in different ways – to a higher or lesser extent in accordance with ‘reality’.

For example Prahalad & Bettis (1986), Lyles & Schwenk (1992) and Walsh & Ungson (1991) believe that it is possible to find and store these ‘world views’ by means of knowledge structures in companies. This reflects a rational perspective or an organisational memory (cf. Kärreman 2004) where the organisation is perceived almost as an input-output model which collects data from its surroundings, manages it and applies the result. The rational perspective suggests an objective world in which optimum (i.e. rational) problem-solving is a possibility.

In the artefact oriented perspective, more data do not result in the creation of a new world view, but more data brings us closer to the existing one. This is illustrated by the importance attached to making knowledge tangible. These artefacts play an important role in identifying, collecting, managing, storing and reusing various concepts. Knowledge is perceived as a ‘visible’ product which can be explained, codified and stored in computer systems whereby it can be transferred just as every other commodity.

Accordingly, Balasubramanian *et al.* (1999) define knowledge as an object consisting of

a module/packet of value-added information that is self-contained and that preserves the content and context from its original business setting for reuse in other settings (Balasubramanian *et al.* 1999, p. 146)

Thereby, they emphasise that knowledge can be explained and made available via artefacts. Thus, knowledge is either an object or it forms part of a network which helps employees find more efficient solutions because earlier developed knowledge is made available in the form of documents, reports etc.

In the same way, Simon (1993), Badaracco (1991) and Toffler (1990) express that knowledge can be exchanged between individuals by identification, collection and use of as much data and information as possible. Thereby the complexity of the surroundings is minimised. The purpose of knowledge management is to reflect reality in the best possible way.

It also appears that the artefact-oriented epistemology mainly deals with explicit knowledge (Polanyi 1966), and that most often there is no distinction between data, information and knowledge – or at least not between knowledge and the other two categories.

Consequently, it is implicitly assumed that knowledge and information are neutral products which are independent of situation, context, organisation, and individual.

2.3.1 Knowledge Management

In the artefact-oriented epistemology, knowledge management is mostly based on collecting, storing and distributing knowledge in the form of e.g. documents and specific information. Vital activities are centred on decision processes. The organisation defines the artefacts and then organises the information so that it can be collected, stored, and reused in other connections (e.g. Huber 1991; Lyles & Schwenk 1992). This means that the process in which the artefacts are created is underplayed relative to the artefacts themselves.

The artefacts are subsequently made available to the rest of the organisation. Focus is here on the implementation of systems to improve and support the distribution of knowledge. The technological approach is rendered possible by means of expert systems, databases, intranet etc. which organise and manage knowledge in the organisation.

In the artefact-oriented epistemology, knowledge is created by collecting and manipulating information. The more data can be identified, collected and managed, the more the company's uncertainty (Thomas & Trevino 1993) is reduced. Uncertainty results from lack of information available to decision makers and can only be reduced by closing the information gap by collecting even more data and information (Daft & Lengel 1986). In the same way, Thomas & Trevino (1993) argue that this information is objective and input for rational decision making.

Besides knowledge creation, the artefact-oriented epistemology emphasises the sharing of knowledge created in the organisation. One way to improve knowledge sharing is to increase communication. Here, Hamel (1991), Inkpen & Birkenshaw (1994) as well as Wathne *et al.* (1996) argue in favour of increased communication and information sharing to reduce uncertainty. Another typical argument is that the efficiency of the communication and information sharing depend on the company's existing structures and routines. Information processing systems are also here perceived as important tools for the distribution of knowledge and information provided that the organisational infrastructure is well-working.

Many different models support knowledge sharing from the artefact-oriented epistemology. Weiser and Morrison (1998) mention project memory (cf. Kärreman *et al.* 2004), and

Malone *et al.* (1993) suggest handbooks or manuals for organisational processes. Both are examples of models seeking to collect and store organisational knowledge.

From the artefact-oriented perspective, the methodologies suggested for knowledge management may often be characterised as either expert systems or Decision Support Systems. Such systems are meant to represent and manipulate knowledge in the form of data which leads to Management Information Systems (cf.) or so-called Business Intelligence which are argued to pave the way to a well-working organisational infrastructure.

The intention of the classical Decision Support Systems in this category was to enhance the efficiency of diagnosing and decision-making for example by means of ‘Question-Answer Dialogs’ (Sprague and Carlson 1982, p. 199). They function within the framework of a sort of decision trees, meaning that choices are based on rules¹ of the type ‘if ... then ... else ...’, known as production rules. According to Eason (1976), this should enable even inexperienced users to solve complex problems. It also means that the more complex the problems, the more rules are required by a ‘Question-Answer Dialog’. Thus, the artefact-oriented epistemology focuses on writing down new rules so that knowledge about ‘the world’ can be shared by as many people as possible. Such systems could as suggested by authors as Metaxiotis *et al.* (2003) be enhanced by presenting knowledge using techniques such as semantic nets, frames and fuzzy logic.

However, in connection with knowledge sharing via documents, Holsapple and Joshi (2001) emphasise the importance of precise definitions and descriptions of knowledge and procedures. Furthermore, information should be stored in such a way that it is applicable, clear and intelligible. Consequently, a very strict coding process is necessary as it should be easy to retrieve the information needed. Lueg (2001) explains e.g. how some knowledge management systems use a ‘profile’ which formally describes the user’s interests or information needs. These profiles automatically match the user’s interests with keywords from documents of potential interest. Lueg (2001, p. 156) also shows that these knowledge

¹ An often suggested example is medical doctors who are capable of making a diagnosis based on different questions which are mutually exclusive (Davis 1977) whereby a diagnosis becomes the result of a decision tree based on medical hypotheses which have been tested over many years.

bases can guide the users towards the documents which are most likely to be relevant, i.e. the documents sought by most people within different fields.

The artefact-oriented epistemology takes its starting point in very structured and explicit knowledge. Badaracco explains this in the following words: “some knowledge is capable of moving quickly because it can be packaged in a formula, a design, a manual or a book, or because it can be contained in one person’s mind or incorporated in a piece of machinery” (Badaracco 1991, p. 35). Thus, it could be said that he argues in favour of data and information being synonymous to knowledge as information can be distributed without losing the content which is exactly the point of the artefact-oriented epistemology.

2.3.2 Knowledge Management Strategy

Hansen *et al.* (1999) have described two knowledge management strategies where the first – *the codification strategy* – focuses on the framework and structure of knowledge sharing. It is based on the so-called ‘people-to-document’-method meaning that knowledge is created independently of the individual who has developed it in a way that makes it easy to distribute. We will return to the other knowledge management strategy – *the personalisation strategy* in section 2.4.2.

Companies, which apply the artefact-oriented epistemology, mostly perceive knowledge as something that can be identified and collected. Therefore they develop detailed procedures for codifying, storing and reusing knowledge – both in the form of documents (e.g. standardisation of project plans and minutes of meeting) and ‘Question-Answer Dialog’-models.

An efficient codification process is important for this kind of knowledge sharing. At the same time, demands are placed on coordination mechanisms when knowledge is to be shared within the company. Intranet and similar IT-solutions are often used as distribution channels because the individual is not seen as the ‘owner’ of knowledge. It is rather the whole organisation which ‘owns’ the knowledge. In that way further development and creation of new knowledge is possible within the organisational framework.

From the artefact-oriented perception of knowledge management, it is a management task to establish a culture which supports coordination and motivates employees to make their knowledge available to others in the organisation. Companies which apply the artefact-oriented epistemology often have a top-down management structure as coordination

mechanism. When knowledge creation and knowledge sharing take place via information processing, simple and selected information passes through the hierarchy to top management who then develops plans and makes decisions that are disseminated directly to the employees through the hierarchy. Information is developed via a functionally organised firm where top management develops the general concepts. These concepts make up the operational basis for the middle managers, in order for them to decide how the concepts are going to be realised and implemented.

2.4 Knowledge in a Process-oriented Epistemology

In our exposition, the process-oriented perspective is not as broad as the artefact-oriented. We see it is as highly influenced by the thoughts and methods introduced by the Japanese Ikujiro Nonaka and his colleagues in the early 1990s but authors such as Prahalad and Hamel (1990), Earl (1997) and Sullivan (1998) express similar views. In accordance with the ideas behind process-oriented epistemology, they express that knowledge sharing processes should be seen as a combination of humans and technology – i.e. via both social interaction and technological transfers. This relationship and interaction are important in the process-oriented epistemology. Furthermore, the interaction of contrasting terms becomes core elements of the models regarding the knowledge creation process. (Nonaka and Takeuchi 1995, p. 237)

The process-oriented epistemology should rather be perceived as a supplement to the artefact-oriented epistemology than an alternative. The organising of and the organisation itself are perceived as a process and not as an information processing or problem solution system. One of the essential features resulting from the process-oriented epistemology is the attempt to get a general impression of how knowledge has been created via complex processes. At this point, we should take various aspects into account, e.g. assumptions, values, experiences, dialogues and decisions. This results in and constitutes the context and background of the artefacts. In the process-oriented epistemology, knowledge is perceived as both tacit and explicit, and knowledge management is about creating interaction between the two knowledge types so that both quality and quantity of the knowledge portfolio are increased (Nonaka *et al.* 2000).

Following the implications of the process-oriented epistemology, knowledge is seen as a dynamic factor created by social interaction between individuals and organisations. Knowledge is active because it is action-oriented, and subjective because knowledge is information in a certain context. Accordingly, knowledge is perceived as a “dynamic human process of justifying personal beliefs as a part of an aspiration for the ‘truth’” (Nonaka 1994, p. 15) which is a very essential point. Therefore, an important task for management is to ensure an ongoing dynamic adaptation of what is perceived as ‘the truth’. This search for the truth should be regarded as a continuous process in relation to knowledge management. It is affected by both artefacts and more unconscious actions. This means that both tacit and explicit knowledge play an important part.

2.4.1 Knowledge Management

The process-oriented epistemology focuses on the individual as the most important actor when knowledge is created. Accordingly, Nonaka (1991, 1994) sees a key task in making the knowledge of the individual available to the rest of the organisation. This may be achieved through systems as was a preferred solution in the artefact-oriented epistemology, or through the creation of the best possible conditions for creating and sharing knowledge between individuals (cf. von Krogh *et al.* 2000). This could take many different forms, such as coffee dispensers in the hallway which may turn out to be a natural place for conversation as is often suggested as an example. But also factors such as care, empathy, nurturing of micro communities, creation of shared visions, specific roles as knowledge brokers or activist and conversation management enter the knowledge management arena.

In the process-oriented view, knowledge creation is seen as a continuous process where existing knowledge is brought into new contexts affecting the actor’s view of ‘the world’. The various perceptions of ‘the truth’ are then adapted and new knowledge arises so that knowledge creation becomes a dynamic interaction process between individuals and/or organisations. This is illustrated in figure 2.1 which shows how new knowledge is created by transformation between tacit and explicit knowledge as indicated by the spiral in the middle of the figure. By repeated interactions between the four types of management activities – socialisation, externalisation, combination and internalisation – the amount of knowledge increases. In the figure, this effect is symbolised by the growth of the extent of the spiral.

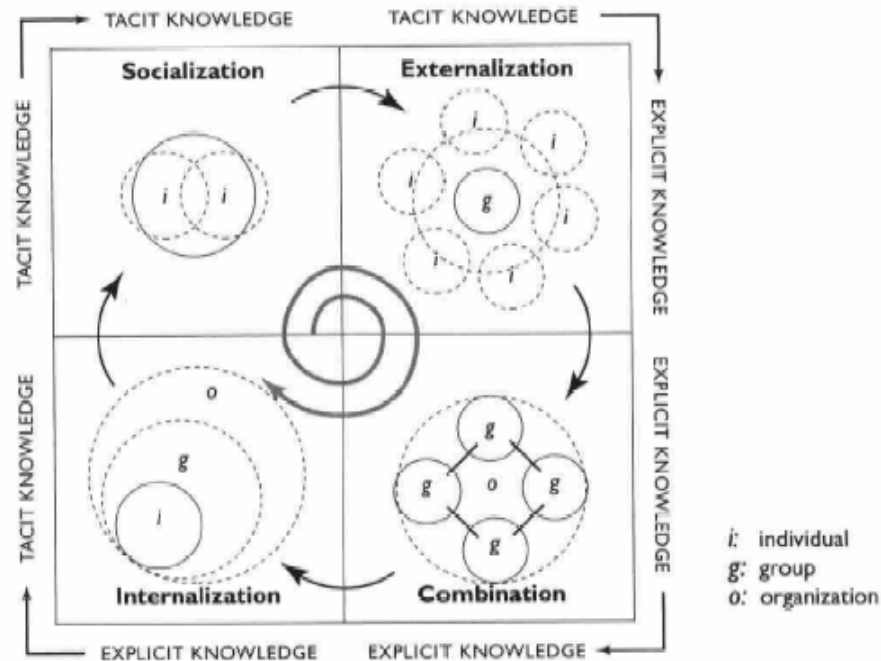


Figure 2.1. The knowledge spiral (Nonaka and Konno 1998).

The main purpose of the first type of management activity, *the socialisation process*, is to ensure a common understanding of e.g. projects which a team is going to complete. As the type of knowledge relevant here is very time and place-specific, it is very difficult to set up formal rules. As the common framework of understanding is gradually obtained, more and more tacit knowledge is transferred between individuals. Therefore, the socialisation process is to some extent similar to organisational culture.

This type of knowledge management is often illustrated by traditional craft's apprenticeship where the apprentice obtains knowledge by feeling his way and imitating his master. As master and apprentice spend so much time together, they affect each other and their frameworks of understanding are slowly adapted to each other whereby a common understanding is reached. It is often informal activities which also comprises meetings both in the workplace and outside of it where mental models and mutual trust are built to such an extent that they may be described as 'communities of practice' (Brown and Duguid 1991, 1998; Lave and Wenger 1991). These may also go beyond company borders in the form of cooperative relations with customers and suppliers. In this way an essential element to ensure the creation of new knowledge is created.

The next management activities, externalisation and combination, have many features in common with the type of knowledge management which follows directly from the artefact-oriented epistemology, and consequently, they are only briefly mentioned here. *Externalisation* is the process which seeks to explicate tacit knowledge. Tacit knowledge becomes explicit when it is made 'visible', meaning that the individual is capable of expressing it. Thereby it is possible to share it with others and thus it creates the basis for new knowledge. In this connection, Nonaka *et al.* (2000) emphasise that the use of for example metaphors, analogies and models is an important element when expressing tacit knowledge as it makes it possible to indirectly emphasise a point.

The purpose of the *combination process* is to combine existing explicit knowledge with more complicated and systematic explicit knowledge. Information is standardised and embedded in procedures, manuals etc. Knowledge can be obtained both internally and externally. When it is combined, edited and manipulated, existing knowledge is brought into new contexts; and new knowledge results. The new knowledge can then be disseminated in the organisation, for example via meetings, telephone conversations and the Intranet. The use of communication networks and large knowledge databases facilitates this sort of knowledge conversion. In the artefact-oriented epistemology, knowledge management fulfilled this task.

Finally, Nonaka emphasises *internalisation* as the fourth type of knowledge management activity. It is somewhat similar to traditional 'learning theory' (e.g. Argyris and Schön 1978, 1996), The internalisation process is action-oriented and deals with the incorporation of explicit knowledge into the backbone of the organisation and the employees.

Besides these four processes, Nonaka & Konno (1998) state that knowledge creation processes should be supported by certain 'spaces' called *Ba* which constitute "a shared space for emerging relationships ... [that] provides a platform for advancing individual and/or collective knowledge" (Nonaka & Konno 1998, p. 40). The term *ba* should be perceived abstractly, and Nonaka and his colleagues (Nonaka & Konno 1998; cf. Nonaka *et al.* 2000) operate with four different types of *ba* created by different interaction levels (i.e. individual or collective) and media (i.e. face-to-face or virtual interaction).

Originating ba dominates in the socialisation process where trust and commitment are present. Tacit knowledge can be shared by individuals. The exchange of experiences, feelings and mental models demands that people meet in real life. *Dialoguing ba* reinforces

the conversion from tacit knowledge to explicit knowledge. This resembles the externalisation process where tacit knowledge is expressed through dialogue and then incorporated into concepts, procedures etc. Key points here are that a group of people are brought together and that mix of competences is selected with care.

Systemising ba, which is both virtual and collective, is often created via various information systems. It often forms the basis for the combination process. At this point, e.g. written documents can be quickly transferred to others and existing explicit knowledge can be presented and combined. Finally, the *Exercising ba* is individual and virtual. The purpose is to internalize the explicit knowledge received e.g. when documents are read. The incorporation of knowledge via reflection and action takes place in the internalisation process.

The process-oriented epistemology implies that knowledge creation depends on the context in which it takes place. Who participates and how do they participate? This means that management has to create the best possible *ba* – i.e. conditions or contexts – for the creation of new knowledge. Social, cultural and historical contexts are of great importance to the individual's framework and thus the way in which information is interpreted. If knowledge is detached from this *ba*, it can only be regarded as information. Thus, *ba* is about both exploiting the dynamic of the continuous knowledge creation in the interaction of tacit and explicit knowledge and collecting and sharing information (Nonaka and Konno 1998).

The knowledge spiral characterises both the transformation from individual knowledge to organisational knowledge and the subsequent knowledge acquisition by individuals. The spiral is scaled as it moves up the ontological dimension: The dynamic process begins at the individual level and develops concurrently with passing teams, departments and organisational borders. Organisational knowledge creation is thus a never-ending process because it constantly upgrades itself. The process takes place both intra- and inter-organisationally as knowledge is transferred across organisational borders and knowledge from different organisations interacts. Thereby new knowledge is created.

2.4.2 Knowledge Management Strategy

Some companies automate the knowledge sharing process and focus on what corresponds to the combination process in the process-oriented epistemology. The other processes,

internalisation, socialisation and partly externalisation focus on knowledge creation and knowledge sharing via the so-called ‘people-to-people’-method. As previously mentioned, this approach has been termed *the personalisation strategy* by Hansen *et al.* (1999) who see it as a contrast to the codification strategy.

Adopting a personalisation strategy ‘*personal contact*’ is decisive to the transfer and generation of knowledge. This takes place through e.g. networks, mentor arrangements and by creating space for dialogue in open-plan offices. Thus the foundation for communication between people is created.

However, knowledge creation and sharing involve the artefacts described under the artefact-oriented epistemology. From the process-oriented epistemology, IT-systems facilitate personal contact in companies in a far better way. Creative employees with good analytical abilities who efficiently use the *socialisation processes* for knowledge creation and knowledge sharing are very central to the personalisation strategy. Good networks are thus very important in the same way as an efficient codification method is decisive when the codification strategy is the primary strategy.

Companies, which use the personalisation strategy, often service customers with highly specialised problems. This requires highly customised solutions. The solutions are often based on a great amount of tacit knowledge, and thus the process is very time-consuming, cost-heavy and slow. Therefore, these companies are more often organised in project teams than other companies.

The complexity of creating, sharing and using knowledge depends on the company structure. It has been pointed out by Brown & Duguid that “[t]he division of knowledge in an organization or in society as a whole reflects the social division of labour” (1998, p. 98). Accordingly, the probability that knowledge creation takes place across departments is less in hierarchically structured companies than in companies based on project teams.

This calls for a management structure in which middle managers play a central role as they are often the cross field of the knowledge flow in connection with the knowledge spiral. Nonaka (1988) named this structure ‘middle-up-down’ because middle managers are at an intersection between the horizontal and vertical knowledge flows. They often fulfil the role as project manager. Through the knowledge spiral, they become involved in knowledge sharing with both top management and front-line employees (Nonaka and Takeuchi 1995). In this process, middle managers often become key persons because they link top

management and front-line employees. The most important task is to ensure knowledge creation by providing front-line employees with tools that to help them make sense of their own experiences at the same time anchor these experiences in the organisation.

4.5 Summary of the Two Perspectives on Knowledge Management

The assumptions of the artefact-oriented epistemology may, compared with the process-oriented perspective, seem fairly unsophisticated. Knowledge is seen as a static object with an objective content that is easily distributed. This, however, does not make the perspective unimportant. Thomas and Trevino (1993) have for example argued for the importance of information processing which reduces ambiguous, multiple and conflicting interpretations. A company's overall strategy may be divided into minor strategies which involve many different employees with different aims, different cultural backgrounds, different frameworks of understanding etc. Therefore, it is important that employees communicate and share knowledge in an attempt to obtain a common understanding and a common aim and thereby reduce uncertainty.

In well-defined situations, the knowledge management tools of the artefact-oriented epistemology such as information processing systems and Decision Support Systems may make up very valuable support to users as they enable inexperienced users to solve complex problems. At the same time, certain standardisation of solutions is ensured. This means that everyone has the opportunity to possess the same knowledge because it exists independently of the single individual.

Thus, the artefact-oriented epistemology very clearly suggests the codification strategy as primary strategy; a choice which is also supported by the top-down structure as coordinating mechanism in the organisation. Companies based on the artefact-oriented epistemology therefore often offer its customers solutions based on knowledge which has been tested and used in other situations. This is the exact purpose of Decision Support Systems. This re-use of knowledge saves time and costs so that more people can be served through the system.

Knowledge in the process-oriented epistemology is characterised as a dynamic process developed by interaction between people and technology. New data and information are constantly interpreted and thereby the 'truth' is continuously adapted concurrently with the

development of the individual frameworks of understanding. The process-oriented epistemology focuses on both tacit and explicit knowledge. Besides, knowledge is perceived as action-oriented and subjective as knowledge is an interpretation of data in a certain context.

The process-oriented epistemology also focuses on the individual as prime mover of knowledge creation. The core of knowledge creation takes the form of a spiral where the interaction between tacit and explicit knowledge as well as between individual, team and organisation plays an important part. Furthermore, it is about creating space for knowledge creation – a platform for the development of individual or organisational knowledge. The knowledge spiral creates a basis for knowledge sharing as knowledge passes different organisational levels (individual, group and organisational) on its way around the spiral.

Knowledge management in the process-oriented epistemology mainly suggests the personalisation strategy. However, it also depends on the company's overall strategy. Focus on socialisation, internalisation and possibly externalisation processes links up to the personalisation strategy as primary strategy. The combination process suggests the codification strategy as primary strategy. All of them are managed by means of the middle-up-down knowledge management structure.

Table 2.1 summarises the general terms. Thus, the table shows how knowledge, knowledge management, knowledge creation, knowledge sharing, knowledge management strategy and knowledge management structure apparently depend on the adopted view.

	Artefact-oriented epistemology	Process-oriented epistemology
Knowledge	Explicit knowledge. All knowledge may be explicated and thus data, information and knowledge are to a wide extent perceived to be the same.	Both explicit and tacit knowledge. When data is structured it becomes information, which in the specific context is interpreted as knowledge

Knowledge management	Focus on representing ‘the surroundings’ as precisely as possible and thus create and share this knowledge via a good infrastructure.	Focus on the ‘creative individual’ who is perceived to be the most essential actor of knowledge creation.
Knowledge creation	Identify and capture data and information from the surroundings so that reality is represented best possible.	The knowledge creating process is interpreted from the knowledge spiral. Space for knowledge creation is particularly important.
Knowledge sharing	Information technological systems and solutions.	Knowledge sharing takes place also via the knowledge spiral as it moves in different ontological dimensions.
Knowledge strategy	Codification strategy. Top-down management.	Personalisation strategy. Middle-up-down management.

Table 2.1. Summary of the two perspectives on knowledge and knowledge management.

Literature

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