Managing Knowledge at FKI Logistex Crisplant: Perspectives and Challenges

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There is general agreement among both management researchers and practitioners that companies' management, organisation and strategy have changed considerably in recent years (e.g. Drucker 1993, 2002; Burton-Jones 1999). For many researchers and practitioners, these changes have marked the transition from industrial society to a new era characterised by such concepts as "the knowledge society" (Drucker 1993).

The emergence of a knowledge society also means that the company is confronted by new challenges which require a new form of management – knowledge management. However, as pointed out by Christensen (2003), the ability to distinguish whether new initiatives should be categorized as knowledge management, change management, quality management, or something entirely different, is not the crucial thing here. Rather, like Christensen (2003), we think it is more important to identify existing management practices, their purpose, and the knowledge-related problems they involve. From this point of view, knowledge management can either be understood as an analysis of the consequences of knowledge to a company, or, like Lucier & Torsilieri (2001), as a problem-solving method and thereby an additional tool for the company.

Thus, knowledge management can be seen as a metaphorical perspective (cf. Morgan 1997) of the company, its management and working methods. Von Krogh & Roos (1995) observed that different epistemologies have been increasingly challenging traditional organisation theory, and that, because "[w]hat you see depends on who you are" (Roos & von Krogh, 1995, p. 1), these basic assumptions of knowledge determine how an analysis and its characteristics will change.

The purpose of this chapter is to examine the influence on – and thus elements of – knowledge management in a specific firm from different epistemological perspectives.

The chapter approaches knowledge management as a description and analysis of a work culture in which employees are conscious of the value of dialogue and knowledge-sharing, and which therefore makes knowledge management a natural part of the company. We regard knowledge management as a management perspective where the focus is on knowledge and knowledge resources (Bukh *et al.* 2004).

The next section introduces the case company, FKI Logistex Crisplant A/S (Crisplant) – a Danish company which is part of the British FKI Group. The company regards knowledge management not as a separate activity carried out by a specific department, but as a part of the company's daily activities – managing knowledge is the responsibility of all employees. Section 12.2 looks at two central elements of Crisplant's management – the creative working model and Crisplant's project-management method. In section 12.3, we show how examining a company from three different epistemologies – artefact, process and autopoietic – gives a more balanced picture of the company's knowledge management than employing only one perspective. Throughout, the analysis shows how creating, sharing and anchoring accumulated knowledge is an integrated part of the company's work. Finally, section 12.4 concludes that the use of more than one perspective in analysing a phenomenon, in this case knowledge management, can contribute to greater insights.

12.1 FKI Logistex Crisplant a/s

Crisplant is a Danish company, whose core business area is the development of tailor-made system solutions within materials handling. The company develops, produces and installs solutions in so-called ATS (Automatic High-Speed Transport and Sorting Systems), which is an important part of operations at airports, postal centres, libraries, distribution centres, mail-order businesses, etc., throughout the world.

Crisplant has had various owners over the years, the 1990s being an especially turbulent period for the firm. In 1999, Crisplant was taken over by the British group, FKI, and became part of the group's Logistex division, which is a major global supplier of automated material handling systems. FKI's acquisition of Crisplant gave the company increased financial strength, enabling it both to expand the existing product range and win new markets. The FKI group is an international engineering company with approx. 15,300 employees and total turnover of around £1,452m. FKI Logistex has about 3250

employees and a turnover of £439m. Crisplant has approx. 700 employees, but does not release separate turnover figures.

Crisplant's aim is to maintain and extend its leading position in the world market for sorting systems, which necessitates continuous development of products as well as the organisation. Crisplant's survival in an increasingly competitive and internationalised market depends on customers regarding it as the premier supplier of *total* logistics solutions for productivity improvements in distribution centres where automatic handling is an essential element. This puts heavy demands on cooperation with the customer, and makes efficient product management an essential element of the firm's customer relations strategy.

Crisplant is a project-based organisation, and this demands a constant focus on the customer's needs and situation, as well as on efficiency and innovation within the company. All activities are project-organised and are carried out according to Crisplant's project management tool, which it calls the *Crisplant Project Management Model* (CPMM).

12.2 Knowledge Management at Crisplant

According to Crisplant, the company's commercial success is determined by its intellectual capital and employees' competencies, which are thus its most important resources. In this chapter, we will describe how Crisplant – without having a distinct strategy for knowledge management – integrates knowledge management into everyday work processes.

12.2.1 Method

The paper is based on a study of knowledge management in its natural setting, where the research design resembles what Yin (2003, p. 43) has termed "embedded case study design", i.e. several units of analysis at different levels. We conducted our investigation at three levels: (1) the firm and CEO (strategy and performance), (2) employees (their interaction and ways of working), and (3) the use of knowledge management (tracing daily work with knowledge creation, sharing and management). The aim of this case design was to ensure richness and multiple perspectives in explaining behaviour.

The three perspectives of knowledge management we examined at Crisplant were derived from the literature beforehand, and were identified through semi-structured interviews, documents and reports. Each interview was carried out with both authors present, one being primarily responsible for the interview and the other for taking notes and filling in gaps in the questioning. The interviewees were asked to describe the company, how knowledge management influences the way they work, how knowledge is created and shared, and how they work with different tools (e.g. a creative model, project planning and IT systems). The interviews, which lasted for an average of about one and a half hours, were recorded and transcribed for later use.

The interviewees were chosen from different positions to get more varied perspectives on the themes. General statements will be presented as "Crisplant says".

12.2.2 Knowledge Management with a Focus on Creativity

The overriding focus at Crisplant is on its employees and their competencies – the company's Managing Director puts it like this:

> Crisplant's employees and their competencies are undoubtedly the company's most important resources because only the right employees, with the right competencies, used at the right time can ensure the fulfilment of our business objectives, the aim of which is that Crisplant's intellectual capital resource – our know-how and skills – is used with advantage to our customers, our owners and ourselves, and it is therefore of decisive importance to Crisplant's business success.

The specific focus of knowledge management on employees means that the development, sharing and anchoring of their accumulated knowledge is an integrated part of the company's way of working. For example, Crisplant says that: "It is natural for us to sustain a going concern by having knowledge and trying to give our customers value through a continuous development and creative use of our knowledge." Knowledge management becomes an integrated part of the company's management activities, influencing its organisational culture and supporting its overall strategic goals. Furthermore, says Crisplant, "knowledge management is about presenting favourable conditions for the creative process of the individual in cooperation with others and hence set the knowledge resources of the company at play."

Crisplant uses a range of IT tools for supporting the creation and transfer of knowledge. Like many other companies, the firm has an extensive intranet. But while this could play

a role in codifying explicit knowledge and in 'storing and distributing' knowledge, it is mainly used for the distribution of news to employees about the company's activities. Thus, it does not constitute an essential part of Crisplant's knowledge management.

However, standardised and codified knowledge is of prime importance to Crisplant's knowledge management activities. Thus, management maintains an overview of customer-oriented projects – often lasting for several years – by codifying and collecting knowledge in progress reports written by project leaders each month. Furthermore, explicit knowledge is continuously collected via the company's ERP (Enterprise Resource Planning) and quality control system, while experiences from projects are collected in a final project evaluation report. In Crisplant's view, however, it is employees' tacit knowledge rather than the explicit knowledge codified and distributed through IT which is essential to the company's progress and growth. The informal knowledge-sharing which takes place daily in 'face-to-face' contact is seen as having the greatest strategic importance.

The firm's knowledge management activities suggest an emphasis on the so-called personalisation strategy by focusing on transmitting tacit knowledge from one individual to another. This way of creating and sharing knowledge can be encouraged through, for example, social networks, mentorship, and by creating space for dialogue. Most authors (e.g. Hansen *et al.* 1999) consider such 'face-to-face' contact as having crucial importance in relation to the transfer and generation of knowledge. See Christensen & Bukh (2004) for a more detailed discussion of personalisation strategy and the alternative of codification strategy.

In accordance with personalisation strategy, Crisplant points out that its project organisation encourages knowledge transfer because a project naturally motivates people to meet and share knowledge, ensuring that more knowledge will circulate throughout the organisation. This is supported by the fact that all employees are constantly participating in new social systems as new teams are set up for the projects. In this way, knowledge is shared and created through the interpersonal relations which arise every time a new team is established and recombined.

12.2.3 The Creative Working Process

At Crisplant, the so-called 'Creative Working Process' determines the way work is carried out at all levels of the organisation. The creative working model is a creative

perception method, based on the work of the Japanese anthropologist Jiro Kawakita (Torpe & Kobayashi 1979). The model is regarded as the 'principal nerve' of the firm's projects, and all employees therefore receive training in how to think as the model prescribes.
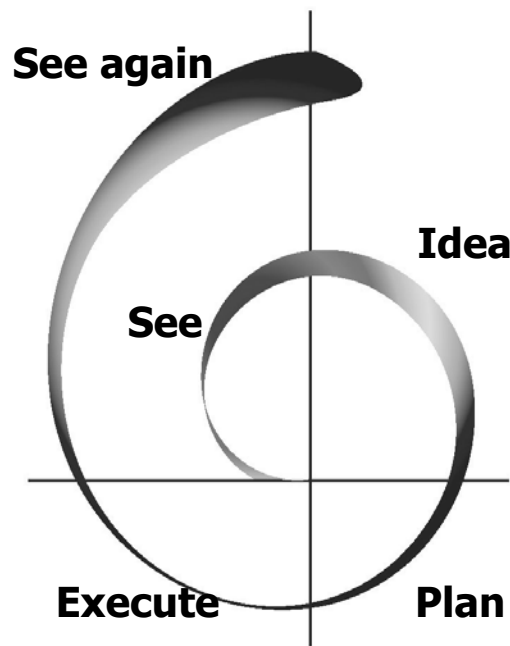

Figure 12.1: The creative working model (Crisplant)

The process in Figure 12.1 starts from the inside of the spiral – *seeing*. This is followed by a dialogue about expectations to ensure that all participants in a project, at a meeting, or during a development task share the same idea about the project – *see* the project in the same way. The second part of the process is the *idea mode,* which determines how the goal should be reached. "To establish how a certain project may be solved, we try to give room to both individual and collective creativity." Next is the *planning mode,* during which the development of the project is planned. Crisplant considers the result first, and thus plans in reverse order. Metaphorically speaking, the creative working method can be seen as a set of Chinese boxes within boxes, the number of boxes being determined by the number of times the creative working method needs to refer to itself, e.g. the firm uses the creative working model to structure meetings in a project's *seeing* mode. When the plan has been drawn up, the project team begins to do the things that are necessary for reaching

the goal, about which all team members should have a clear idea by this time. Subsequently, the project team goes into a *seeing again* mode, where the course of events is evaluated and the project team learns from their experiences.

According to the company, this mode is where much of knowledge-sharing and creation takes place. The employees involved in the project – sales representatives, developers, production, and service employees – meet across departments and share knowledge about problems and strong points. In this way, the different bits of knowledge are brought together to form a holistic knowledge centre which is internalised in team members, and which thereby adds value to the company through a higher degree of success in future projects.

In this sense, the *seeing again* mode has a clear reference to the learning organisation, since it is based on double-loop or even triple-loop learning. The *seeing again* mode challenges existing knowledge through basic *why* questions – *why* are we doing it this way, *why* not choose another strategy? This starts a collective learning process, which leads to innovation both in future projects and in the organisation. Occasionally, the creative working model will lead to triple-loop learning, where participants reflect on experiences learn that mental assumptions no longer lead to appropriate models and accumulation of knowledge. This challenges basic values and principles, and the collective learning process leads to the development of both organisational, production and strategic character. This is crucial to a company like Crisplant, which must constantly develop and find new customer segments – and is in fact the basis for growth as well as survival.

12.2.4 Crisplant Project Management Model

In a project-oriented, contract-based company like Crisplant, efficient project implementation is decisive for success. A management tool which enables Crisplant to meet project goals as regards quality, time and budget is therefore essential. Crisplant uses a project management model (CPMM) inspired by Cooper's stage gate (Cooper, 2001). The purpose of the model is according to the project manual to establish "a common set of rules for project control, management and execution internally as well as in corporation with customers, suppliers and other partners".
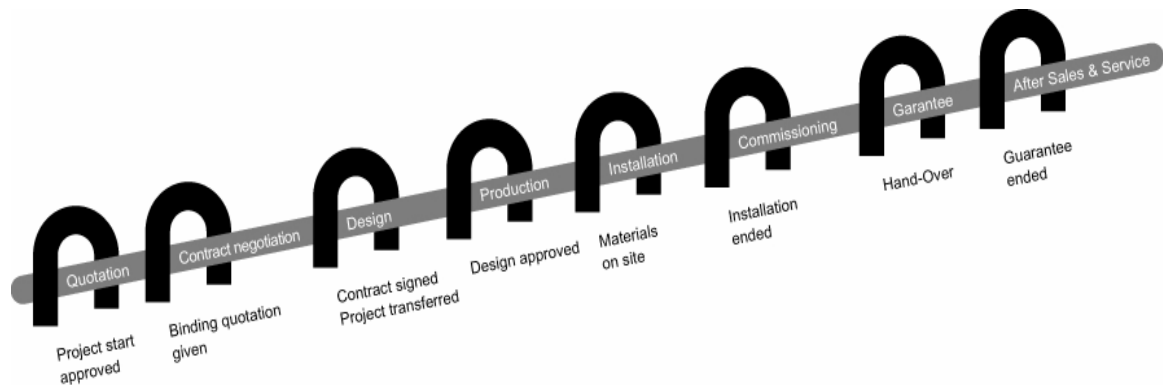
Figure 12.2: Crisplant Project Management Model

A project is divided into a number of stages, each of which are independent and time-limited parts of the overall project, and these stages are specifically created for Crisplant. CPMM is a method of dividing each project into stages, thereby spreading the workload and avoiding hectic activity at the end of the project. Each stage ends with a gate, which can only be entered if the goal of the previous stage has been met. In this connection, the project manager draws up a gate report briefly stating the status of the project as regards the schedule and budget. Crisplant explains: "This is actually the most important point as this is where status is established – how is the project really progressing?"

Crisplant believes that this leads to the best long-term solutions, and stresses the importance of looking ahead, which is illustrated by the following quote:

> We should not dwell on the past because it only consists of feelings and struggles… The only thing we can do is to look ahead. If the past carries something we should have done, then we should have a future plan for it. ... what we're saying is that for instance gate meetings should consist of 10-15% evaluation and the rest should concern something which is going to happen in the future…. we are looking ahead - this actually sums it up.

In this way, the company's focus is directed towards the future, which is also Crisplant's intention, since it has realised that it is only possible to influence the future when the past is behind you.

By dividing projects into gates and milestones, Crisplant creates a metaphorical image of a gate as a door which closes at the completion of a stage, while a new one opens to the future as a new stage begins. Although every stage is viewed in isolation from other stages by opening and closing doors, Crisplant realises the importance of as many project employees as possible participating in the project gate meetings. Thus," we need to be

attentive and ensure that everybody contributes during the project to avoid misunderstandings." The company tries to eliminate misunderstandings and errors precisely by giving each project member more insight into the project as a whole rather than knowing only about the part in which they are directly involved.

There are two apparent relations between CPMM and the creative working model: The spiral of the creative working model is followed in every stage of CPMM, and, in addition, the model can be used throughout the entire project or CPMM. Crisplant explains this in the following way:

> The creative working model may be made linear corresponding to CPMM because it applies to the same things… In CPMM, the first two stages are quotation and contract negotiation and this is actually to *see* what the result should be. In the design stage, we get ideas and we actually also make plans. During the next three stages – production, installation and commissioning – the project is implemented. The customer is present during the implementation, as he is not ready to pay unless he is satisfied and at the same time we would like to evaluate before the gate meeting of the stage.

Together, the creative working model and the CPMM constitute the backbone of day-to-day knowledge management at Crisplant.

12.4 Knowledge Management in Perspective(s)

This section analyses Crisplant's knowledge management according to three different epistemological perspectives. By using different perspectives, we show that an analysis of knowledge management depends on the eyes of the beholder. The epistemologies help explain the significance of knowledge management to Crisplant's field of activity. The aim of using different epistemologies is both to give a diversified picture of knowledge management and to show that disregarding your own epistemological perspective gives a more nuanced idea of the challenges facing the company.

12.4.1 Artifact-oriented Epistemology

Artifact-oriented epistemology (Conklin 1996) is characterised by a knowledge management focused on collecting and sharing formal data and information, such as documents, reports, statistics, etc. Decisions, official procedures, projects and other forms of formalised data are described in this context. This kind of knowledge management found its way onto the management-related agenda in the mid-twentieth century, when

writers such as Herbert Simon, Noam Chomsky, John McCarthy and Marvin Minsky presented a new view of how organisations can be perceived as open systems, which, by creating knowledge, formulate more and more precise representations of the surrounding world. The more the company is able to reflect the world by using artifacts, the more knowledge of "reality" it possesses.

Such documents form an important part of the knowledge collecting process at Crisplant. The Managing Director describes it as follows:

> As we work out a concept proposal and a solution to our customers, we document the thoughts and ideas we have concerning the solution to a specific project. Thus, the knowledge stays in the company so to say – because it has been taken down in writing.

The company is able to learn from previous project descriptions when new quotations are given. In fact, the ISO-certified quality management is based on artifact-oriented epistemology, since it uses comparable formalised data. To a project-oriented organisation like Crisplant, it is essential to signal a uniform project quality to customers. Crisplant has therefore chosen to document the project process in the organisation with comparable artifacts such as CPMM, progress reports, quality guidelines, budget control tools, etc. As a result, the company has been ISO-certified. The Managing Director explains the process as follows:

> We have described the executed processes. We have taken knowledge out of the employees' heads and asked them to describe the working processes applied… We attached great importance to describing the way we really performed the processes instead of painting an idealised picture of how we would have liked to have done…. It is on the basis of the company's stage plan idea (CPMM) that we have described all the routines.

Getting employees to describe the procedures used has meant that the company now has knowledge in writing which was previously only in employees' heads. The creative working model and CPMM are examples of procedures, or, more correctly, "best practices", at Crisplant that have been described in detail. In this connection, the Managing Director says

> We facilitate the integration of new employees into the company by documenting how we do things and by describing our routines: How do we carry out a sales or a gate meeting? … and a project guideline is available etc.

This means that, today, Crisplant has extensive descriptions of the things needed for the agenda at various meetings, the things the company needs to consider, the way a project should be carried out, etc. These procedures support existing as well as new employees in their daily work.

The essential elements of an artifact-oriented epistemology to analyse Crisplant's knowledge management would include the written documents and reports describing the company's procedures and processes, including the creative working model, CPMM, and the quality control system. IT tools used at Crisplant, such as the company's intranet, budget control systems, databases, administrative systems, etc., support the collection, storage and distribution of the formalised knowledge which is the focal point of an artifact-oriented epistemology. Within artifact-oriented epistemology, knowledge management is focused on the type of knowledge which can be explicated, formalised and, ultimately, codified. Knowledge management activities within this epistemology involve a kind of codification strategy, i.e. knowledge is processed in data processing systems using as much information as possible in order to present the most precise equivalent of reality.

At this point, the critical reader might ask how other employees could use such codified knowledge, since they might have a hard time figuring out the meaningful relations in the information due to lack of knowledge about the context in which it was created. This results in discussions about meaning, whereas in fact artifact-oriented epistemology should be regarded as a knowledge-management or merely an information-management technique (Burton-Jones, 1999, pp. 10-12). We will not discuss this further here, but instead regard artifact-oriented epistemology as only one perspective of knowledge management, which is unable to capture all knowledge-processes in a company, particularly because of its lack of context.

In the next section, we will therefore take a closer look at the importance of the processes behind the creation of information and knowledge.

12.4.2 Process-oriented Epistemology

Process-oriented epistemology (Conklin 1996; Baxter & Chua, 1999) considers knowledge creation and sharing as a continuous process between people and technology and between tacit and explicit knowledge. While Prahalad & Hamel (1990) and Earl (1997), among others, agree with this, process-oriented epistemology mainly takes a

starting point in the work of Ikujiro Nonaka. The aim of the so-called SECI model (Nonaka *et al.* 2000), or knowledge spiral, which functions through the transformation between tacit and explicit knowledge, is to raise the quality and increase the quantity of knowledge (Nonaka *et al.* 2000). The knowledge spiral consists of four different interacting processes: 1) socialisation (from tacit to tacit knowledge), 2) externalisation (from tacit to explicit knowledge), 3) combination (from explicit to explicit knowledge), and 4) internalisation (from explicit to tacit knowledge), as illustrated in Figure 2.3 in chapter 2.

That knowledge management at Crisplant is process-oriented can be illustrated by the fact that the company uses the creative working model – which focuses on human relations – and by the fact that knowledge is collected through progress reports and quality control systems, and ultimately distributed throughout the organisation via, among other things, the intranet. By sharing knowledge, the company tries to internalise it in more persons, thereby increasing its value.

As shown above, the creative working model is an important part of Crisplant's daily work, which, as the company stresses, is because

> as time goes by you no longer think about the fact that you're following the creative working model. But when you reflect upon your actions, it is obvious that the creative working model has supported the processes that we have gone through and that just means that the model has proven an easily applicable tool – and this goes for each employee, each project and the organisation as a whole.

From the point of view of process-oriented epistemology, the creative working model can be considered as a knowledge management activity both for structuring the working process and for creating, sharing and internalising knowledge. In this sense, knowledge management is predominant at Crisplant – not least because there are parallels between the creative working model and the SECI model, which is the primary element of process-oriented epistemology.

The aim in the socialisation mode is to achieve a better understanding of other project members, and to ensure that everybody is working in the same direction and towards the same goal. Similarly, dialogues among employees about expectations are required – both at project and company level in both the socialisation and *seeing* mode. The vote on expectations ensures clarity about each member's role in the project and about how the project and final goal should be seen. At Crisplant, the socialisation mode is stressed by

the importance attached to project teams meeting physically (*face-to-face*), because the company believes in a culture where this is the way to share opinions, values and knowledge and to obtain a common framework of understanding.

The externalisation mode should be seen as a process whereby employees can express their ideas. According to Nonaka *et al*. (2000), the use of images, metaphors, analogies, etc., may help the employee to express a point without really being able to explain it. This is exactly what happens in the creative working model's idea mode. In this way, Crisplant regards the white boards used in connection with the creative working model as the most essential part of their knowledge transfer tools.

When all thoughts and ideas have been aired, it is important that they are combined and reduced in order to make a realistic plan for the development of the project. The ideas of the CPMM are therefore incorporated and thus structure the development of the project. This is the equivalent of what takes place in Nonaka's combination mode and Crisplant's planning mode.

The internalization mode is the fourth mode of the knowledge spiral, the objective of which is to embody common guidelines and goals corresponding to Crisplant's executing mode. At this stage, experiences from the current project will probably also be incorporated, and may later be used in another project. Subsequently, the socialisation mode begins again and the spiral continues.

The different ways in which knowledge is created faces companies with different demands for creating 'space' for knowledge creation and transfer. Nonaka & Konno (1998) have therefore developed a model of 'spaces' for giving ultimate conditions for knowledge flows in the knowledge spiral. For example, it is important for a project team to meet physically in the initial modes, where the objective is to express thoughts and ideas concerning the project, whereas physical proximity is not essential in the acting and reflecting modes. It should be mentioned here, however, that certain demands regarding the knowledge assets or resources used in the different modes must be met, and likewise concerning 'space' for knowledge creation.

Table 12.1 shows how process-oriented epistemology (as understood through the SECI model) relates to the creative working model.

Crisplant's	Seeing	Idea	Planning	Executing

creative working model				
Knowledge spiral	Socialisation	Externalisation	Combination	Internalisation
Ba ('space')	Originating	Interacting	Cyber	Exercising
Knowledge assets	Experimenting	Conceptual	Systematisation	Routine
Strategy	Personalisation	Personalisation	Codification	Personalisation

Table 12.1: Comparison of SECI and the creative working model.

Due to its focus on the creative working model in the process-oriented epistemology, we can regard Crisplant's knowledge management activities as a distinct personalisation strategy by which they try to 'lift' the knowledge level of the company by distributing knowledge around the organisation through human relations. By sharing knowledge across the organisation, knowledge becomes internalised in more individuals and its value increases.

Choo (1998) categorises knowledge internalised in this way as cultural knowledge. This aspect of knowledge management is important, since new knowledge is created through the interaction of both tacit, explicit and cultural knowledge. Thus, it is important to focus on the distinction between individual and organisational knowledge. For the organisation to use individual knowledge, it has to go through the socialisation process, where tacit knowledge – often subconsciously – is transferred through the interaction of individuals. The group is then able to convert some of this tacit knowledge into explicit knowledge, and spreading and combining members' explicit knowledge raises the knowledge level of the organisation. The combined knowledge is then used, acted on, and eventually internalised. There are two important elements here: the distinction between tacit and explicit knowledge and the range between the individual, the group and the organisation. In this way, the interplay between socialisation, externalisation, combination and internalisation creates a foundation for lifting and developing the knowledge level of the organisation, creating a greater collective, organisational knowledge which may be further developed through a new cyclic movement (Nonaka & Konno, 1998).

12.4.3 Autopoietic-oriented Epistemology

A third way of looking at Crisplant's knowledge management is through an autopoietic-oriented epistemology. Though autopoiesis (Maturana & Varela 1980, 1987) is rooted in neurobiology, it was later developed into a theory about social systems such as employees, project teams or organisations by Niklas Luhmann (1986, cf. 1995). It has subsequently been introduced into organisational theory by von Krogh & Vicari (1993) and into knowledge management theory by von Krogh & Roos (1996). In this chapter, we will use part of the theory concerning the composition and structure of social, self-organised systems, as presented by von Krogh & Vicari (1993) and von Krogh & Roos (1995, 1996).

Autopoietic-oriented epistemology requires an untraditional organisational understanding of interaction between employees and the organisation and its surroundings, since it presumes that information and knowledge cannot be transferred from one system to another. Communication takes place through data, which thus represents potential information and knowledge. Meaning is given by interpretation of this information and data. Interpretation is determined by the system's own framework of understanding, since the conversion of data into knowledge depends on the existing knowledge of the system. Therefore, autopoietic systems are said to be simultaneously open and closed – open to the transfer of data, but closed to the transfer of information and knowledge.

The focus is therefore on self-reproductive systems, by which is meant that only the system itself (e.g. an employee or project team) is capable of maintaining itself through internal processes, e.g. knowledge resources maintained or increased through the interpretation of data. For knowledge to be created, therefore, it is important that employees are interested in or curious about receiving data from others and sending data out themselves. Through the surrounding systems, it is possible to communicate through structural linkages, e.g. a common language.

From the point of view of autopoietic-oriented epistemology, language is one of the determinants of Crisplant's knowledge management, and language differences are an excellent example of the fact that data cannot be converted into knowledge until it is interpreted. To a great extent, language is a social structure; inasmuch as it makes demands on employees both regarding social and national languages. The social language emerges on the basis of education and work-related functions, which is also the case at Crisplant. Among other things, this explains why, for example, salesmen and developers

may find it hard to communicate. The salesmen speak 'sales language', while the developers speak a very technical language. The gate meetings encourage project members to talk together and achieve a common language, and thus also a collective framework of understanding. A project team tries to overcome social language barriers through the creative working model by focusing on dialogue on expectations, which ensures that everybody has the same goal in mind and how to achieve it.

Even though we speak the same language – both socially and nationally – it is important to realise that the receiver understands the message only on the basis of his/her own knowledge, not on the basis of the sender's.

Another autopoietic characteristic of Crisplant's knowledge management can clearly be seen in the development department, where 'space for communication' is constantly being created as employees move physically to whichever project they are assigned to. This is important, because 'dialogue is made possible' and physical proximity promotes the exchange of data and thus creates knowledge.

It is also extremely important that everybody in a project organisation like Crisplant is working in the same direction – on the level of individual projects and in the organisation as a whole. Among other things, Crisplant ensures this by means of gate meetings, "where a common goal is created, avoiding a trumpet effect where everybody is working in different directions. The road leading toward the goal may have some detours, but the goal remains the same. This is ensured through the creative working model, which is applied throughout." This is a third example of how knowledge management at Crisplant is expressed through an autopoietic-oriented epistemology, where it is largely about achieving a common understanding about how to make 'closer' dialogues possible. Employees know each others' 'background variables', and therefore share a common mental picture which is very important to a project team.

In the autopoietic understanding of knowledge, knowledge management must also focus on tacit group knowledge anchored in non-codifiable structures and procedures, which may only be detected through the team's collective problem-solving process.

If knowledge management at Crisplant is considered on the basis of autopoietic-oriented epistemology, we get an organisation trying to maintain its identity through essential factors such as language, physical proximity, dialogue and common understanding. Given the fact that this epistemology regards knowledge as an individual, and primarily tacit, phenomenon, enabling information to be exchanged by incorporating a dialogue-based

company culture becomes an essential knowledge management activity. In this way, the individual organisation member may 'irritate' each other's systems through the data they send, and every member of the organisation has the opportunity to process recently perceived data into knowledge within his/her own individual framework of understanding. Thus, every individual produces new knowledge (possibly of improved quality), which, ultimately, means that the knowledge resources of the organisation are increased, or at least improved.

Knowledge management at Crisplant understood through the autopoietic-oriented epistemology supports the personalisation strategy underlying the company's knowledge management activities. From this point of view, knowledge management is focused on tacit knowledge, individual as well as collective. The information in reports, databases and documents is, according to this epistemology, only understood as context-dependent data, which does not become knowledge until a system converts it into knowledge through reflection, using the system's existing knowledge. This therefore increases the overall amount of knowledge in the organisation, since every system – the employee, the project team, the development department – has been 'irritated' either by receiving data or by experiencing a need for it. This irritation of the system, leading to reflection, and, ultimately, to knowledge, takes place through communication. This makes Crisplant centre its knowledge management activities on creating good communication opportunities for the individual, where one is conscious of the importance of language and the need to clarify the framework of understanding in which communication takes place.

12.5 Conclusion and implications

Crisplant depends on its knowledge resources to meet customers' requirements. The company's experiences show that it is possible to carry out knowledge management on a day-to-day basis without the need for a separate strategy. Rather, knowledge management is integrated as part of the company's overall management activities, the aim of which is to try to create an organisation culture which encourages development, sharing and anchoring of knowledge in support of the main strategic goal.

Depending on the epistemological perspective adopted, the analysis indicates how the form of knowledge management at Crisplant can take shape and the potentials or possible problems in knowledge management on a daily basis. The analysis stressed the

importance of knowledge management being an integrated part of the company and its processes. Table 12.2 presents an overview of the main differences and similarities between the three epistemologies regarding knowledge management.

Artefact-oriented	Process-oriented	Autopoietic-oriented
• Explicit knowledge • Technology • Quality control • Intranet • Documents and reports	• Tacit and explicit knowledge • People and technology • Quality control and intranet • Documents and reports • Dialogue and common understanding • SECI	• Tacit knowledge • People • Language • Physical proximity • Dialogue • Common understanding

Table 12.2: Overview of the three epistemologies

By focusing mostly on tacit knowledge and informal knowledge sharing, Crisplant leans towards a personalisation strategy where social networks and creativity constitute the core of knowledge management. Under this strategy, the essential knowledge management activities are a dialogue-based company culture, the creative working model and the Crisplant Project Management Model, and the improvement of teamwork in the project organisation. These knowledge management activities can be perceived differently depending on which epistemology the analysis is based on. The practice of knowledge management can be more clearly understood if the epistemologies or paradigm(s) the strategy is based on are taken into consideration. The chapter thus clearly illustrates how different epistemological perspectives influence the way we 'see'.

Generally, the chapter shows how we are all more or less limited by our own existing knowledge. We are subconsciously controlled by our framework of reference and understanding, but the more conscious we are of it, the more we acknowledge it and the more we will be able to overcome these limitations and thus achieve a more nuanced view of existing management activities. Being aware of which epistemology forms the basis of our analysis or which paradigm we are influenced by may contribute to a greater insight into the meaningful contextually dependent relations in the 'world'. At the same time, awareness of different epistemologies and paradigms can help us shape a more holistic

and thorough knowledge management strategy which is more in keeping with the overall business strategy.

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