

KNOWLEDGE MANAGEMENT

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Edited by
PASI VIRTANEN AND NINA HELANDER

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Preface

Knowledge is nowadays recognized as a significant factor of production. However, as the area of interest is still relatively new, there are multiple views and angles to the phenomenon. This book is a compilation of writings handpicked in esteemed scientific conferences that present the variety of ways to approach this multifaceted phenomenon.

The challenge in all research is to know where to draw the line, to make limitations for what to include and what to exclude in one's study. It is often seen as a sign of a good scholar when the borders of the subject in one's study are clear to see. Quite often the writer has to define the outlines for the study artificially, for example, in management there is no management without the organization and on the other hand there is no organization without people and structures. All this falls beneath the umbrella of knowledge management. The question remains, which are the relevant parts in accordance with one's own study and its focus. One has to theorize on something that is both tangible and intangible as well as their interactions.

Knowledge management as a research field divides further into several schools including such orientations or focusing areas as intellectual capital, information systems, communal direction (communities of practice), social networks and complexity, to name but a few. It is also extremely important to recognize that also the roots of knowledge management lie on several disciplines and focus areas, like general management, human relations management and information systems management and their respective literature.

First studies in leadership and management arose among the military issues and date back centuries. One of the first ones, if not the first one, was written some 2300 years ago. This refers to Sun Tzu's *The Art of War* (Sun Tzu 1993), which is quite widely read especially among the eastern leaders (Wee 1994), but also in the western hemisphere. After that there are names such as Machiavelli (1993, orig. 1531) and von Clausewitz (1998, orig. 1832) that surely ring a bell among those interested in these matters. However, this area is still not finished.

Knowledge management might also be seen as a descendant of the so called human relations - school that dates back to the nineteen twenties and thirties. Up until then the dominant way of how management was seen, had been the classic theory of management in which the labor is looked upon an asset like all the other assets for manufacturing businesses, the employee could even have been thought of as a part of a machine. The so called scientific management is one the best known examples of this movement. In 1924 General Electric's plant in Hawthorne near Chicago, US, authorized a group of scholars from Harvard to conduct a study on the effects of lighting on productivity. The results of these experiments were somewhat surprising and although later at least some of the implications were questioned, they still gave a start to

more human-centered viewpoint to management and began to clearer divide management and leadership from one another.

Since the thirties this more humane approach has been attracting scholars in certain amount but not en masse. After the war in the forties and later in the fifties the human side began to win on popularity also among academia. This may be seen for example in the increased amount of literature that goes in this direction.

In all, it can be argued, that the roots of the scholars in knowledge management are mostly to be found in the human relations school. There are quite a few overlapping and shared elements in human relations schools writings and in writings that may be later defined to be knowledge management literature. Penrose (1958) wrote already in the late fifties about a new way to regard a business enterprise and knowledge management as a discipline is being born. Later Peter F. Drucker introduced the term knowledge worker (1970). The early years were perhaps neither easy nor successful but the thoughts remained in the under current. They may be seen as re-emerged at the latest in 1995 when the Knowledge-Creating Company was published by Nonaka and Takeuchi (1995).

Although the role of human relations and leadership, i.e. the softer side of knowledge management, is highly important and can be seen as the origin of knowledge management approach, we cannot ignore the fact that effective knowledge management in practical business life needs also solid understanding and utilization of information systems. In fact, in some occasions this kind of "harder" side of knowledge management is more concrete thing for the managers to grasp the big umbrella of knowledge management – there needs to be a solid starting point for every new idea and approach.

In this book, knowledge management is seen as an integral part of information and communications technology (ICT). The theme is approached firstly from the more general angles, starting by discussing knowledge management's role as a medium towards increasing productivity in organizations. This also relates to the discussion of intellectual capital and its measurement methods, without forgetting the viewpoint of manufacturing operations. In the starting chapters of the book, the duality in between technology and humans is also taken into account. In the following chapters, one may see the essence and multifaceted nature of knowledge management through branch specific observations and studies. Towards the end of the book the ontological side of knowledge management is illuminated. The book ends with two special applications of knowledge management.

We hope that this book gives fresh ideas for applying and practicing knowledge management in different organizations, especially those operating in the ICT sector, as well as opens new directions for future studies in the growing field of knowledge management research.

Editor
Pasi Virtanen and Nina Helander

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Cutting costs and making profits through knowledge management

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1. Introduction

The commonly recognised primary idea of a business enterprise is to make a profit for its owners. There are three conditions that a company must meet in order to survive: it should be financially sound and solvent, it should have liquidity, and it should be profitable. Making a profit means that the enterprise should be viable; it should be capable of maintaining a certain amount of income and keeping costs down. Furthermore, in order to be successful it should do this in some way better than its competitors. Today, as most companies possess or at least may gain access to the infrastructure generally used in their chosen field of operations, they have to seek a competitive edge elsewhere. That advantage can be achieved by finding a unique way of combining the more traditional tangible assets with intangible ones such as individual and organisational knowledge (Spender & Grant 1996). It is exactly this combination of different types of knowledge that makes each and every company different from its peers, as there simply are no two companies exactly alike. Knowledge is widely recognised as an asset, but it is also a vital factor of production (Zack 1999a). This means that the general perception of knowledge is changing. Knowledge is no longer seen as something one needs, or even is allowed to, hold on to oneself; instead, personnel are encouraged to share it. Companies will have to alter their ways of thinking about knowledge and start to look at it as they looked upon raw materials or finances some decades ago. The state of affairs is somewhat contradictory, since the financial means, flows of money, are in general kept under rather good control while knowledge, which is often even more important - as it may control and aid in monitoring the other flows - is only just reaching this point. One feature of knowledge is that it multiplies when shared (Allee 2000). One can only hope that this would apply also for financial assets.

As indicated above, knowledge is an essential resource for contemporary organisations (Penrose 1995, 79-80), especially according to the knowledge-based view of the firm, under which theory knowledge is seen even as a critical element in many organisations' success (see, e.g., Grant 1996). The modern company must evaluate its assets and resources, which include knowledge, and where there is shortage, they must acquire the deficient or entirely lacking asset so that production, whatever its nature, can commence anew, or continue efficiently and economically. One way to utilise this resource is to optimise the use of existing knowledge in the company. As knowledge is a focal component of an organisation's success,

critical knowledge should first be recognised, after that it may and should be utilised effectively. Knowledge management (KM) is the tool for recognising and utilising this knowledge. In this chapter, KM is elaborated upon through a real-world example. The chosen example is a software company operating in business-to-business markets; i.e., the company produces software solutions and sells these to other organisations. In this company, the business unit management realised that there is a large amount of overlapping work, as the software production teams tend not to be aware of the big picture. Thus, the teams start their software production with a clean slate regardless of the work already done and knowledge created elsewhere in the company. All projects have more or less the same costs, because each team creates software code covering all aspects of the functionality, whether or not the same features already have been created by another team for another project or software product. If the latter features could be thought of as a common component in and of software rather than merely lines of code relevant to a single project, a significant amount of working costs could be saved. The company's management sought a solution in componentisation - which translates into codification in the language of knowledge management. To be more precise, this chapter is meant to clarify the use of componentisation as a way and example of putting codification strategy to use as part of KM in the context of software production.

2. What is knowledge management?

On a general level, knowledge management can be seen as managing the sharing and application of knowledge, as well as improving knowledge creation (Marchand & Davenport 2000). Essential elements in knowledge management are administration and goal-oriented management of knowledge, skills, competence, and communication (Suurla 2001). On the basis of these statements, it may be concluded that, as these concepts cover the whole enterprise and its operations, they belong to the jurisdiction of the board of directors. Basically it can be said that one of the main ideas in knowledge management is effective diffusion and promotion of the reuse of existing resources (Wah 2000) throughout the organisation. Thus, to move knowledge and experience in the organisation from their origin to places where they are novel can be seen as one of the tasks of knowledge management (Ainamo 2001). The knowledge should be shared openly, which, in turn, means that, from the organisation's point of view, the only proprietary view is that of the company itself. However, getting people to talk and share their knowledge could be considered to be the greatest obstacle to effective knowledge management (Desouza 2003). It has been stated that an attitude of wisdom is required within an organisation (i.e., the members of the organisation willing to search for knowledge inside the organisation and also willing to share their own knowledge) if knowledge management is to work well there (Hansen et al. 1999). This implies that knowledge management also is a function that has a close connection or an interface with human resource management and leadership in companies.

The attitude of wisdom inside the organisation can be enhanced and encouraged by social interaction. Through social interaction, organisational units have more opportunities to share their resources and ideas. Social interaction also promotes trust and reduces uncertainty among employees (Tsai 2000). Despite all this, many companies lack an attitude of wisdom, as the employees see their knowledge as their personal capital rather than something benefiting the whole work community. Still, exactly this attitude of wisdom would be

needed for unrestricted knowledge flows to occur more commonly. One reason for this lack might be that even if the different organisational units are expected to collaborate with each other, in fact they still quite often compete with each other (Tsai 2000). It can be said that it is exactly social interaction that is indispensable in creation of the attitude of wisdom that is needed for sharing knowledge among the various units in companies. Among the benefits cited for inter-unit knowledge-sharing are innovativeness (Tsai & Ghoshal 1998) and efficiency in project completion times (Hargadon 1998a); these, in turn, are among the success factors of a modern enterprise. A question may arise as to whether an organisation can perform knowledge management without knowing it. We state that the distinction in this context is to be drawn between implementing carefully planned operations in KM and doing things that match the definition of KM. In the first case, we say that KM is being applied; in the latter case, we claim that the organisation in question is simply managing its knowledge. Problematics with knowledge management and knowledge acquisition especially are sometimes divided into two: sharing knowledge and creating new knowledge. Sharing of knowledge may on some occasions also be called knowledge transfer. This question is further elaborated upon later in this chapter. Concerning the creation of new knowledge, the founding fathers of KM, Nonaka & Takeuchi (1995), wrote that it is to be divided into a fourfold table, which they named the SECI model. This model shows that knowledge is created in different ways between different actors in organisations. The model derives its name from these means of transfer: socialisation, externalisation, combination, and internalisation. In brief, socialisation occurs when two knowledgeable persons share experiences (i.e. tacit knowledge, not previously explicated) and both learn something new from the combined knowledge base. Externalisation happens when a knowledgeable person makes his or her tacit knowledge explicit for the rest of the organisation. Combination refers to the situation in which there are two separate explicit sources from which facts can be drawn together to create new knowledge. Internalisation describes the situation wherein an individual takes in explicit knowledge and processes this within the framework of his or her experiences and creates new tacit knowledge. (Nonaka & Takeuchi 1995) Each of these processes can be found in organisations; they may be realised in an orderly manner or spontaneously. It may well be said that knowledge management consists of carefully designed operations in which these forms can be realised through proper planning and management, rather than just to choose the *laissez-faire* policy of not trying to influence knowledge utilisation and creation but instead just letting them happen if they occur at all. In effect, knowledge management may also be said to be there to channel and govern the human capital and intellectual properties of an organisation (Ståhle & Grönroos 1999) to maximise performance and to make the most of the efforts of the organisation.

According to Ansoff (1965, 5), the main problem of an enterprise is how 'to configure and direct the resource conversion process in such way as to optimize the attainment of the objectives'. This problem for decision-makers involves all sub-segments of the company and their functions. As most businesses are meant to be continuous endeavours, they need to carefully plan their actions on a day-to-day basis but also in the long term. Daily operations are run in terms of operational tasks. The tool for long-term planning is strategy, where strategy refers to 'the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals' (Chandler 1966, 16).

As already shown, knowledge is an important part of the asset repertoire of an enterprise, so it and its use must be included in these plans. This also means that knowledge management should be grounded within the context of business strategy (Zack 1999b, 142). Whether there is need for a specific KM strategy or KM should be part of the overall business strategy is debatable. Whichever approach is chosen, such strategy should include the actual activities that are needed to embed knowledge management in the organisation (Seeley & Dietrick 1999). This also should include a timetable for actions, so that the actual tasks become scheduled and not only planned. With proper strategic grounding, the investments in knowledge management will be better focused and prioritised, providing competitive advantage (Zack 1999b, 142).

The main idea of KM is to make the reuse of existing resources effective (Wah 2000). A quite commonly known way to put knowledge management into practice is to apply either a codification or personalisation strategy (Hansen et al. 1999). The main idea in codification strategy is to concentrate on codified knowledge and information technology. The purpose is to codify knowledge carefully and store it in databases. Through this, anyone in the company can access and use the knowledge easily. In implementation of the codification strategy, the focus is on technology-oriented issues. The other perspective in executing knowledge management is to employ personalisation strategy; here, the main idea is to concentrate on tacit knowledge and person-to-person contacts. Information technology is used to help people network and communicate. (Hansen et al. 1999) In a personalisation strategy, the emphasis is on human-related issues.

It has been claimed that an organisation should make a choice between these two strategies. At the same time, however, when one strategy is chosen, the other should not be totally neglected. The ideal balance between these two strategies has been suggested to be 80/20. (Hansen et al. 1999) In spite of this, some suggest that in software companies the balance could be different from this. The suggestion is that codification and personalisation strategies should go more hand-in-hand and there should be a dual-core process, of codification and personalisation. (Mukherji 2005) Software companies' core competence often lies in software development. The software development process is typically characterised as rather knowledge-intensive. Also, the actual outcome of the process, software, is very much a knowledge-intensive product.

One wise choice for software development is component-based software engineering (CBSE), called componentisation in this chapter. Componentisation means in this context the way of not using unique code written specifically for each and every project and product but instead always keeping in mind the broader opportunities to reuse the code once it has been written. The other side of componentisation is that when writing the code, one must always bear in mind the wider possibilities for using the code throughout the organisation and in all of its teams and products. The actual components are always independent entities, and they may vary from a few lines of code to larger functional units. Either way, the component must possess one or more interfaces via which it may be used also in other contexts. It has been stated that componentisation is one way to increase the effectiveness of software development (see, e.g., Meyers & Oberndorf 2001), as it decreases the amount of overlapping work, which, in turn, corresponds with Wah's (2000) main idea of KM making the best of reusing the knowledge in organisations. Through componentisation, existing knowledge can be used more effectively. The emphasis in componentisation is typically on codified

knowledge. Still, to be able to create unique solutions to meet customer needs, the human side of knowledge management (tacit knowledge) should not be neglected.

One of the challenges for organisations is the difficulty of recognising what knowledge is needed in which situation (Lave 1988; Reeves & Weisberg 1994; Thompson, Gentner & Loevenstein 1998 as cited by Hargadon 1999). Organisations typically face a big problem in employees not knowing about all of the available knowledge existing in the organisation. Therefore, they cannot look for it or utilise it in their own work. The creation of new ideas would be most effective if old knowledge could be attached to new situations and in this way be cultivated and developed (Hargadon 1999, Hargadon 1998b, Hargadon & Sutton 1997).

Whilst working in componentisation mode, in addition to completing their day-to-day tasks as before, the teams must try to identify potential components - i.e., products, subparts, or features - that could also be used in other teams and environments. The components created must be made available for the organisation's use. Exchange of resources and interaction among the people developing and using reusable software is an important factor for enabling componentisation (Sherif et al. 2006).

While one of the goals of knowledge management is effective reuse of existing knowledge, KM can be seen as an integral element in the shift to componentisation. The choice to renew software development in the direction of componentisation can be seen as a choice leading toward a codification-based strategy of knowledge management. Despite the emphasis on codification strategy, it should be remembered that personalisation strategy should not be totally neglected. Through this division it is quite easy to recognise the elements that are important in knowledge management. Only by noticing both aspects (despite the fact that the emphasis might be on codification strategy) can one discern an approach to knowledge management that is appropriate for software development. No matter what the knowledge management strategy is, both technology and human issues should be considered.

It is still worth noting that it is estimated that as many as a third of software reuse cases fail. The lack of processes dedicated to reuse and adaptation of existing processes are the main reasons for the failure. In such cases, the processes do not support reuse; i.e., there is no means or time for reuse and componentisation (Morisio et al. 2002). By drawing up and implementing a proper KM strategy, these challenges might be tackled. In accordance with this, in order to work, componentisation requires very careful planning and adjustments (Morisio et al. 2002). It has also been stated that often componentisation projects fail because, it is thought, they are implemented in the existing structures with little motivation and technical training. Often, the human factor has been neglected. (Morisio et al. 2002) Typically, also pressure from various sources (related to the customers, the management, and financial goals) takes the attention away from componentisation. Another potential challenge is that independent or physically dispersed units may even compete with each other (Lynex & Layzell as cited by Kunda & Brooks 2000), leading to a situation in which there is no willingness to share software code. There is some evidence that social interaction enhances inter-unit knowledge-sharing (see, e.g. Tsai 2002). Thus the role of social interaction might be crucial when one is introducing componentisation, as its point is to get people to share knowledge in the form of components that are creations of others' knowledge. After reflection on the above-mentioned aims of knowledge management, one can state that the idea of componentisation - i.e., reuse of work already done and existing resources - is very closely tied to the central idea of knowledge management.

3. A practical example of an organisation and its operating environment

Let us consider a large software company operating in business-to-business markets. In the segmentation of the software industry devised by Hoch et al. (1999), this company stands mostly in the enterprise solutions sector, although it also has characteristics of professional software services (e.g., tailoring the software for specific customer needs is typical for the company) and of software products (e.g., there are 'product categories' visible to customers). It provides large and complex information and communication technology (ICT) systems and solutions for its organisational customers. The company is quite dispersed. The operations of the company are based on independent teams, which differ in many ways. They have different organisational backgrounds on account of mergers and acquisitions, different technologies in use, and different products and customers. Each of these teams is responsible for its own software development, production, and sales. In addition, the teams can be quite separated from each other even physically and geographically. This makes it difficult to know what others in the organisation are doing. For the most part, even the team leaders do not know what those on an equal level in the organisation are working on. Because of this, the teams mainly create the software from scratch. This also leads to the problem that too often the teams do overlapping programming and software development work. The unnecessary redundancy in the software development process naturally causes extra costs for the company.

The toughening competitive situation is forcing the company to review and renew its software development process to form a more efficient way of working. The aim is to root out redundancies and to improve productivity. To get to that point, full utilisation of the knowledge within the organisation is needed. Thus, improvements in knowledge flows and closer collaboration between teams and individuals throughout the organisation are a necessity. The organisation is tackling its problem by switching to component-based software engineering. In this organisation, work has been strictly team- and project-based. Thus, the current organisational structure does not support the interactions required by componentisation. Nor has there been time or motivation to create code that works for the common good. Hence, the transition from a team-oriented way of working to a productised, more holistic software development process is a great challenge for the whole organisation.

In addition to a change in the organisational structure, the organisation has now decided to take advantage of a single shared technology by applying the same programming environment and language across the organisation. The chosen technology is already in use in a few teams but is new to most. As this field is not the focus of the chapter, it is not addressed further here.

Two stages of progress have been identified for the renewal of the company's software development practices: the design and preparation phase and the implementation phase. The design and preparation phase include preliminary assessment of the available, and thus possible, technologies; analysis of the current process; the revision of practices; division of responsibilities; preliminary allocation of resources; and, finally, the technological decisions. Early on, in preparation of the componentisation shift, a dynamic, well-functioning cross-team group of specialists, the architect group, is to be set up. The task of the architect group is to critically monitor the actions and needs of the teams. The group will scrutinise these and decide whether a suggested part is suitable as a component, on the basis of the team leaders' suggestions. Each member of the organisation so authorised can use and reuse components. To be fully usable and developed further for and by other teams, a component

must be well documented. Therefore, carefully planned specifications for the documentation must be completed. The planned practices are put into action and anchored in the organisation in the implementation phase. In this phase, the architect group should monitor the process and support the correct actions. The aim of these two phases will be to ensure appropriate implementation of new practices and technologies.

Renewal of the software development process by introducing componentisation comprises many challenges from a knowledge management perspective. The fundamental idea in renewal for componentisation is to share knowledge effectively, in order to be able to reuse it. Before that point can be reached, several knowledge management challenges can be identified. By renewing the software development process by introducing componentisation, the organisation emphasises a technology-oriented KM strategy. The focal element is a repository, also called a component library, where the knowledge is explicated. Alongside utilisation of components from the repository, the programmers still need a lot of their own and others' expertise and tacit knowledge to effectively develop and produce software. Thus, the human side should never be neglected in the organisation. Accordingly, the knowledge management challenges (and their eventual solutions) for the renewal may be described by dividing them into technology-oriented and human-oriented challenges (and solutions).

The amount of redundant work and the great diversity of the teams in their initial situation are the main sources of the need for implementation of knowledge management in renewal of the organisation's software development process. Both technology- and human-oriented challenges can be seen to derive mainly from the diversity of the teams. It was clear even in the design and preparation phase that the heterogeneous nature of the teams makes it challenging to find an appropriate common technological solution that could fit all the technological demands of all the teams. It is a difficult and trying task to find a technology to support the existing software produced and maintained by the teams, because of the different nature of the software developed in the various teams. Also a tricky question is that of how the component library should be structured such that it is truly usable and exploitable by the members of the organisation.

For the implementation phase there is a great challenge of making the chosen new technology fit with the initial technologies used in different teams when the initial technologies are still in active use. The aim of making a transition to the new chosen technology throughout the organisation creates a challenge, as there is a lack of competence in the new chosen technology. The challenge of making the component interfaces general enough when the components are created can also be considered a technology-oriented challenge in the implementation phase. There is also a lack of time for training and experimenting related to the new technology. When there is insufficient time for training and experimentation with a new technology, the members of the organisation do not have enough knowledge to utilise the new technology properly. Overall, the technology-oriented challenges in the shift to componentisation impose great demands.

The design and preparation phase too features human-oriented challenges. There are prejudices related to the new chosen technology. People have questioned the superiority of the chosen technology, and many people would like to continue with the old and familiar technology that they are used to. Some members of the organisation even feel afraid as they feel that through the change the future is blurred and unknown. One phenomenon perceived in practice is the change in internal power/value structures. This change stems from the fact that, with the new technological choices, the competence and know-how of some individuals

are becoming more valuable whereas those of some others is becoming less significant or even obsolete. Also, in the implementation phase there exists the challenge of activating the information and knowledge flow between teams. The heterogeneous nature of the teams in the organisation also has an effect from a human perspective by adding some contradictory or controversial notions to the knowledge-sharing between the members of different teams. People are not used to sharing knowledge with members of other teams. The social interaction between the teams is weak or even non-existent. Prejudices and attitude problems such as lack of trust and a 'love' for the code they themselves have written are significant reasons for this. Overall, attitude problems pose an obstacle to the change. Questions have been raised in relation to, for example, the whole idea of componentisation and whether the technological decisions are right.

4. Generalisations and managerial implications

The general goal in management is to get the company to make a profit. One way to achieve this is to produce low and sell high. As customers are becoming more and more price-conscious, there is nearly always the need, and room, to cut costs. One way to do this cost-cutting is to make the best of existing resources. As knowledge is recognised as a resource and as it is seen to be in a strategic position for contemporary organisations, its full utilisation and reuse becomes vital. This requires a conscious decision at the strategic level to implement organised knowledge management in the organisation.

In our example organisation, the main idea behind the componentisation is, as noted above, an attempt to avoid overlapping work and to utilise existing knowledge better across team and project boundaries. Thus, the role of effective knowledge management and especially of knowledge-sharing is recognised in the organisation. However, there remain several knowledge-management-related challenges that should be considered more carefully. From the facts presented, we argue that by recognising these challenges and reacting to them more proactively, starting in the design and preparation phase of the renewal process, the knowledge management magic can happen more effectively and the shift to CBSE be easier. In the subchapter three of this chapter there were described some KM-challenges that the example organisation faced in the change-over to componentisation. Based on these examples and existing KM-frameworks the generalisation of challenges that are most typically found in a team-oriented organisation implementing a codification strategy are presented in the following table 1. To aid in examination of the process of implementing the codification strategy, the process is divided into two phases here also: the design and preparation phase, in which the process is mainly being planned, and the implementation phase, in which actual procedures are carried out. The challenges are divided into two categories, technology-oriented and human-oriented challenges, according to their primary sources.

	Design and preparation phase	Implementation phase
<i>Technology-oriented challenges</i>	<ul style="list-style-type: none"> · Different kinds of teams and demands · Agreement on viable tools that meet the needs of different teams · Usability and exploitability of the knowledge repository 	<ul style="list-style-type: none"> · Compatibility between the initial and new knowledge · Assuring sufficient familiarity with the new knowledge · General enough usability of the knowledge · Lack of time for training and experimenting
<i>Human-oriented challenges</i>	<ul style="list-style-type: none"> · Prejudices against change from the present state · Fear and uncertainty caused by not knowing the future · Change in the competence-related power/value structure 	<ul style="list-style-type: none"> · Information and knowledge flows between teams · Social interaction between the teams · Attitude problems related to change · Attitude problems related to the new technology

Table 1. KM challenges in different phases of the renewal process

Naturally, the first step toward efficient KM is analysis and identification of the potential obstacles present within the organisation and its practices. Often one can identify multiple challenges that are present at several organisational levels and related to many central business processes of the organisation, as can also be seen in Table 1. There are, however, also many possible solutions to these challenges. The most interesting feature of knowledge management is that the effects of the actions taken are multiple and sometimes even difficult to pinpoint. This is why the solutions to KM challenges cannot all be matched against a certain challenge presented in Table 1. The purpose is that, by applying the suggested solutions, the organisation creates the right circumstances for meeting the challenges. This is fairly natural, as KM is not a single organisational tool but an overall management philosophy. Possible solutions based on the ideas of codification and personalisation strategies are represented in following Table 2.

	Design and preparation phase	Implementation phase
<i>Technology-oriented solutions</i>	<ul style="list-style-type: none"> · Strategic-level decision to go through with the project · Proper planning and scheduling of the implementation · Implementation of the chosen strategy according to plan · Approval of parallelism of the old and new way of working in some situations for the agreed time · Designing of the knowledge repository with experts and representatives of different teams 	<ul style="list-style-type: none"> · The new way of working being adaptable and agile enough to accommodate the needs of the teams · Allocation of enough resources and opportunities for training · Clear architectural design and structure
<i>Human-oriented solutions</i>	<ul style="list-style-type: none"> · Strategic-level decision to go through with the project · Proper planning and scheduling of the implementation · Implementation of the chosen strategy according to plan · Proper communication of the change · Training for the chosen approach 	<ul style="list-style-type: none"> · Publishing of pilot cases to serve as an example · Creation of both formal and informal communication areas and of spaces for work between teams · Pursuit of cultural change toward a more open and sharing work environment

Table 2. Solutions to KM challenges in different phases of the renewal process

In the design and preparation phase, one of the main issues from the technology-oriented perspective is to plan well the implementation and the schedule for implementation of the new chosen technology. Experts and members of different teams should be involved in this process. In addition, as early as in the design and preparation phase, it would be wise to consider letting some teams use old technologies as long as required for maintaining software that has been created with old technology and that will not adapt to the new technology. This should be allowed only in situations where the integration of old and new technology is impossible and only if it is truly necessary. In the choice of the new technology, the knowledge of the experts inside the organisation should be utilised to ensure that the choice is right from a technological perspective (and from different teams' perspective) and so also to rationalise and justify the choice. The experts should also be involved in the design and preparation of a knowledge repository. This aids in building a knowledge repository in which usable and exploitable knowledge can be found.

The choice of new technology in the design and preparation phase has a direct effect on the implementation phase. In relation to the technological side of the change, it should be considered that the chosen way of working must be agile enough to enable the work of the individual teams to continue. The new techniques should also be such that they mesh at least on some level with the old way of working. Only this guarantees that the old and new knowledge go hand-in-hand and no knowledge is missed out. In choosing of the technology, it should be made sure also that the members of the organisation are either already familiar with it or have the ability to learn how to use it. For learning how to use the new technology, there must be sufficient training possibilities to match people's different ways of learning. The managers should also allocate time and money for the employees to adapt to the new technology. In the implementation phase, the usage of the existing knowledge is the main focus. Thus, to ensure the usability of the newly created knowledge, clear definitions and guidelines for this knowledge that is placed in the knowledge repository should be prepared. This aforementioned should be done by means of which it could be ensured that the knowledge is general enough for everyone to use.

The human-oriented challenges of the design and preparation phase that are related to prejudices, fear, and uncertainty could be met with proper communication. Through appropriate communication about the change, the various grey areas may be elucidated and the uncertainties eliminated. It is important to communicate the message of the renewal clearly all the way down to individual teams and groups within the organisation. It is also wise to provide training for the chosen approach already in the design and preparation phase. Through training, various types of prejudices may be diminished.

What is essential at the beginning in all situations involving a change is short-term success. A counterbalance to the human resistance to change is needed. The organisation and its members need to see positive examples if they are to overcome the difficulties. Successful pilot cases should be promoted on the company level (e.g. via the intranet). To make sure that information and knowledge will flow between the teams in the implementation phase, different kinds of spaces where people can meet and create mutual trust, along with similar opportunities, would be useful. Examples are job rotation among the teams, formal and informal meetings of team members, regular team leader meetings, shared coffee rooms and game rooms, and visits of a team member to meetings of other teams. The communication of the renewal should be handled well. This way, a better and more thorough picture of the process can be given to the members of the organisation. The change needs promotion

through well-executed organisation-wide communication. Promotion is more likely to be taken care of properly and to remain functional if dealt with by dedicated personnel, even if their main tasks lie elsewhere. It is also wise for a known and appreciated person inside the organisation to be nominated to be a leading figure in the change. Additionally, the opinions and ideas of the members of the organisation on all levels should be better taken into account. Also, the team leaders' meetings could be visited (at least occasionally) by a member of the top management for promotion of the process. In turn, the team leaders could promote the message of the management to their own team members. In these middle-level meetings, various training needs could be discussed and developed also. To put it simply, if the people know what is going on and they are able to be active about it, they are less concerned and are more confident and trusting in a better future.

Leadership carries immense weight in knowledge management. The 'people skills' of the management have an essential role in winning the employees over to the new *modus operandi*. Thus it can be said that leading the change systematically is critical also in the kind of endeavour discussed in this chapter. Often the individual teams in the organisations of this kind all have their own 'business as usual' modes. In the organisation wide renewal process they are typically expected to renew these and, at the same time, their thinking patterns. A major adjustment can be seen on a mental level. All teams and individuals need to adjust their functions and even change the technology that is being used. Some must learn and adapt to a wholly new technology and way of working. To achieve these changes, a new way of thinking and readiness to adapt to change are needed. Thus, the attitude of wisdom is needed. This can be brought about properly and at all functional levels only if leaders create the right circumstances and provide all necessary resources for successful social interaction. This also supports the claim that reuse in the absence of means or time typically fails. Hence it can be said that leading and leadership in this kind of undertaking and setting are crucial for a successful outcome.

5. Conclusion

This chapter has discussed the challenges of knowledge management on the basis of an actual example. We analysed the software development renewal process of a large software company from a KM perspective. The aim was to track the KM challenges that appear during the renewal process and, by reflecting the example on the basis of the KM literature, propose possible solutions to the challenges identified. While we identified several challenges related to the renewal process from the knowledge management standpoint, still it can be said that knowledge management is also a key to helping renewal go forward. By identifying knowledge management challenges, these challenges can be faced and handled. It can be argued that companies that are renewing their ways of working would benefit a great deal from applying KM practices even in starting the design and preparation stages of the renewal process; KM practices should already be considered in the design phase of the change, to ensure smooth progress of the change. Another significant issue that should be raised is that both technological and human perspectives of KM need to be recognised in renewal process. Also proper technological KM solutions may be needed and are worth taking into consideration for making things easy and efficient. To master the technological side of the whole change process is a great challenge already, but the organisational and human side may be an even bigger one to handle. The key element is to have the right

attitude towards knowledge-sharing. This has already been stated in many KM studies. For example, Desouza (2003) has stated that 'The biggest obstacle to effective knowledge management is not implementing a cutting-edge IT solution, but getting people to talk and share their know-how'. Monitoring and guiding the change and persons involved in it is extremely useful. Some control is needed or even vital if a renewal process is to bear successful fruit and especially for the new approach to actually become the usual way of working. The role of the management is that of a facilitator of this knowledge sharing forum. The qualifications and traits required of leaders in this kind of situation are not necessarily easy to find in one person. It is very challenging to fully consider which organisational changes are needed, and it is even harder to figure out how they should be implemented and presented. This all can also be seen as taking up of knowledge management practices as everyday functions inside the company. In this kind of situation, one should always bear in mind that it is typical that such a procedural change may well take up to two or three years or even be continuous, a sort of ongoing change. The ultimate goal of all this fuss in an organisation is a permanent change in the ways of working so that abundant and overlapping work is cut to the minimum. This way the company may be able to significantly cut the costs and make profits.

6. References

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