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# MAPPING ORGANISATIONAL KNOWLEDGE

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## Ph.D. thesis

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# I. OBJECTIVES AND SIGNIFICANCE OF THE RESEARCH

## I.1. Introduction

The role of knowledge in the economy, the utilisation of knowledge, the creation of knowledge and knowledge management in general, have become popular topics for researchers of a number of scientific disciplines. Experts investigating management, organisational theory, psychology, sociology, information systems and cognitive sciences are among those affected. There are at least three different fields which provide the background for the topic: the resource-based approach to corporate competitiveness, organisational learning, and the field of intellectual capital. During the nineties a number of publications were published in these fields, ranging from popular literature to ambitious scientific articles.

From among the activities included in KM, scientific literature often focuses on the creation of new knowledge, on innovation. The reason for this, among others, is the assumption that innovation is one of the most important factors of competitiveness, and knowledge is the most important part of a company's wealth. Within KM literature far less attention is paid to systemisation of the knowledge available at the company and to ensuring the accessibility of this knowledge.

The basic assumption of the thesis is that systematic mapping of knowledge is the basis on which all KM activities rest. It is meaningless and useless to speak about the creation of new knowledge unless the company is well aware of its available knowledge including both the company's internal knowledge and the relevant external knowledge. To survey the company's internal knowledge it is necessary to scan and map this knowledge.

Knowledge mapping must be a permanent activity, since the value of knowing a certain field could change continuously too. Knowledge mapping will aid the efficient use of company resources and will help decide whether a knowledge element could or should be saved in some form to facilitate sharing.

## I.2. Research Questions

In the literature authors show a preference for discussing the creation of new knowledge and innovation (Nonaka 1994, von Krogh 1998b, Nahapiet and Ghoshal 1998, Schüppel 1998). The roots of this approach can be attributed partly to the approach of the school

advocating organisational learning, where the central issue is the creation of organisational knowledge. Considering innovation as one of the most important factors of competitiveness (Huang 1998, Swan and Newell 2000) and viewing knowledge as a tool of strategic importance (Winter 1987, Liebeskind 1996, Probst, Büchel and Raub 1998) also lead to investigate the creation of new knowledge.

Far less attention is paid to the systemisation of the knowledge available at the company or to ensuring its accessibility, though these, too, can be found in the literature (Snowden 1998b, Bednar 1999, Wakin 1999, Tobin 1999). Moreover, focusing on present or past activities in KM is considered to be a serious mistake by some influential authors (Fahey and Prusak 1998). However, all the KM activity models I am acquainted with, have the mapping of current knowledge as a starting point (Angus and Patel 1998, Davenport 1998, Bengston and Lesser 1999, Lai and Chu 2000, Weggeman 1999).

One of the objectives of the thesis is to provide practical advice to those companies which are taking their initial steps in the introduction of the KM function. A company can be said to have a KM function if there is a designated organisation or person with the task of

- locating, saving and transferring the knowledge elements selected for the purpose,
- monitoring the process of mapping the relevant company and external knowledge in accordance with a specific set of criteria,
- ensuring that the knowledge mapped can be captured and saved, that it is transferable, as well as ensuring the evaluation of the efficiency of the transfer.

I propose the use of the structured approach to plan the process of setting-up a KM function. The structured approach is an engineer's approach, which demands that after the envisaged goals are set, the products to be produced should be clearly defined. Product in this context can be a palpable product, a book for instance or a computer system, but it can also be a trained person or an organisation to be set up. The product must be defined in such a way which makes it feasible to decide in an objective manner whether it was made in conformity with predefined quality. Knowing the products, the activities required for producing them and the necessary resources can be decided upon. Then the activities are ordered into a hierarchic structure and succession (precedence) rules are defined. In this way it becomes possible to plan the achievement of the goal set.

The information system development methodologies (e.g. SSADM, SDM, Merise, Method-1 etc.), which evolved in the eighties, are typical examples of the structured approach. The structured approach provides normative rules, which set forth the series of actions to be followed in order to achieve a certain objective, e.g. to build up a software system or an organisational function.

A suitable frame must be set up in order to provide the normative description required to create the KM function. I propose that maturity modelling used in a number of areas and well known from literature should be used as a frame for this purpose. An additional advantage of maturity modelling is that it presents a clear vision about the development of the KM function to the company's employees, which could contribute to the success of a KM initiative.

The thesis deals with the systematic mapping of knowledge. A company can survey the available knowledge (both the internal knowledge of the company and the external knowledge relevant for the company) by mapping it, searching it out. This assumption is in line with the view advocated by Grant (Grant 1996:113), who examines the company as a knowledge using institution (at the same time he considers disregarding creation of new knowledge as a weakness).

Knowledge mapping is especially important at those companies, which are taking the first steps in the intentional implementation and designated use of KM. Thus, the key question of the investigation is:

> ***To what extent and how do the companies rely on the mapping of available knowledge during the course of implementing knowledge management? How does knowledge mapping take place and what factors affect this process?***

The above central question can be divided into the following research questions:

***A, Which are the first steps during the course of setting-up an independent knowledge management function?***

The literature reports about "KM projects" where success is formulated in a variety of ways (Davenport, de Long and Beers 1998). The introduction of the KM function is rarely formulated as an objective, instead, researchers call certain initiatives as KM projects.

The justification for the initiation of a KM project is a problematic area, examined separately. According to Davenport, de Long and Beers there are projects initiated both on the basis of „belief" and on the basis of returns. The reasoning probably fits into the culture of the organisation (Davenport, de Long and Beers 1998). I will not deal with this issue in the essay.

My assumptions regarding this matter[1] were:

A1 The first step in setting-up a KM function is always the mapping of available knowledge.

A2 Information technology tools are often used during the first steps due to the fact that system development often leads to concrete results and it is relatively simple to control.

A3 Initiatives based on vision and strategy develop at a faster pace.

***B, How do companies carry out knowledge mapping?***

Using lessons learned from the case studies, I wanted to set up a model for the process of knowledge mapping and describe techniques used in this process.

The areas (and the reasons for selecting those) where the company wants to map the knowledge, and how it intends to make the acquired knowledge accessible are also part of the issue. The intentional determination of the areas for knowledge mapping, the continuous monitoring of the consequences of the decision and the eventual necessary modification can be the measure of the institutionalisation of knowledge mapping. In this respect my expectations were:

B1 If the KM function is built in a top-down manner then broad scope areas, covering the entire company are examined. If the KM function is set up in a bottom-up manner, the principle of "where the shoe pinches" prevails, that is, the areas to be mapped are determined by momentary necessity.

***C, What are the factors that affect the intensity of knowledge mapping?***

Essentially, the phenomenon to be examined is how much effort the company uses on the mapping of internal and external knowledge. In the course of the research I wanted to examine whether the companies had any intention of meas-

[1] I have consciously not used the word hypothesis, as the essay is built on case studies, and it is explorative in character, see chapter I.4 on the methodology of the investigation.

uring activities carried out with the mapping and if they had, were there any indicators used to characterise the process.

A common, foreseeable problem of such indicators is, that the data required to calculate them were probably available in poor quality, and this would distort the picture. This was one of the reasons why I did not propose a quantitative approach of investigation (see also section I.3.).

C1 According to my expectations the following factors affect the volume of resources expended on knowledge mapping:

- the size of the company,
- the knowledge-intensive character of the company,
- the competition's approach to KM in the company's business sector,
- the commitment of the senior management to KM,
- the monitoring of the intellectual capital indicators,
- the change in the company staff,
- the relation of the company's core activity to information technology,
- the approach of the company to quality and
- the existence of a company culture supporting knowledge sharing.

## I.3. The Characteristics of the Research

In order to select the proper research methodology, it was necessary to examine the topic in a broader sense, the selection of the research topic and the environment available for investigation. The characteristics of the broader topic, of the field of KM are the following:

- Basic KM terms have no uniform definition (see for example the different constructions of the central term of tacit knowledge, Venzin, von Krogh and Roos 1998). Those cultivating different disciplines focus on different things due to their different notions and their criteria are also different.
- Activities of KM, as opposed for instance to accounting or production are not "real" activities, in the sense that KM activities traditionally cannot be separated from other activities of the company.

- The approach used in literature is mainly based on case studies, though there are also quantitative analyses, which use statistical methods (Hall 1992, Bierly and Chakrabarti 1996), as well as large sample surveys made by consulting firms, which examine current practice (Ruggles 1998, KPMG 2000a). One of the reasons for these phenomena could be that it is very difficult to operationalise the terms, which can be constructed in different manners (see for instance Davenport, de Long and Beers 1998).

The characteristics of the questions in this research are the following:

- There are no deductive examinations aimed at the verification of a hypothesis among the questions A, B, C, which are of an inductive nature. That is why the research deals with expectations and not hypotheses.
- The time horizon of the examination (the beginning of the setting-up of the KM function) is concentrated, well suited to the method of field research (Babbie 1996:305).
- One of the goals of the research is to compile practical recommendations for companies about to introduce the KM function.

The scope of accessible companies, where investigations could be conducted was small:

- As far as I know, very few companies in Hungary have announced a KM program (KPMG 2000b),
- There are relatively few companies, whose size would justify the introduction of a KM organisational function.

## I.4. Research Methodology

As the operationalisation of the terms is difficult and the character of the research is inductive, I have used the field investigation method, and within that, the preparation of case studies. According to Yin, case studies should be used when *"...the how and why question is being asked about a contemporary set of events over which the investigator has little or no control"* (Yin 1994:9). Ass a consequence of the reasons exposed in the section above, the triangulation methodology (in the sense of the Balaton-Dobák interpretation, Balaton-Dobák 1991:101) could not be used, that is why I made no use of statistical tools. From among the six possible authentic data collection method classes

described by Yin (Yin 1994:80), I used the studying of documents and historic records and conducting interviews.

The companies investigated in case studies were selected in a qualitative basis, on the basis of determined aspects. The selection criteria were:

- knowledge mapping should be important for the company. This could be recognised from the resources expended on it.
- The company should be a Hungarian company and a large company within Hungarian conditions.
- The company should be introduced into the stock exchange.

In my view, the closer the connection between the company's core activity and information technology is, the more likely it is that an equality is drawn between knowledge and information, and therefore, the more technicist KM solutions are sought. The three companies chosen differ in the extent their core activity is linked to information technology.

The companies (from the aspect of the research) have the following characteristic features:

- At the first company the intentional introduction of the KM function is in progress (Chapter VI.1). A project has been set up for the purpose, which initiated the introduction of KM after careful preparations. The company's core activity is not related to IT. This company was an ideal subject for starting the investigation. In this case, the task was to examine the proceeding of the implementation project, to overview the experiences through the processing of secondary literature and falling back on the most essential interviews only.
- At the second company there is no intentional setting-up of a KM function (Chapter VI.2). However, the size and complexity of the company has long led to the necessity of homogenising and institutionalising the available knowledge. At that company, I have studied the efforts made for the broad dissemination of knowledge in connection with Lotus Notes, a software which in literature is often referred to as a KM tool. The activity of the company is not connected to information technology, but the possibility of developing in that direction is present.

- The third company met KM (Chapter VI.3) in the framework of a development project, in order to solve a problem brought up by practice. The core activity of the company is expressly connected with IT. In this case the use of interviews prevailed.

I have used Eisenhardt's structural model in planning the steps of the research (Eisenhardt 1989:533). This model can be considered a fine tuned version of the Yin classification (Yin 1994:49). The following table contains the sequence of theory building steps based on the case studies (activities, which were relevant in this research are in italics).

| Step | Activity | Reasoning |
|---|---|---|
| Getting Started | *Definition of research question*<br>*Possibly a priori constructs*<br><br>Neither theory nor hypothesis | Focuses effort<br>Provides better grounding of construct measures<br>Retains theoretical flexibility |
| Selecting Cases | *Specified population*<br><br>*Theoretical, not random, sampling* | Constrains extraneous variation and sharpens external validity<br>Focusing efforts on theoretically useful cases |
| Crafting Instruments and Protocols | Multiple data collection methods<br><br>*Qualitative and quantitative data combined*<br>Multiple investigators | Strengthens grounding of theory by triangulation of evidence<br>Synergistic view of evidence<br><br>Fosters divergent perspectives and strengthens grounding |
| Entering the Field | *Overlap data collection and analysis, including field notes*<br>*Flexible and opportunistic data collection methods* | Speeds analysis and reveals helpful adjustments to data collection<br>Allows investigators to take advantage of emergent themes and unique case features |
| Analysing Data | *Within-case analysis*<br><br>*Cross-case pattern searching using divergent techniques* | Gains familiarity with data and preliminary theory generation<br>Forces investigators to look beyond initial impressions and see evidence through multiple lenses |
| Shaping Hypothesis | *Iterative tabulation of evidence for each construct*<br>*Replication, not sampling logic across cases*<br>*Search evidence of „why" behind relationships* | Sharpens construct definition, validity and measurability<br>Confirms, extends and sharpens theory<br>Builds internal validity |
| Enfolding Literature | *Comparison with conflicting literature*<br><br>*Comparison with similar literature* | Builds internal validity, raises theoretical level, and sharpens construct definitions<br>Sharpens generalisability, improves construct definition and raises theoretical level |
| Reach Closure | Theoretical saturation when possible | Ends process when marginal improvement becomes small |

*Table 1. Theory building process based on case studies (Eisenhardt 1998)*

In the course of the data analysis I have used the descriptive approach corresponding to the research question (Yin 1994:104).

## I.5. The Significance of the Research

According to my knowledge very few companies in Hungarian economy have tried to set up a KM function yet, and thus, a growing number of such initiatives can be expected in the near future. I set out to collect applicable and at the same time theoretically well founded ideas and advice to aid the institutionalisation of knowledge mapping.

Due to the fact that the field of knowledge mapping has been little examined the research helps to fill in gaps.

## I.6. The Structure of the Thesis

The second chapter of the research provides an overview of the literature. It discusses the history of KM, the related terms, the frequently asked questions of the topic and the success criteria of KM.

There are a number of terms in the field of KM, which do not have a uniformly accepted meaning and therefore in chapter three, I have presented my own presumptions and definitions related to knowledge.

Chapter four summarises the results of the examination of the first question of the research (which are the first steps of the introduction of the KM function). I recommend the use of a methodological tool, the maturity model, for a planned introduction building from up downwards.

Chapter five contains techniques and methods recommended in connection with the second and third questions of the research (the examination of the process of knowledge mapping), as well as the results.

Chapter six contains the description of the three case studies, with references to the ideas expounded in the two preceding chapters.

Chapter seven summarises the findings of the thesis and the further possible directions of research are drawn up.

# II. OVERVIEW OF THE LITERATURE

The role of knowledge in the economy, utilisation of knowledge, knowledge creation and KM in general has become a popular topic, probably due to the diverse possible interpretations of the underlying concepts. Researchers of different disciplines - of scientific management, organisation theory, psychology, sociology and information systems - utilise the theme as an opportunity to discuss their own problems in a new context.

KM, as a system of human activities that target the utilisation, assessment, distribution and exploitation of knowledge, has always existed in companies. Ideas concerning institutionalisation and ensuring the possibility of transfer of individual and organisational knowledge, as well as the utopia of company's total independence from its staff can already be found in the works of Weber and Taylor. The ultimate objective of KM is to help the value creating activities of the company, more precisely to enhance their effectiveness and efficiency. KM activities can be classified among the support activities in the value chain model of Porter, though such activities are not separately named even within that model (Porter 1984).

In the second half of the nineties a large number of publications appeared about the topic. The quality of these writings spans from popular articles to scientific publications. Editors of periodicals considered the topic so important that they published thematic special issues (California Management Review 40(3), Strategic Management Journal 17(Winter Special Issue), Expert Systems With Applications 13(1), Long Range Planning 30(3) and 33(1)). New periodicals were established, too, that are dedicated to the topic (Knowledge Management, Knowledge Management Review, Journal of Knowledge Management, Journal of Intellectual Capital, Knowledge and Process Management, Knowledge Directions).

Three precursor theories can be identified within the theme of KM: the resource-based approach of company competitiveness, the theory of organisational learning and measuring intellectual capital.

## II.1. Precursor Theories

### *II.1.1. The Resource-based View of Competitiveness*

The underlying cause of competitiveness and the success of companies is one of the basic questions of management research. The objective, according to the rationalist approach, is that the company should consciously build and maintain positions that are necessary to keep and increase its competitiveness. A suitable tool to implement this behaviour is the elaboration of a proper strategy.

According to Andrews, strategy can be interpreted as an art of balancing between the forces of the environment and the capabilities of the firm (Zack 1999a). In the original model both sides are equal which is reflected in the classical SWOT technique of strategic planning (see e.g. Grant 1992).

The investigation of the environment and the inner capabilities, however, did not enjoy the same amount of attention. For a certain time the stress was on the investigation of the environment. A good example of this phenomenon is the "five forces" model (Porter 1985). The basic assumptions behind an approach which focuses on the environment are the following (after Hitt-Ireland-Hoskisson 1995, on the problems of the approach see Bokor 1999)

- Most of the companies possess similar resources and they can choose among similar competition strategies.
- The existing resources are mobile, they can be transferred between companies, therefore there can be only temporary differences in terms of resources.
- From the point of the strategies that lead to the maximal profits, environment has determining power.

Critiques of this approach appeared in the literature from the eighties on. These writings proposed and stressed the need for building on the capabilities, and on how to select and apply those (as a new approach, e.g. Wernerfelt 1984, Prahalad and Hamel 1990, Grant 1991, Peteraf 1993, Collis and Montgomery 1995). The underlying assumptions of the resource-based approach are the following:

- Companies possess different pools of resources even in the same industry.
- It is difficult to transfer a significant amount of resources between companies.

- The main source of competitiveness stems from owning the valuable resources as well as from their more efficient utilisation than that of the competitors'.

Though Machlup devoted a considerable extent of work to the role of knowledge in the economy in the sixties (Machlup 1980), a deeper research on the importance of knowledge started only in the eighties. Viewing knowledge as a resource (Winter 1987, Liebeskind 1996) led directly to resource-based research on competitiveness. Certain authors considered knowledge as (some times the only) resource of competitiveness and this led to the knowledge-based view of the firm, too (Leonard-Barton 1992, Grant 1996, Kogut and Zander 1996, Spender 1996, Tsoukas 1996, Kapás 1998). KM can be investigated on a strategic level (Drew 1999, Hansen, Nohria and Tierney 1999), and we can speak of the concept of knowledge strategy (Zack 1999b) similarly to functional strategies.

Knowledge is considered to be a critical resource one has to manage it, and it is this idea that leads to the area of KM.

### *II.1.2. Organisational Learning*

The creation of organisational knowledge is one of the most important and most frequently investigated questions of KM. Organisational learning is directly connected to the aforementioned topic. Researchers dealing with the creation of organisational knowledge usually build on the research results of organisational learning. There is a huge amount of literature on organisational learning, which can be separated into different mainstreams (a very terse overview is in Argyris 1999:1-15 or Bakacsi 1996:299, more information and overview on organisational learning and its mainstream theories can be found in Lewitt and March 1988, Huber 1991, DiBella, Nevis and Gould 1996, Edmondson and Moingeon 1998, Magelhães 1998, Crossan et al. 1999 and in the thematic issue of Journal of Organizational Change Management 9(1)).

This thesis does not discuss the problems of the creation of knowledge, however, this track cannot be omitted from a literature overview. Two models of creation of knowledge will be shown shortly, first Nonaka's spiral model based on the conversion of knowledge (Nonaka 1994), then a model from Nahapiet and Ghoshal based on the exchange and combination of intellectual capital (Nahapiet and Ghoshal 1998).

### *II.1.3. Measuring Intellectual Capital*

It is a well-known fact that book value and capitalisation of companies on the stock exchange may be very different. This is especially true for companies working in such industries where competitiveness is mainly based on the innovation capability and effectiveness of R&D activities (e.g. pharmaceutical or software industry).

The problem is that it is very difficult or very clumsy to measure the size of the intellectual capital of a company by using classical accounting methods, though these methods work well concerning measurable goods where the mere concept leans itself to be quantified easily. For intellectual capital the first question before measuring is what should be measured at all. Without a precise definition of what to measure one cannot speak of its management, and no controls can be established.

There is a need for more precise, measurable categories (Eccles 1991). A significant number of proposals were made for such categories and in a broader sense concepts for measurable indicators were introduced (Norton and Kaplan 1996, Saint-Onge 1996, Edvinsson and Sullivan 1997, Lank 1997, Sveiby 1997). The basic idea is that if there is a set of measurable indicators then objectives can be drawn up and their fulfilment can be objectively verified. This objective-led approach - as I shall call it - can be directly connected to the resource-based view of the firm. This approach will be shown later on the example of Sveiby's work (see sub-chapter II.3.5).

Nahapiet and Ghoshal utilise the concept of intellectual capital, too. In their work intellectual capital can be identified with knowledge. The focus of their research is the creation of new intellectual capital (creation of new organisational knowledge), therefore I classified their work under the heading of organisational learning.

## II.2. Basic Concepts

As I mentioned in the foreword researchers of a number of different disciplines work on the problems of KM. The interpretation of the basic concepts vary depending on the representative of the certain scientific areas. Data, information, knowledge and KM in general is considered to be basic concepts as well as further related constructs such as competence, skill, organisational memory and knowledge-intensive organisation.

### *II.2.1. The Concept of Knowledge*

Most of the publications in KM, depending on their level quality give a working definition of knowledge, at least the one which is used in that particular article. Usually a definition of data, information and knowledge is given and then these definitions are contrasted. In the case of data and information there are no significantly different views regarding their concepts. The concept of knowledge leads to many more problems as the researcher has to define answers to a number of partly philosophical questions within himself.

Polányi is probably the most often quoted philosopher on the field of KM. According to a well-known quotation from him *"We can know more that we can tell"*. This statement is often illustrated with the example of cycling. The experience and technique of cycling cannot be described by words, it has to be experienced. Polányi likened our knowledge to an iceberg where the explicit, articulable part of our knowledge is above the water level, whereas the remaining part is "tacit". Explicit or codified knowledge can be transferred with the help of a formal, systematised language. However, a significant part of knowledge is hidden, tacit (see Nahapiet and Ghoshal 1988). Polányi investigated whether knowledge can be articulated and formulated and he had the view that this is often not possible. In spite of this, however, knowledge can be transferred.

The approach of interpretation and the meaning of tacit knowledge varies in the literature (comparisons: Venzin, von Krogh and Roos 1998, Hedesstrom and Whitley 2000, individual definitions: Winter 1987, Nonaka 1994, Saint-Onge 1996, Sveiby 1997, Leonard and Sensiper 1998).

A deeper classification of tacit knowledge was also proposed (Snowden 1998b). Snowden was interested in the knowledge used for making a decision in a certain situation. Snowden classified tacit knowledge by the uncertainty of objectives and by the uncertainty of cause and effect. Organisations have to make decisions in different situations according to the previous two factors. The need for tacit knowledge in decision making can be classified as:-

- *intuition*, when both objectives, i.e. cause and effect uncertain;
- *gut feel*, when objectives are uncertain but causes and effects are defined;

- *decision making which can be made explicit within context*. Objectives are clear but there are a number of choices. Business schools prepare their students typically for such situations.;
- *decision making in stable environment* (both objectives and the cause mechanism is stable), where there is very limited need for tacit knowledge during the decision making process.

Tacit knowledge has a personal side to it other others this makes it difficult to formalise and communicate it (Polányi 1966).

Polányi pinpointed the socially constructed nature of knowledge when introduced the notion of *personal knowledge.* Knowledge from the viewpoint of sociology is embedded in the mind of its holder, and it is transferred and at the same time it is created through a learning process (Berger and Luckmann 1991). Finally Polányi considered knowledge both as an object *("knowledge")* and as a process *(knowing)* and he used these two notions interchangeably (Polányi 1966).

A basic question of understanding "knowledge" is what kind of knowledge can be codified, i.e. can be described with the help of a certain tool. Both the transmitter and the receiver of knowledge must possess an understanding of the description tool. The question is in what cases could knowledge be considered codifiable and when should codifiability be rejected owing to the socially embedded nature of knowledge.

A further question is whether a group or organisation could also be considered to be as owner and carrier of knowledge or only individuals can possess knowledge. According to Simon, we can speak of only knowledge of individuals (Simon 1991). Spender and Nonaka, however, views individual and organisational knowledge as separately existing concepts (Nonaka 1994, Hedlund 1994, Spender 1996).

On this basis a researcher has to take a stand on the following points:-

- is knowledge considered to be an objective existing matter or is it socially constructed, also, is transferability of knowledge accepted or rejected?
- is knowledge a static object or is it a process *(knowing),* is it possible to codify it?
- only the existence of individual knowledge is accepted or that of also group or organisational knowledge, too.

These basic assumptions cannot be assessed as „right" or „wrong" – they just reflect the standpoint of the researcher. My own assumptions will be presented in the next chapter.

Venzin, von Krogh and Roos formulated the method of „contextualized theory building" (based on the previous works of von Krogh, Roos, and Varela). Before posing a research question one must collect the most important issues of the research area. Then there should be *one* concept selected from among the possible interpretations of the basic assumptions to be used, this will be the underlying basis of the research. This basis should be compared to the most important questions and concepts of the investigated area as well as to its applications. This process is called *retrofitting* (Venzin, von Krogh and Roos 1998).

Venzin, von Krogh and Roos illustrated the usage of their method on the topic of KM, and in this way they provided an overview of the KM literature. They identified six main critical issues in KM:-

- **Knowledge implies sustainable, heterogeneous resource distribution.** This leads to value knowledge and viewing KM as a resource of strategic importance due to the resource-based approach of corporate competitiveness. Consequently, a basic question is how to measure and quantify knowledge. From a strategic management point of view further questions arise such what sustainability of knowledge means; who the owner of these resources is; how and how quickly one can have access to such resources.
- **Knowledge changes the nature of resource investment decisions.** As the importance of knowledge is increasing it will be a new factor to be taken into consideration at decisions.
- **Path dependency in the knowledge economy increases**. The past activities and decisions of a company influence the possible ways of future development to a great extent and they also constraint the company. It is very hard to get significantly new resources in the knowledge based economy. Excellence in a certain field can also hinder further development.
- **Knowledge triggers positive feedback loops rather than negative ones.** The more knowledge someone possess the faster his knowledge can develop. The nature of knowledge differs from traditional commodities: it remains with the transmitter after

sharing or transmission, moreover the transmitter can benefit from the experiences gained during the transfer.

- **Knowledge changes the nature of work and property.** In the post-industrial society traditional tools are partially replaced with knowledge and services. Property is distributed and it is not identical with the possession of objects, it is increasingly intangible and invisible instead (Stehr 1994). Individual knowledge is embedded into the knowledge of the company. If knowledge is really one of the most important resources then only those companies will be attractive for employees that offer such a job that will increase their value on the job market.
- **Knowledge emphasises the social context.** The meaning of knowledge is changing. The individual can use several different sources when an event is to be interpreted, therefore knowledge loses its universal characteristic, it can be interpreted in a variety of ways. As a consequence the circle of problems for which there is a „single" and „best" solution gets narrower. The interpretation of the individual and the group on an event will develop over time and it is in close connection with the previous experiences.

Based on the underlying assumptions the cognitivistic, connectionist and autopoietic approaches can be differentiated as different epistemological views. Differences among these views are summarised in the next table (based on Venzin et al. 1998)

| | Cognitivistic | Connectionist | Autopoietic |
|---|---|---|---|
| **View of organisation** | An organisation is like a computer. It is open for information that is collected and stored centrally. Action is steered by top management. | The organisation consists of individuals who are connected mostly through information technology. Action is self-organised and steered by local rules that refer to several frames of reference. | The organisation is an autonomous and observing system that is simultaneously open for data but closed for information. It is a group of individuals who have created an emergent frame of reference. |
| **Perception of environment** | The environment is pregiven. The task of the organisation is to represent it and to adapt to it. | Clusters of the organisational network produce different pictures of the pre-given world that form the basis for a differentiated adaptation. | The world is brought forth in conversations. The environment and organisation are coevolving systems. |
| **Notion of knowledge** | Knowledge is a fixed and representable entity (data) that can be stored in computers, manuals. Knowledge can be transferred easily to the members of the organisation. | Knowledge resides in the connections of experts and is problem-solution oriented. Knowledge is dependent on the state of the of interconnected components. | Knowledge resides in the mind, body and the social system. It is observer- and history-dependent, context-sensitive and is not directly shared only indirectly through discussions. |
| **Knowledge development** | Knowledge develops through the assimilation and dissemination of incoming information. Inner representations that partly or fully correspond to the outer world are created. | Local rules in a network of individuals determine how knowledge is accumulated. | The process of interpreting incoming data in conversations is the cornerstone in knowledge development. |
| **Characteristics of truth** | Truth is the degree to which our inner representations correspond to the world outside. | Different experts who have accumulated information about parts of the objective reality bargain about the truth. | There is no objective reality, different standpoints are possible. Reality is socially created. |

*Table 2. Epistemological approaches (Venzin, von Krogh and Roos 1998)*

Venzin, von Krogh and Roos compare the aforementioned views with the six main issues of KM. A question is relevant or irrelevant according to the used view.

They investigate the notion of "tacit knowledge" amongst the relevant concepts in KM and Collins' classification (see later, Collins 1993 and Blackler 1995). The transfer of tacit knowledge is examined as an application of KM.

Venzin, von Krogh and Roos conclude that before starting a KM investigation the researcher has to choose one of the views. No view has precedence over another one. This is acknowledged by Spender, too (Spender 1996:48). The concepts under scrutiny should be fit into the selected view and their meaning should be consistently applied.

For example Nonaka utilised Polányi's work when he created his theory of dynamic knowledge creation (Nonaka 1994).

Similarly to the previous train of thought Comas and Jordi pointed out how important the underlying assumptions are in a KM research (Comas and Jordi 2001). They separated three research paradigms after Orlikowski and Baroudi: positivism, interpretativism and critical theory. The characteristics of these directions are:

| | **Positivism** | **Interpretativism** | **Critical theory** |
|---|---|---|---|
| **Epistemology** | Objective<br>Dualistic<br>Finding fundamental laws /true probably or true | Subjectivist<br>Pluralist<br>Transactional created findings | Subjectivist<br>Transactional<br>Value-mediated findings |
| **Ontology** | Realist/nonothetic (shared) meaning system<br>Naive<br>Critical | Relativism<br>Unique meaning system | Realist - mediated interest structures<br>Historical |
| **Methodology** | Experimental<br>Verification or falsification of hypotheses<br>Mainly quantitative analysis | Hermeneutical / dialectical<br>Mostly qualitative methods | Dialogic/dialectical<br>Action research |

*Table 3. Characteristics of research paradigms (Comas and Jordi 2001)*

According to practice-oriented authors there is no need for academic steps which strive for precision. Snowden says it is not too fruitful to have a precise definition of knowledge, however, it is important is to define the management of knowledge (Snowden 1998a). In Drew's opinion philosophy and too high degree of abstraction are to be avoided in the practice (Drew 1999).

### *II.2.2. Dimensions of Knowledge*

It is common to use several dimensions for characterisation of knowledge which is, after all, a classification, categorisation of knowledge based on different viewpoints. Most of these categorisations - with the exception of Blackler's - deal with knowledge as an object. Blackler, however, proposes to investigate knowledge as a process (Blackler 1995). The categorisations are mainly dichotomies, but there are taxonomies, too (Wiig 1993).

Winter used the term "taxonomic dimensions" by which he meant pairs of concepts according to which knowledge can be classified. He mentions the following "continua" (Winter 1987):-

- **Tacit – articulable.** "Tacit" means for Winter that the owner of the knowledge cannot provide a useful explanation of the rules followed by himself in the course of actions. On the contrary, articulable means that it can be communicated from its owner to another person in symbolic form, and the recipient of the communication becomes as much "in the know" as the originator. Knowledge possessed by an organisation may be tacit in the sense, first, that possession arises from the association with the organisation of an individual for whom the knowledge in question is tacit. Second, organisational knowledge is tacit to the extent that its top decisionmakers are uninformed regarding the details of what happens when their decisions are implemented.
- **Not teachable – teachable.** According to Winter, it is a "subdimension" of the tacit-articulable dimension, saying that we can speak of certain tacit skills that may be teachable but not articulable.
- **Not articulated – articulated.** The second subdimension of the tacit-articulable continua where one may know about a phenomenon but the process of the development of this phenomenon is not known.
- **Observable - not observable** refers to the extent of disclosure of underlying knowledge that is necessitated by uses of the knowledge.
- **Complex – simple.** This dimension has to do with the amount of information required to characterise the item or knowledge in question.
- **An element of a system – independent.** This is similar to the complex-simple dimension.

A dimension is meaningful or unnecessary for a researcher according to his epistemological assumptions. For example, tacit knowledge is uninteresting for a cognitivist researcher, as for him knowledge can always be codified. For an autopoietic researcher, however, articulated knowledge is meaningless (Venzin, von Krogh and Roos 1998).

Wiig defines five dimensions of knowledge. For each dimension he gives an ordered sequence of levels that are the following (Wiig 1993:75):-

- the dimension of conceptual knowledge level, ranging from *"automatic knowledge"* to *"goal setting idealistic knowledge"*,

- the dimension of manifestation which runs through the chain of knowledge, expertise, skill up to a codified knowledge (this justifies to classify Wiig's work in the technology-focused school),
- the information dimension ranging from *"pathways"* to *"wisdom"*,
- the knowledge detail dimension ranging from "*knowledge atom"* to *"knowledge domain"*, and the
- proficiency dimension ranging from *"beginner"* to *"grandmaster"*.

see the next figure.

The level of proficiency is extremely important from the point of knowledge transfer. Transfer between different levels of proficiency requires different techniques and methods.

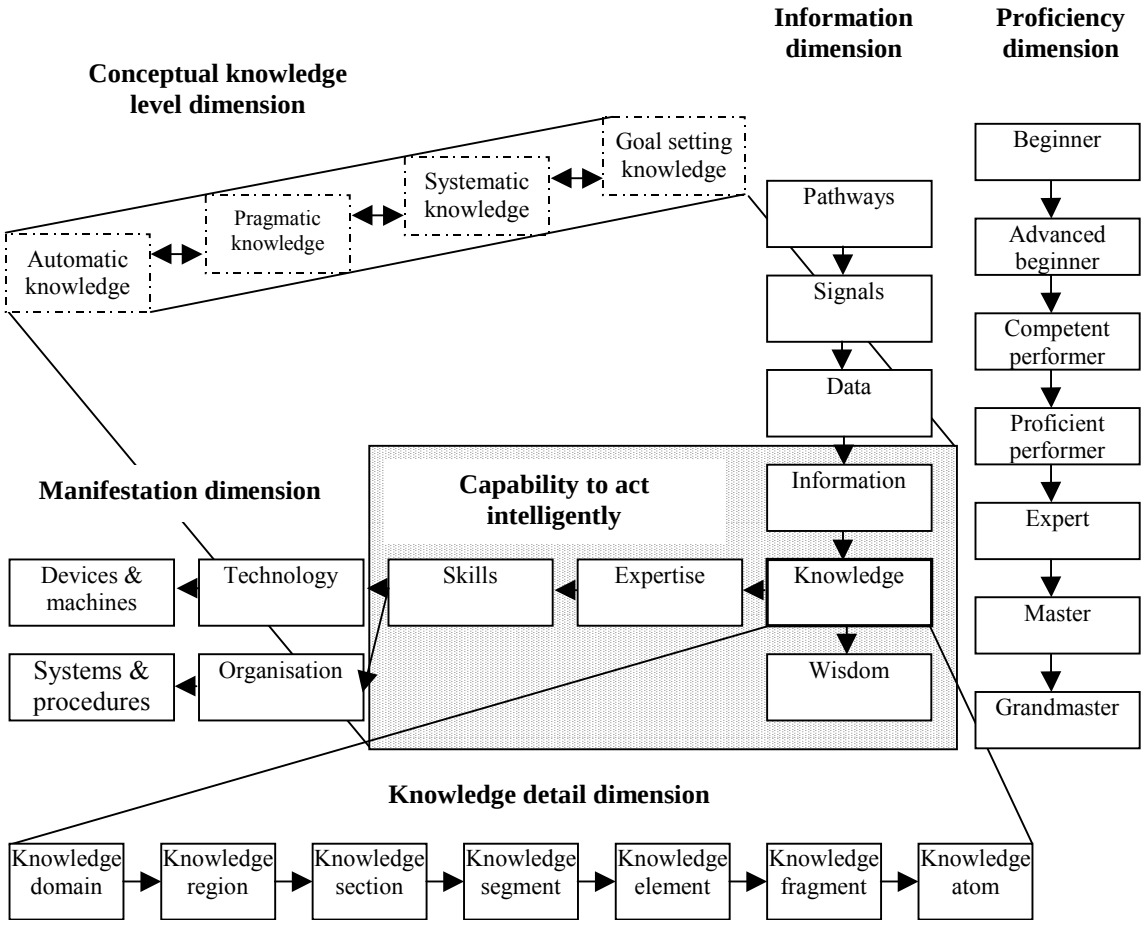


*Figure 1. Dimensions of knowledge (Wiig 1993)*

Quinn, Anderson and Finkelstein differentiated among the following projections (Quinn et al. 1996, see the orientation of knowledge Bokor 1999)

- cognitive knowledge *(know-what)*, that is the basic mastery of a discipline that professionals have (e.g. knowledge of dates in history),
- advanced skills *(know-how)*, that translates "book learning" into effective execution (see Kogut and Zander 1992),
- systems understanding *(know-why)*, which is a deep knowledge of the web of cause-and-effect relationships underlying a discipline (e.g. when a fuse has blown the knowledge of the concept of overload and maybe reasons for overload),
- self-motivated creativity *(care-why)*, when the owner of the knowledge strives for the continuos change and adaptation of his knowledge.

During his investigation of knowledge transfer Collins distinguished among four types of knowledge (Collins 1993). He started his idea with two accounts:

- The first example is from a comic strip. A firm appears on the market with expert systems of high effectiveness, which is not understandable for the competitors. The firm built its expert systems by capturing human experts, removing their brains, slicing them very thin and inserting the slices into their machine. Capturing a spy they also made money: they removed and sliced his brain enabling them to offer a line of industrial espionage experts systems.
- The second example is from a TV series. Here transfer of knowledge was done via electrical signals from one brain to another, in the example the knowledge of a tennis player was passed to a Vietnam veteran.

The investigation of these previous two - obviously fictional - examples led Collins to the following classification:

- there is *encoded* knowledge where knowledge can be transferred simply by passing signals. As a typical example Collins refers to the example of knowledge transfer by connecting computers;
- there is *embodied* knowledge. In Collins' example if all thoughts of a professional tennis player would be transmitted to a Vietnam veteran then "tennis knowledge"

would still not be transferred - the hand of the veteran cannot cope with the first serve. This type of knowledge is *action-oriented* (Blackler 1995);

- there is *embrained* knowledge, which is to do with physicalness of the brain and cognitive abilities, and
- there is *encultured* knowledge which is connected with the environment, with the shared, common understanding. In the example of the tennis player the Vietnam veteran would not be able to play with a graphite racket as that was not part of knowledge at that times (this type of racket needs a different playing style). Knowledge depends on culture.

Blackler extended the aforementioned four types with a fifth one called *embedded* knowledge that can be found in *systemic routines* (Blackler 1995). Blackler in his critical writing argued for such an investigation of knowledge where attention is drawn to the process during which knowledge and related actions are formed. He believes that the adequate questions are targeted at the changes in the knowledge creating and action systems. Knowledge as a process is proposed to be investigated from the following viewpoints:-

- knowing as mediated,
- knowing as situated,
- knowing as provisional and
- knowing as pragmatic.

I am going to use Collins's and Blackler's classification as well as Blackler's proposals of the investigation of knowing in the characterisation of the knowledge elements found during the knowledge mapping process.

Boisot describes knowledge from the learning side with help the of the I-space *(information space).* The I-space can be characterised from three dimensions:

- codified - uncodified,
- undiffused – diffused and
- concrete - abstract.

Boisot calls his own KM activity model *social learning cycle (SLC),* and illustrates it as a movement in the I-space.

### *II.2.3. The Knowledge-intensive Organisation*

The concept of knowledge-intensive organisation was raised parallel with the research on the role of knowledge in organisations. Economists used to classify companies as capital-intensive and labour- intensive which reflects the relative importance of goods needed for production. By analogy a knowledge-intensive firm (KIF) is such a company where knowledge has more importance than inputs for production (Starbuck 1992).

The concept of knowledge can interpreted in a variety of ways therefore the definition of the KIF is ambiguous. Some authors claim that a basic feature of a KIF is to be able to handle complex problems with creative and innovative solutions, others point out the importance of expertise (Alvesson 2000). There were attempts to operationalise the concept with the help of the proportion of professionals in the firm. It is believed that KIFS typically operate with social norms as opposed to hierarchical controls. KIFs select their experts after a long recruiting process and support their professional development (Starbuck 1992).

Starbuck points out the following based on empirical evidence (Starbuck 1992):

- A KIF may not be information-intensive. Knowledge is a stock of expertise and it is not a flow of information. Thus, knowledge relates to information similarly to the way that assets relate to income. There are firms that process a large amount of information, however, they are not knowledge-intensive, e.g. payroll check processing companies.
- When deciding whether a firm is knowledge-intensive, one ought to weight its emphasis on esoteric expertise instead of widely shared knowledge.
- The term "expertise" can be defined in a variety of ways. One can define expertise broadly recognising many people as experts and investigate how the human expertise is utilised in production. The other way is to count only highly qualified people as professionals and put the emphasis on the practice different from the daily routines.
- A KIF may not be a professional firm. The characteristics of professional firms is the existence of an ethical codex, a high level of cohesion, collegial enforcement of standards and autonomy. Management consultancy or software development is not a professional activity in the previous sense though they require special - often scarce - expertise.

- KIF's knowledge may not be in individual people but on can find it in routines, company culture and in further forms, too.

Starbuck thinks that a KIF exists in symbiosis with its environment. For example, KIFs in the service industry can be often seen as a mirrored reflection of their customers.

Alvesson notes that the concepts of knowledge-intensive work and knowledge worker are closely connected to the concept of KIF. A knowledge worker rarely works by instructions of a scientific methodology. According to Alvesson we can better understand the concept of knowledge if we consider it as a social process rather than a functional resource.

The objective assessment of the results of knowledge-intensive work is often difficult, for example who can decide whether the quality of an audit is acceptable or not. Therefore Alvesson considers *ambiguity* as the general characteristic of KIFs, and due this to ambiguity those abilities play central role that deal with rhetoric, regulate images and manage relationship in interactions with clients. We can speak of "intensity" in the context of these abilities. This way Alvesson detaches himself from considering knowledge as an input resource.

Sveiby is one of the earliest researcher of KIFs, he has investigated the topic since the beginning of the eighties. In his later works he describes the following principles for the knowledge organisation (Sveiby calls knowledge organisation a KIF) in the knowledge paradigm as opposed to the industrial paradigm (next table, Sveiby 1998:27).

Sveiby describes the results and concomitants by indicators and does not deal with knowing (knowledge as a process).

Using the idea of knowledge brokership is another possibility to understand KIFs. Knowledge brokership can be defined interpreted on the level of individuals within a company (Davenport 1997:79) and also on the level of the company itself. Hargadon calls such companies "knowledge brokers" that work in different markets with different technologies at the same time and apply knowledge of one business area in another one. In other words, these are the companies whose strategy is continuous innovation.

| | Industrial paradigm | Knowledge paradigm |
|---|---|---|
| **People** | Cost generators or resources | Revenue generators |
| **Manager's power base** | Relative level in organisation's hierarchy | Relative level of knowledge |
| **Power struggle** | Physical labourers versus capitalists | Knowledge workers versus managers |
| **Main task of management** | Supervising subordinates | Supporting colleagues. |
| **Information** | Control instrument | Tool for communication, resource |
| **Production** | Physical labourers processing physical resources to create tangible products | Knowledge workers converting knowledge into intangible structures |
| **Information flow** | Via organisational hierarchy | Vial collegial networks |
| **Primary form of revenues** | Tangible (money) | Intangible (learning, new ideas, new customers, R&D) |
| **Production bottleneck** | Financial capital and human skills | Time and knowledge |
| **Manifestation of production** | Tangible products (hardware) | Intangible structures (concepts and software) |
| **Production flow** | Machine-driven, sequential | Idea-driven, chaotic |
| **Effect of size** | Economy of scale in production process | Economy of scope of networks |
| **Customer relations** | One way via markets | Interactive via personal networks |
| **Knowledge** | A tool or resource among others | Th focus of business |
| **Purpose of learning** | Application of new tools | Creation of new assets |
| **Stock market values** | Driven by tangible assets | Driven by intangible assets |
| **Economy** | Of diminishing returns | Of both increasing and diminishing returns |

*Table 4. The principles of the knowledge organisation (Sveiby 1997)*

Hargadon identified the following four activities of knowledge-broker companies on the basis of the examples of eight large companies (Hargadon 1998):

- *Access*, the company can have access to several technologies and gets in position to broker valuable knowledge from industries where it is known to where it is not.
- *Learning*, while solving the problems it piles up knowledge. This creates an inventory of potentially valuable ideas with "requisite variety" typically broader than held by any other firm working within the same industry.
- *Linking,* enable development teams facing a problem in one industry to recognise its similarity to other problems - and their solutions in another one, maybe combine solution techniques.

- *Implementing,* turns innovative concepts from outside industries into real products or processes, and during the implementation it gains more experience and knowledge.

Knowledge-broker firms have a certain, determining company culture that enables continuous innovation. Hargadon advises four tactics to enable innovation through knowledge brokering: (i) explore new territories, (ii) learn something about everything, (iii) find hidden connections and (iv) *"make the damn thing work"*.

According to Nurmi a common feature of KIFs is that they sell knowledge, know-how. During selling the knowledge of both partners will increase as both learn. Comparing knowledge workers with blue-collar workers he notes that formal and informal *professional relations* are more important for knowledge workers than the company they are working for. For this reason the question of motivation come to the limelight.

The work of KIFs is very different from that of the industrial age. To count finished products or to measure the elapsed time for production is meaningless. Creativity is important and automation is not, working smarter is more important than working harder. Quality is intrinsic to the work of the knowledge worker, in fact quality is more important than quantity. The source of competitiveness of a KIF is differentiating and not price-efficiency. Nurmi thinks that a hierarchic, bureaucratic organisation does not fit to a KIF. The KIF organisation is more flexible, ad-hoc and changes continuously therefore it inherently has conflicts among employees. Conflicts, paired with proper management, can support creativity.

The role of management is not same as in the case of the traditional company. The actual customer is usually more important for a knowledge worker than his direct manager. Managers play the role of knowledge-broker inside a KIF a well as between the KIF and its customers. Their important task is to manage internal conflicts and to create a proper, supporting atmosphere for work.

The products of the KIFs have a short life-cycle. The strategy of a KIF is in the brain of its members, or it might be written down but it will be outdated by that time. The strategy is a result of the knowledge accumulated during selling the knowledge of the KIF (Nurmi 1999).

### *II.2.4. Further Concepts*

There are several more concepts related to knowledge, listed and summarised in the next table

| **Concept** | **Description** | **Researcher** |
|---|---|---|
| Intellectual capital | Value in the company, cannot be revealed by traditional accounting tools. | Edvinsson, Sveiby, Saint-Onge, Norton and Kaplan |
| Intangible resources | Transferable intellectual capital. The owner can be a legal entity. | |
| Knowledge as an asset | An approach to interpret knowledge | Boisot |
| Organisational memory | Memorising ability of the organisation (anthropomorphism) | Walsh and Ungson |
| Adsorbing capacity | The capability of the company to accommodate new knowledge. | Argyris |
| Core competence | A business area with a strong competitive capability | Prahalad and Hamel, Leonard-Barton |
| Skill | Knowledge can be divided into levels of competency, transfer between these is the question. | Allee, Huang |
| Intellect | Approaching knowledge by focusing on people. | Quinn |

*Table 5. Theoretical concepts related to knowledge*

### *II.2.5. Typologies of Researchers and Research Directions*

As the number of KM articles grew surveys of literature appeared that have mainly a critical attitude (Ponelis and Fairrer-Wessels 1998, McAdam and McCreedy 1999, Lai and Chu 2000). These reviews usually focus on one part of the literature according to the area of interest of the author. There is one exception to that, the writing of Despres and Chauvel which is by far the most ambitious and thorough survey of the literature I am aware of (Despres and Chauvel, 2000).

Having noticed the difference amongst the questions posed under the umbrella of KM they had the objective to provide a thematic analysis. Their working method was:

- they searched the ABI/INFORM database for the terms „intellectual capital" or „knowledge management" with „model" or „taxonomy" or „classification" or „typology". The first result of the query was narrowed and it yielded 72 titles of interest.
- These titles were reviewed by their conceptual models. The assumption of the authors was that these models represent views in the community well.

The authors pointed out a limitation of their research that saying the analysis dealt with published, written documents and did not take into consideration the practice of consulting companies. The analysis, however, is based on structural models and classification systems and it ignores literary text treatment.

Despres and Chauvel mentioned the works of the following authors in their review (topics are mentioned in brackets): Nonaka (SECI model, see later); Hedlund (N-form organisation); Earl (*Chief Knowledge Officer*, CKO concept); Carayannis (organisational knowledge network, OK Network); Wiig (three „pillars" of KM); Edvinsson (concept of intellectual capital); Van Buren (management of intellectual capital); Snowden (KM ecology); Inkpen and Dinur (KM processes) and Despres and Chauvel (supporting KM in practice).

On the basis of these authors they identified seven recurring themes that are used and investigated by the scientific community. These were classified as primary and secondary structuring devices. Primary structuring devices are used frequently and have relatively stable definitions. Secondary devices are used often with different meanings by the authors of the review.

| | | |
|---|---|---|
| *Primary structuring devices* | Time<br>Types, Forms, Embodiments<br>Social Space | Greater commonality ↑ |
| *Secondary structuring devices* | Context<br>Transformation and Dynamics<br>Carriers and Media<br>Knowledge Culture | |

*Table 6. Themes in the KM community(Despres and Chauvel 2000)*

The meaning of these devices are the following:

- Types, forms, embodiments classification of knowledge of some sort is one of the central questions.
- Social space. A significant portion of the authors investigate the knowledge phenomena in different social and group levels, as individual, group and organisation level knowledge
- Context. Nothing has any meaning outside its context.

- Transformation and dynamics. Knowledge without transfer and usage has no value, therefore these processes are investigated.
- Carriers and media. It I concerned with the discussion of those devices that support the transfer process of knowledge.
- Knowledge culture. A number of the authors draw the attention to the fact that the environment or the ecology of the knowledge phenomena is more important than knowledge itself.

Some reviews believe to have found paradigmatic differences (Kuhn 1984) connected to KM. McAdam and McCreedy reviewed the literature from the point of a new paradigm of organisation theory and practice (Clegg et al. 1996), considering the concept of kuhnian paradigm unambiguous (McAdam and McCreedy 1999). By contrasting the old and new paradigm they want to point out differences in the underlying assumptions of KM researchers.

On this basis they separate three KM schools:

- one which deals with knowledge category models, where the model categorises knowledge into discrete elements (Nonaka, Hedlund, Boisot)
- one which deals with intellectual capital models (Sveiby, Chase) and
- one which deals with socially constructed models of KM (Demarest).

Sveiby classifies researchers into four groups on the basis whether they investigate knowledge as an object or as a process and whether they do it on individual or organisational level (Sveiby 2000).

| | **Object** | **Process** |
|---|---|---|
| **Organisation** | Re-engineers | Organisation theorists |
| **Individual** | Artificial intelligence researchers | Psychologists |

*Table 7 .A typology of knowledge management researchers (Sveiby 2000)*

Sveiby notes that researchers in different groups use different language, also they use concepts with the same name but divergent meaning which leads to misunderstandings.

At the same time articles appeared projecting the research directions in KM (Wiig 1997, Skyrme and Amidon 1998, Teece 1998, Venzin et al. 1998, Holtshouse 1998). At the selection of the research question the worldview of the researcher i significant, that is

what his view of basic concepts (knowledge and its creation, organisation, environment, truth) is from epistemological standpoints. That is why the selection of underlying assumptions should be a conscious and not an accidental act.

## II.3. Different Approaches in Knowledge Management

We have seen that KM literature can be classified in different ways. In the following sections I review the literature according to their focus of the investigated questions.

### *II.3.1. The Learning Focused Approach*

#### *Creation of knowledge by knowledge conversion*

Nonaka's dynamic theory on organisational knowledge creation is one of the most influential ideas in the KM literature. Nonaka defines knowledge as „justified true belief" after Platon. When he elaborates this definition he contrasts the static, absolute, independent from human view concept of knowledge with his dynamic one, based on personal beliefs (Nonaka 1994).

Nonaka, using Polányi's ideas, distinguishes between tacit and explicit knowledge. He suggests that the new knowledge is a result of the conversion processes between tacit and explicit knowledge. He distinguishes four ways of knowledge transfer on the basis of the conversion between the tacit-explicit dimensions:

| | **To tacit** | **To explicit** |
|---|---|---|
| **From tacit** | Socialization | Externalization |
| **From explicit** | Internalization | Combination |

*Table 8. Knowledge conversion modes (Nonaka 1994)*

New knowledge is created when knowledge conversion occurs in a continuous cycle, in the sequence of socialising-externalising-combining and again socialisation (this called as the SECI model). This process is illustrated on the next figure:

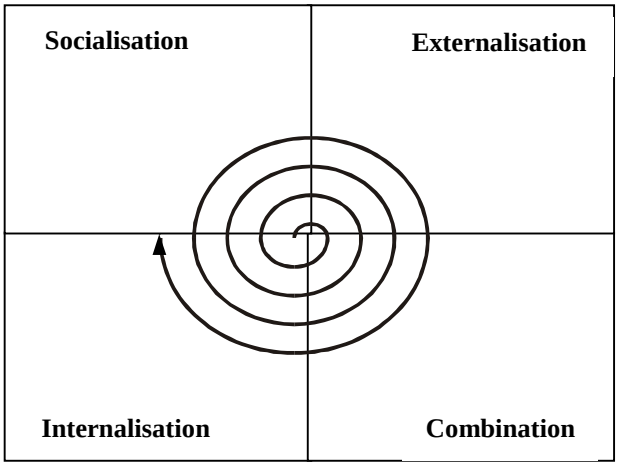


*Figure 2. Knowledge spiral (Nonaka 1994)*

This model does not show that the organisational knowledge is developed through individual, group, organisational and inter-organisational conversion steps. Nonaka calls the level of social interaction *„ontological dimension"*, the tacit-explicit dichotomy *„epistemological dimension"*. In these two dimensions the creation of organisational knowledge can be illustrated as the following figure:

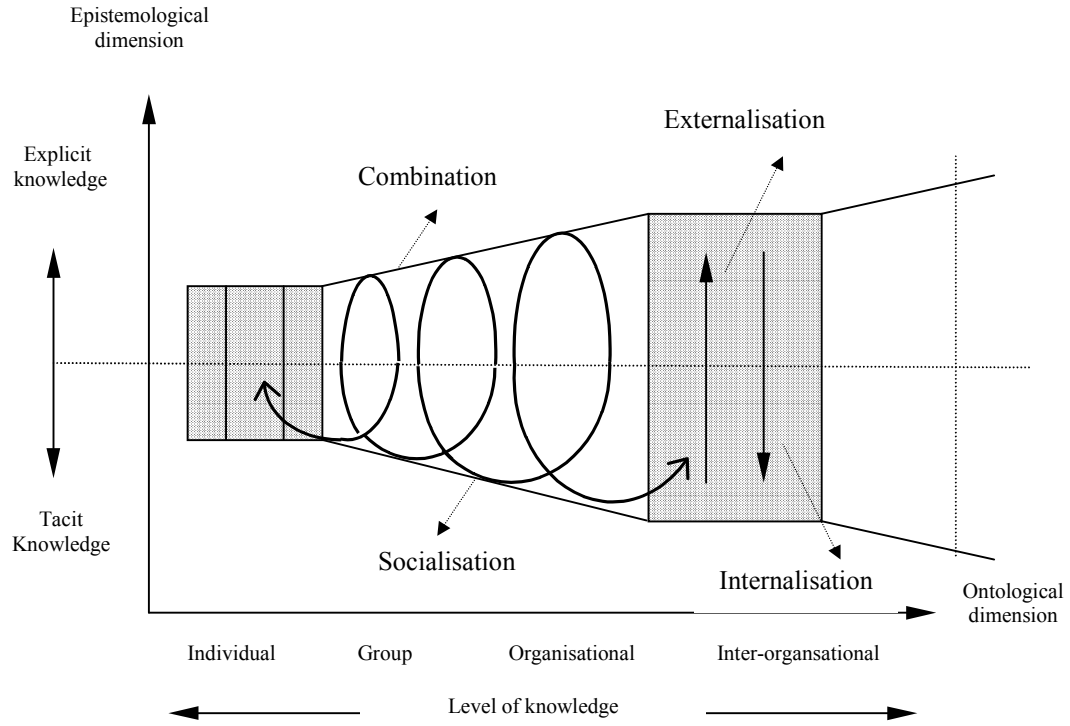


*Figure 3. Spiral of organisational knowledge creation (Nonaka 1994)*

Nonaka sketched a sequential model with feedback of organisational knowledge creation, too (1994:21-27), and he developed it further in his later works (Nonaka 1995:83). This process is quasi-sequential, steps are closely interdependent. In this process the concept of organisational tacit knowledge also appears. On this occasion he deals with the enabling factors of the process, too (see II.4).

From the point of the knowledge creating process Nonaka investigates - on the basis of his previous works - three models: (i) top-down, (ii) bottom-up and (iii) middle-up-down management styles. In his later work he also illustrates his idea with examples (Nonaka and Takeuchi 1995). He claims that middle managers synthesise the tacit knowledge of top management and frontline employees, and therefore they are the true *"knowledge engineers"* of the company (Nonaka 1994:32).

Nonaka investigates the creation of knowledge also from the point of organisational form and proposes to use the "hypertext" organisational form. In such an organisation knowledge creation is carried out by self-organising teams as opposed to the hierarchical form. The hypertext organisation combines the efficiency and capability of a hierarchical bureaucratic organisation with the dynamism of the flat, cross-functional task-force organisation. Nonaka and Takeuchi show a concrete example for this form in their later writing (Nonaka and Takeuchi 1995:179).

On the basis of Nonaka' ideas Hedlund proposed an organisational form applicable for KM (Hedlund 1994). Hedlund gave the next description of forms and types of knowledge on the basis of articulated-tacit knowledge and levels of knowledge carriers:

| | **Individual** | **Group** | **Organisation** | **Inter-organisation** |
|---|---|---|---|---|
| **Articulated knowledge/ information** | Knowing calculus | Quality circle's documented analysis of performance | Organisation chart | Suppliers' patients and documented practice |
| **Tacit knowledge/ information** | Cross-cultural negotiation skills | Team co-ordination in complex work | Corporate culture | Customers' attitudes to products and expectations |

*Table 9. Knowledge categories and transformation processes (Hedlund 1994)*

Hedlund assumed that both articulated and tacit knowledge appear in cognitive, skills and embedded form. He distinguished among the following set of concepts:

- Articulation and internalization, whose interaction of which is termed reflection.,
- extension and appropriation together constituting dialogue,

- assimilation and dissemination.

On this basis he proposed the model shown in Figure 4. He investigated the model on the example of Japanese companies and defined the N-form (N stands for novelty) organisation. In the N-form organisation technological interdependence is handled by combination rather than by division, people form temporary constellations which are continuously changing, primary focus is on employees on middle levels, communication is lateral and top management is a catalyst of communication.

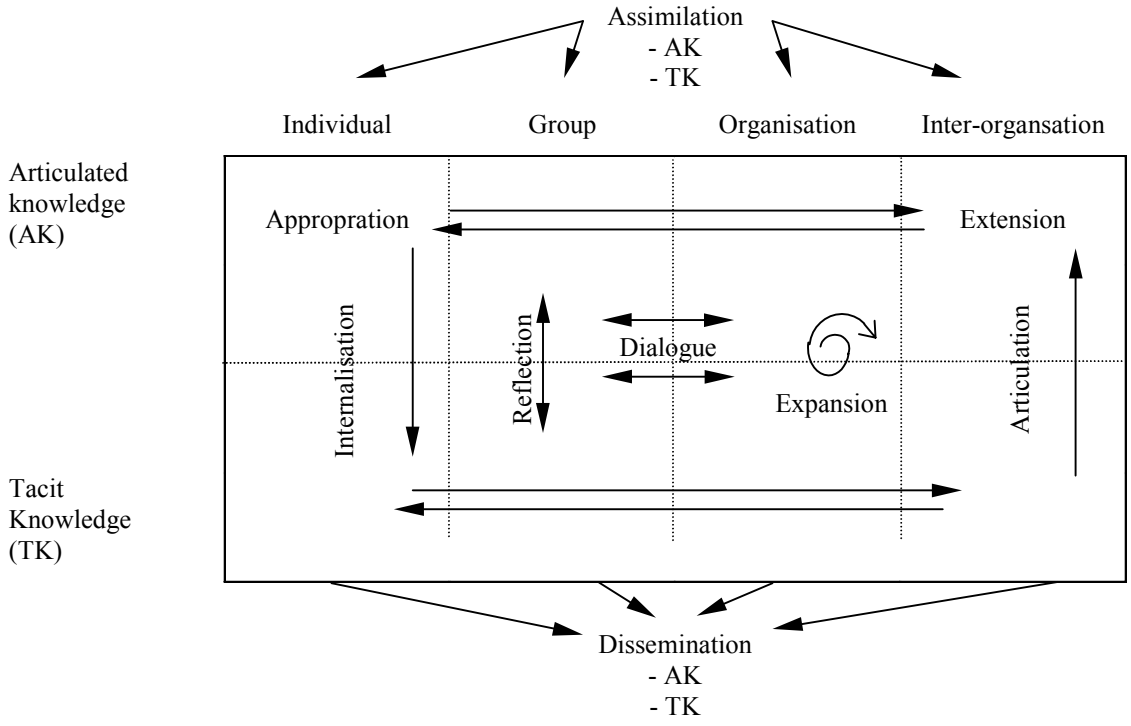


*Figure 4. Types of transfer and transformation (Hedlund 1994)*

### *Creation of intellectual capital by combination and exchange*

Nahapiet and Ghoshal investigated the creation of new intellectual capital. They defined intellectual capital as the knowledge and knowing capability of a social collectivity (Nahapiet and Ghoshal 1998:245). They justify this terminology because it is parallel with the concept which considers human resource as a form of capital. They divided the intellectual capital of a company into four classes according to the dimensions of tacit-explicit knowledge and individual-social knowledge (Spender 1996:52):

| | **Individual** | **Social** |
|---|---|---|
| **Tacit** | Automatic | Collective |
| **Explicit** | Conscious | Objectified |

*Table 10. Different types of organisational knowledge (Spender 1996)*

Spender, after the works of Durkheim, interprets social or collective knowledge as the knowledge of a group. Nahapiet and Ghoshal (using Schumpeter's ideas) viewed intellectual capital as a resource and name the general processes of combination and exchange that create it. They note carefully, however, that this claim has to be verified yet and there might be other processes that lead to the creation of new knowledge. In this context combination means the gradual change and development of the current knowledge, as well as the radical change in knowledge. A precondition for knowledge combination is its exchange.

In the definition of combination Nahapiet and Ghoshal build on the concept of „combinative capability" that was used by Kogut and Zander for describing the process growth of the firm's knowledge. Kogut and Zander mean ass combinative capability *„…the intersection of the capability of the firm to exploit its knowledge and the unexplored potential of the technology"* (Kogut and Zander 1992:391).

Nahapiet and Ghoshal used the term *social capital* in their model. By their definition social capital is the sum of the actual and potential resources embedded within available through and derived from the network of relationships possessed by any individual or social unit (Nahapiet and Ghoshal 1998:243). According to the theory of social capital the networks of relationships function as important resources for their members (Bourdieu 1986). Social capital is divided into structural, cognitive and relational dimensions which are in turn sub-divided into further factors.

Nahapiet and Ghoshal argue that

- social capital helps the creation of new intellectual capital,
- organisations as institutional settings are conductive to the development of social capital,
- the co-evolution of social and intellectual capital underpins organisational advantage.

### *II.3.2. The Process Focused Approach*

Several authors tried to break the process of KM into parts. This task differs from the usual description of activities, as activities of a company have not been called as „KM activities" so far, therefore one cannot speak of existing activities. It is problematic to define what we want to describe (Angus and Patel 1997). This is particularly true if one considers knowledge as a socially constructed object.

One of the theoretical sources of these approaches is the value chain of Porter (Porter 1984). This model is used as an analogy in Weggeman's model (Weggeman 1998). (Porter's influence can be caught in the fact that authors often use arrow-shaped boxes for the names of activities in their models).

A common feature of these models is that they describe the life of one knowledge element. That is the reason why KM models are sequential in time, usually starting from identification and ending with disposal of a knowledge element, see for example the seven-step model of Schreiber et al. (1998).

Before presenting his own four-step model Davenport mentions three further models and he draws the attention to the fact that a concrete model is always dependent on the interests, problems and business activities of the applying company. This opinion, i.e. the model is embedded in the context of the company, is in fact the acknowledgement of the socially constructed nature of knowledge. Davenport calls his model „information management model", for him KM and information management cover the same issue (Davenport 1997).

All these model have a weak point due to their sequentiality. Feedback is necessary by all means, and authors usually mention the need for this. (Nonaka's activity model of organisational knowledge creation incorporates feedback). The model of Angus and Patel avoid this problem as they do not use the tool of arrow-shaped boxes (Angus and Patel 1997). Probably the best way to avoid this trap can be found in the model of Schüppel, Müller-Stewens and Gomez which is organised into „dimensions" and there are no indications of time dependencies (Schüppel, Müller-Stewens and Gomez 1998).

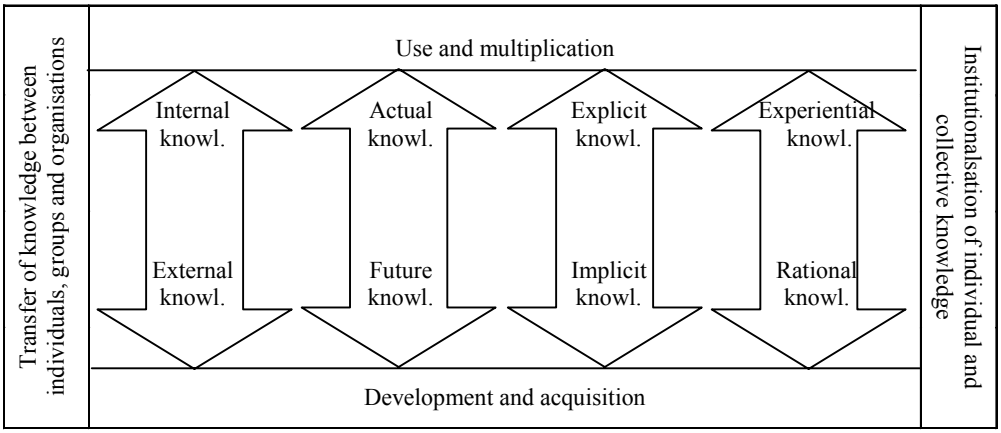


*Figure 5. Four bipolar dimensions for forming KM (Schüppel et al. 1998)*

Lai and Chu proposed an integrated activity KM model having reviewed writings of a dozen authors (Lai and Chu 2000, they show some negligence in reviewing Nonaka's model, too, which is a model of organisational *„dos and do not dos"* creation and not a KM model). In the second row of the table there are the activities of the integrated model that are projected onto the activities of the different models of the authors.

Lai and Chu argue for their model on the basis of previously published case studies.

Another source of the process-focused approach is the quality movement. The best tools of knowledge creation, according to Allee, are the following: total quality management, leverage and the practice of learning organisation where there is an emphasis on systems thinking. Allee thinks that these three tools have a lot of similarity. Existence of a total quality management system in a company increases the interest in learning and strengthens the willingness to share knowledge (Allee 1997).

| | **Activities** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Lai and Chu** | Initiation | Generation | Modelling | Repository | Distribution & transfer | Use | Retrospect |
| **Wiig (1993)** | Exploring knowledge | | Governing knowledge | | | | Appraise and evaluate |
| **Leonard-Barton (1995)** | | Shared & creative problem solving<br>Importing and absolving technologies | | Implementing and integrating new methodologies and tools | | | Experimenting and prototyping |
| **Nonaka and Takeuchi (1995)** | Sharing tacit knowledge | Creating concepts | Justifying concepts | | Cross levelling knowledge | Building an archetype | |
| **Arthur Andersen (1996)** | | Identify<br>Collect<br>Create | Organise | | Share | Apply | Adapt |
| **Choo (1996)** | Sensemaking | Knowledge creating | | | | Decision making | |
| **Taylor (1996)** | Knowledge development (created knowledge) | | Knowledge use (storing, distribution, applying, review) | | | | |
| **Alavi (1997)** | | Acquisition | Index<br>Filtering<br>Linking | | Distribution | Application | |
| **Beckman (1997)** | | Identify<br>Create | Capture<br>Select | Store | Share | Apply<br>Sell | |
| **Demarest (1997)** | | Construction | | | Dissemination<br>Embodiment | Use | |
| **van der Spek and Spijkervet (1997)** | Conceptualise<br>Reflect | | | | Act | | Retrospect |
| **Davenport (1997)** | Determine requirement | Capture | | | Distribute | Use | |

*Table 11. Analysis of knowledge management activities (Lai and Chu 2000)*

Hansen, Nitin and Nohria studied the practice of consulting companies and identified two basic approaches of KM:

- *the codification strategy*, where knowledge is stored in databases, from where it is accessible for the interested parties; and
- *the personalization strategy*, where information technology is used to ensure and promote the communication amongst people and not for storing coded knowledge.

By contrasting the two strategies the authors claim that there are different drivers in the background. Though the characteristics of the knowledge to be managed is similar, the utilisation of knowledge and the catalysation of new knowledge creation can be improved effectively with both strategies (Hansen, Nohria and Tierney 1999). We can say that the codifiability of the knowledge elements have different importance at companies pursuing the two different strategies. According to the authors it is not wise to combine

the two strategies. They believe that selection criteria for the proper strategy are the following:

- Does the company offer standardised or customised products? Hansen at al. argue that companies offering customised products should pursue a personalisation strategy whereas for companies offering standardised products codification strategy seems to be better suited.
- Is the product mature or innovative? A business strategy based on product innovation is best supported by a personalisation strategy, whereas for mature products the necessary knowledge is well understood and can be more easily codified.
- During problem solving is explicit or tacit knowledge used more often? Explicit knowledge can be codified, tacit knowledge is difficult to articulate which indicates a natural choice.

We can interpret the different KM strategies in such a way that necessary actions depend upon the tacit or explicit nature of the knowledge to be managed (Snowden 1998a).

Snowden divides holistic knowledge management programs for four parts as:

- knowledge mapping, that gives answer to "what do we know?" and "what should we know?" questions. Snowden thinks that the map of knowledge assets should not be complex. In the case of an explicit knowledge asset, it has to be identified then its accessibility must be ensured. In the case of a tacit knowledge asset two questions should be posed:
  - is it possible to make it explicit, at least partly?
  - if the answer is yes, should we do it?

  If the answer for the first or second question is no, then a proper competence has to be created within the company.
- Competence creation. Tacit (or remaining tacit) knowledge assets can be found only in the minds of individuals or in communities. The only way to keep or even to develop such a knowledge asset is to share it in some community of affinity.
- Intellectual capital management systems (ICMS). by which Snowden means systems that help to store and to transmit explicit knowledge assets. It also provides the

infrastructure that helps members of communities of affinity to communicate with each other.

- Organisation change. Snowden suggests to build such an organisation that is capable of continuous learning.

In Snowden's model both exploiting existing knowledge as well as innovation turn up. The model is summarised in the next figure:

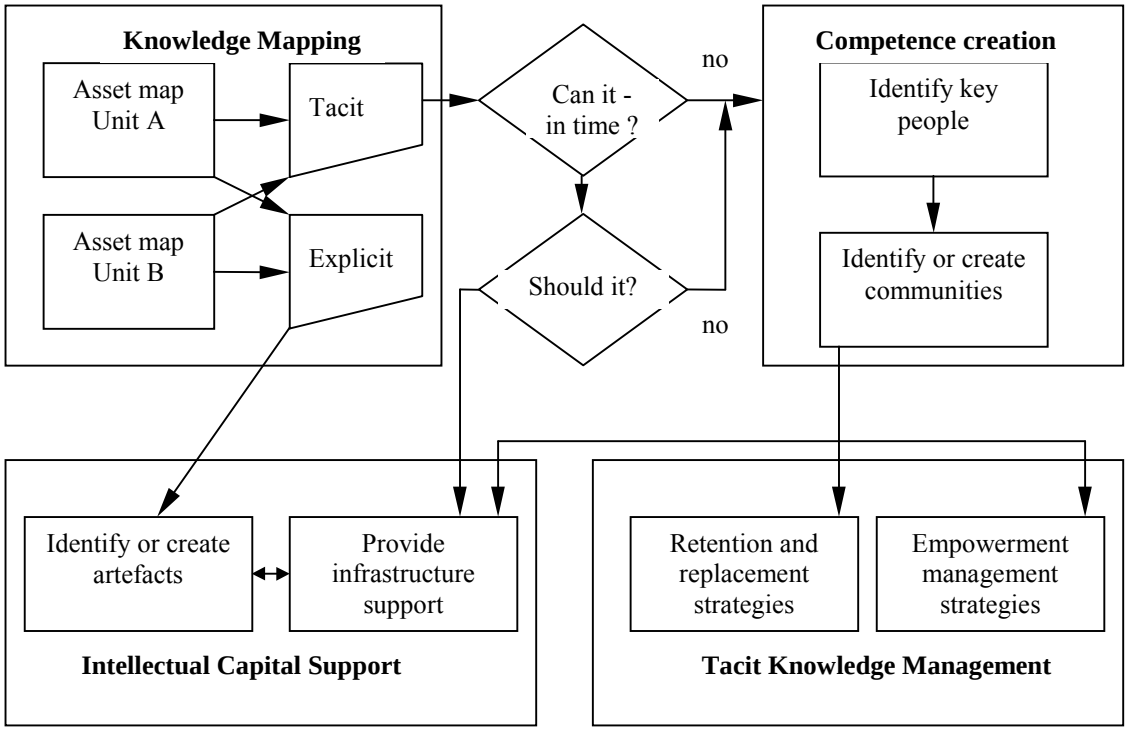


*Figure 6. Elements of a holistic knowledge management program (Snowden 1998a)*

### *II.3.3. The Technology Focused Approach*

Researchers who follow the technology focused approach consider knowledge as a transferable object of individuals. Representatives of this theory often come from the field of artificial intelligence (that fits Sveiby's typology of researchers, see II.2.5). There is a well-founded set of formal tools for knowledge acquisition and knowledge engineering for building an expert system. These tools seem to be evidently applicable in the field of KM (Schreiber et al 1998). A good example of this the thematic issue of Expert Systems With Applications 13(1).

The basic assumptions of researchers from the technology focused school can be classified as cognitivist in the Venzin-classification of epistemological views, that is, knowl-

edge can always be codified and therefore transferred. Simon's views fit this approach. Simon pinpoints the importance of expert systems (Simon 1999).

For a researcher coming from the technology focused school the ultimate task of KM is to ensure accessibility and/or transferability of knowledge with the help of information technology tools (see for example Frappaolo and Wayne 1999, Cohen 1999). Certain surveys do suggest that in the state-of-the-art KM practice the emphasis is on the proper use of information technology. The problem is how to operationalise what is consider to be as "state-of-the-art KM practice" as it was pointed out by Davenport et al. (Davenport, de Long and Beers 1998).

The supporting tool for KM is the knowledge management system (KMS) that means primarily an information technology system (Maier and Lehner 2000). One of the problems of this approach is to define precisely what is to be supported support with information technology (Angus and Patel 1998), as software companies often use the verb "KM" for marketing purposes.

I reckon Wiig also belongs to this technicist school though his ideas are much more complex and he does not limit himself to the usage of technology. Wiig's original definition of the term KM in an earlier work is a whole page (Wiig 1993:18), in his later works he defines it in a more succinct and general way (Wiig 1997).

Wiig divides the patterns of KM practices into technology-based and broad-based approaches (Wiig 1993:435). Technology based approaches are then classified into two subclasses:

- knowledge-based system as a starting point. This approach uses the techniques of expert systems and artificial intelligence. Wiig says it is only a narrow segment of the practice and it spreads very slowly.
- integrated intelligent-agent approach when knowledge-based systems used in different areas of the company are networked.

Solutions based on textual database technology are missing from Wiig's listing, though they proved to be very successful (Davenport 1997, Wakin 1999). Davenport and Prusak separate approaches on the basis of the technology used (neural networks, textual database management systems, case-based reasoning, web technology, Davenport and Prusak 1998).

The first step of a technology based approach is often to set up a knowledge repository (Davenport, De Long and Beers 1998), in which the proper search capabilities should be offered. A similar approach with another starting is the one that deals with the so-called organisational memory which is considered to be a real object that can be constructed with the tools of information technology (Abecker et al. 1998). Abecker and his co-authors want to help context-sensitive searching in the organisational memory through the usage of different levels of ontologies (company, business area, information level). They compile functional requirements for the technology implementing organisational memory.

In order to search in the knowledge base a thesaurus is needed (Davenport and Prusak 1998), but having one might not be enough as the found data should be interpreted and this can cause problems in the practice (Lindgren and Wallström 2000). A number of consulting companies have had problems with the usage of the textual database of best practice (O'Leary 1998). The size of the task related to building and maintaining the thesaurus is well demonstrated by the example of Teltech. Artificial intelligence researchers propose most often the usage of ontologies (O'Leary 1998).

A methodology for building knowledge-base or simply knowledge systems is the CommonKADS method (Schreiber et al. 1998). The authors of this methodology wanted to provide a structured, verifiable and repeatable way for building a (software) system. Knowledge acquisition is done by engineering-like methods, with the help of *knowledge engineering*. The underlying assumption of CommonKADS is that knowledge engineering means description of the knowledge from different viewpoints, however it does not mean mining knowledge from an expert's head. Knowledge engineering means a modelling activity where an aspect model is a proper abstraction of reality itself. CommonKADS assumes that knowledge has a stable internal structure that can be analysed by describing different roles and knowledge types. This assumption is analogous with the stability of data models in structured methodologies that help building up traditional data processing systems (CCTA 1996). During knowledge engineering the focus should be on the conceptual structure of knowledge. And finally, CommonKADS is built on a spiral development life-cycle model, that is, structured learning is considered as a part of the methodology.

CommonKADS prescribes to produce a model suite during the preparation of the knowledge-based system.

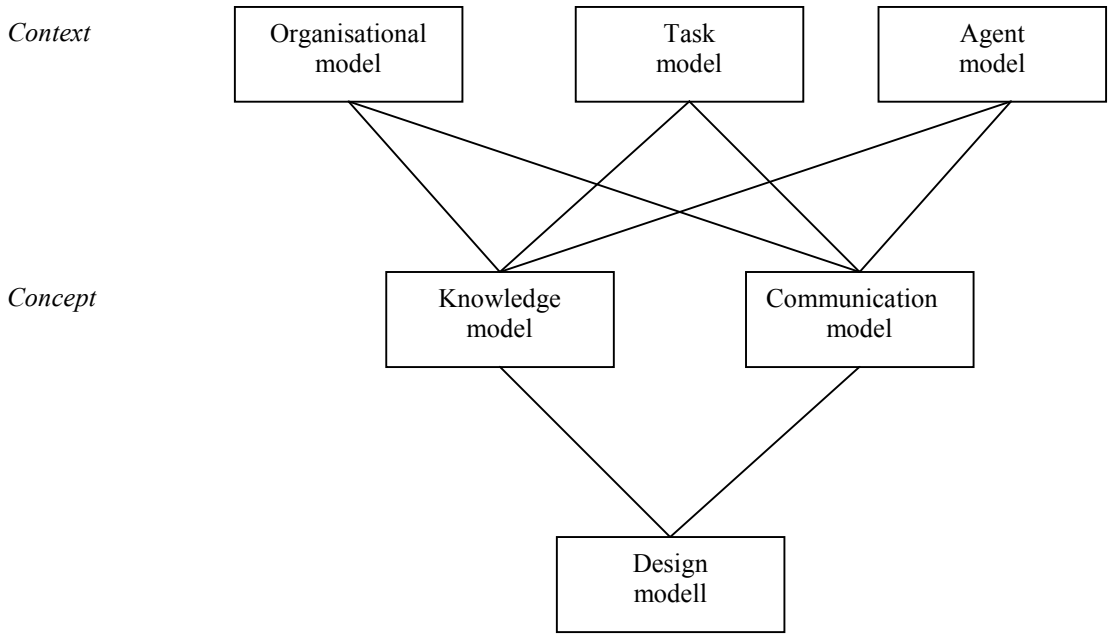


*Figure 7. The CommonKADS model suite (Schreiber et al. 1998)*

The role of the models are the following:

- The organisation model deals with opportunities and problems of knowledge systems, establishes its feasibility and assesses the impact on the organisation the intended knowledge system.
- Tasks are relevant parts of a business process. In this model the global task-layout is analysed, i.e. the inputs and outputs, preconditions and performance criteria, needed resources and competences.
- In the agent model, task executing agents are investigated. An agent can be a human being and an information system or any other entity which is able to carry out a task. In this model, competencies and authority relations of agents are described.
- The purpose of the knowledge model is to describe knowledge types and structures used during performing a task. It gives a system-independent description of the different knowledge components, and their roles in the problem solving process.
- The communication model describes transactions amongst the agents.
- The aforementioned models together can be viewed as a requirements specification for the knowledge system. Based on these requirements the design model provides

the technical specification in terms of applicable architecture, implementation platform, software modules, representational constructs and communication models.

There are rules of thumb available for the preparation of each model, even the contents for the notes to be used are given.

From the viewpoint of this sub-chapter the preparation of the knowledge model is interesting, which consists of three parts, in CommonKADS terminology *"knowledge categories"*.

- *Domain knowledge* contains the domain-specific knowledge and information types that the knowledge systems works with. The tool for the description of domain knowledge is the „domain schema" and „knowledge base".
- *Inference engine* contains the basic rules (inference steps) of the business area.
- *Task knowledge* describes the goals an application pursues, and how these goals can be realised through a decomposition into subtasks and inference rules.

Preparation of the knowledge model is done in three steps: (i) identification (ii) specification and (iii) refinement. These steps can overlap and they might have to be iterated.

Technology focused approaches are systematised in Despres' and Chauvel's taxonomy. Despres and Chauvel sketched regions of practice in the dimension of their model of KM activities on the one hand and in the dimension of levels of appearance of knowledge on the other, see next figure.

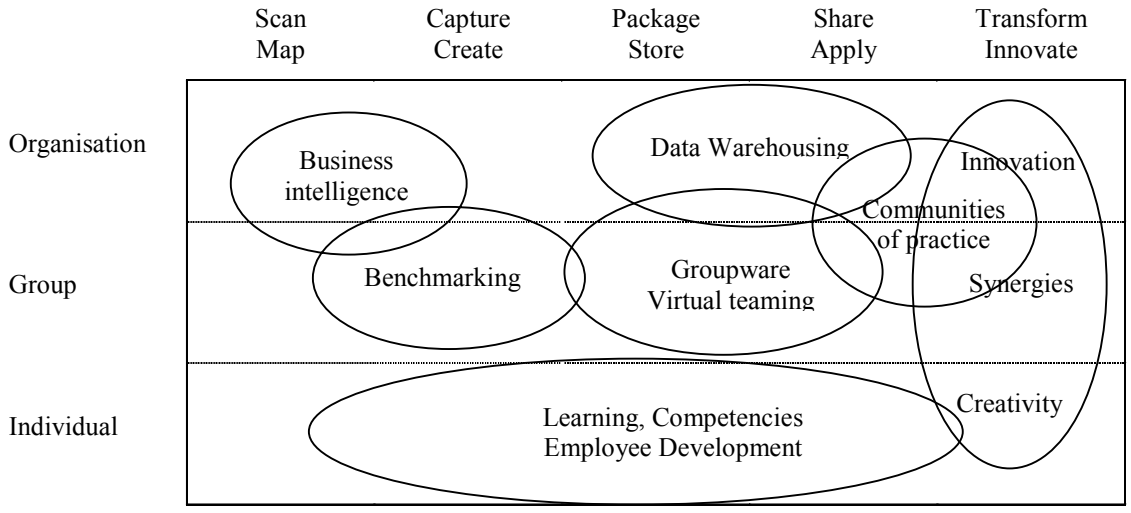


*Figure 8. Regions of practice in knowledge management (Despres and Chauvel 2000)*

*II.3.4. The Environment Focused (Ecological) Approach*

In biology ecology means coexistence of different forms of life. On the basis of this concept, Davenport introduces the idea of *„information ecology"* (Davenport 1997). He considers the notions data, knowledge and knowledge as a part of a broader information concept (Davenport 1997:9). His objective was to create a holistic view as opposed to stiff, mechanical separation. He rejects the techno-utopist view of the company in which everything can be described by engineering precision and moved to computers, however, he admits that such description is possible at least for certain parts.

Information ecology has four attributes (Davenport 1997:29).

- It is an integration of diverse types of information, including company gossips as well as product databases.
- The ecology changes continuously. We cannot be certain how the information environment of a company changes therefore the system should be flexible.
- The emphasis is on observation and description. Davenport quotes Mintzberg: *„...if we cannot anticipate the future we should not plan it in detail"*.
- The focus should be on the people and their information behaviour.

On this basis Davenport put forth the next model

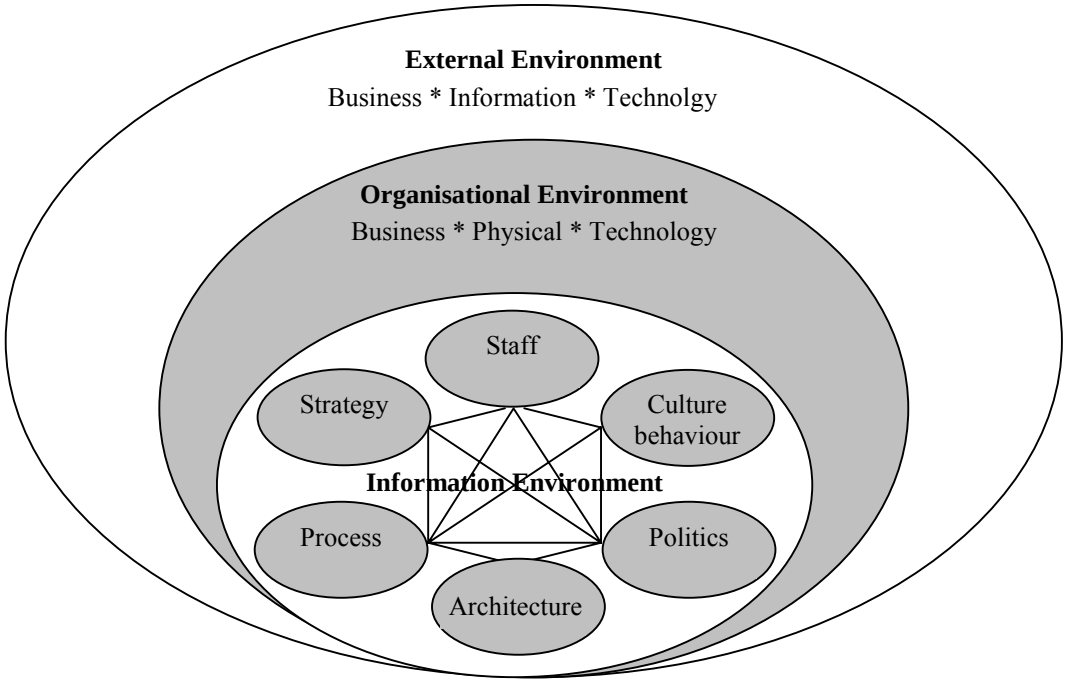


*Figure 9. An ecological model information management (Davenport 1997)*

Davenport's view applies the schemes of the organisational behaviour school, when he pushes the investigation of questions on power, behaviour, culture and employees to the forefront.

Possession of information always means being in a power position. Davenport distinguishes four types of information control according to the level of the local or centralised control of the information environment (Davenport 1997:69). He puts information control in „politics" as he believes it is similar to the fights in the political arena.

The investigation of the willingness to share information and to stimulate this attitude is the crucial information problem from the point of information behaviour. The description of the information architecture, that is what can be found where within the organisation is one another of the most important questions. Davenport illustrates this with several examples (Davenport 1997:165).

The concept of *„company knowledge-database"* resembles to the information environment concept of the ecological approach (Bokor 1999:55). Bokor's division does not deal with the questions of power, culture and strategy explicitly, these can be found in their subconcepts.

*II.3.5. The Purpose Focused Approach*

The purpose focused approach is practical: it measures the indicators showing values which should be improved. If objectives are verifiable processes become manageable. A typical example of this view is the *„balanced scorecard"* (Kaplan and Norton 1996). In the context of KM, the size of intellectual capital (Edvinsson and Sullivan 1997, Sveiby 1997), and in the area of learning (Kaplan and Norton 1996) are the areas where indicators have to be defined.

An alternative expression for the idea of intellectual capital is the introduction of the concepts of *knowledge asset* (Winter 1987, Boisot 1998) or *intellectual asset* (Snowden 1998b, Huang 1998). Certain authors define the concept of intellectual capital very broadly and they do not intend to measure its size. Their objective is to search for tools that could help the growth of intellectual capital (but not in a numerically expressible way).

A recognised representative of this school of intellectual capital is Sveiby, therefore these notions will be shown with his works (Sveiby 1997). A summary on the accounting methods of knowledge assets can be found in Wilkins et al. 1997.

Sveiby deals with knowledge companies in his writings where assets to be managed are mainly not material ones. In such cases the stock value and book value of the company can be very different. Sveiby mentioned, among others, Microsoft's position in 1995 where the stock value was ten times more than the book value. As this phenomena seems to be getting widespread (Quinn 1992, Stewart 1997), it is important to classify and value the intangible assets. Sveiby himself does not like the expression „KM". He interprets these activities as an art of value creation based on the intellectual assets of the company (Sveiby 2000).

A typical example of knowledge-intensive firm is a software firm. There are three new phenomena at software firms (Arthur 1996):

- The law of diminishing returns does not apply, as production costs are independent from the number of copies sold.
- Knowledge remains or even increases after being sold as opposed to traditional commodities.
- Competition gets harder: products that can substitute each other pursue aggressive price policies *(competitive upgrade)*.

Intangible assets are divided into three subcategories by Sveiby:

- individual competence, that is the organisational capability to produce value in different situations,
- internal structure, which include patents, company culture, concepts, administrative and computerised systems, and
- external structure that covers the relationships with the suppliers and the customers. It includes the brand and company image.

The total market value of a company is illustrated by the next figure (Sveiby 1997:12)

| **Visible equity (book value)** | **Intangible assets** (stock price premium) | | |
|---|---|---|---|
| | **External structure** | **Internal structure** | **Individual competence** |

*Figure 10. Components of the total value market of a company (Sveiby 1997)*

Intangible assets or intellectual capital can be classified in different ways, too. Saint-Onge uses the terms human capital, structural capital and customer capital (Saint-Onge 1996, Stewart 1997), the Skandia company, often referenced in the literature has a multilevel, hierarchical breakdown (Wilkins et al. 1997).

Sveiby highlights the concepts of knowledge and competence. He says knowledge is a capacity to act. Knowledge has four characteristics: (i) it is tacit, (ii) it is action-oriented, (iii) it is supported by rules and (iv) it is changing constantly.

Sveiby uses the term "information" to describe the act of the communication when someone wants to transfer his knowledge to another person. He believes that information is meaningless and of low value (Sveiby 1997:43).

A key activity of knowledge-intensive firms is the transfer of knowledge which is done by transferring information or tradition. Transferring tradition refers to the process during which the apprentice personally recreates the knowledge of his master. Knowledge already possessed always influences the acceptance and interpretation of new knowledge.

As the concept of „knowledge" can be interpreted in a variety of ways and the word itself has several secondary meanings Sveiby often uses the term „competence". He divides the competence of the individual into five mutually dependent elements: (i) explicit knowledge, (ii) skills, (iii) experience, (iv) value judgements and (v) social network. By this interpretation he diverges from the usage of the word in everyday language. The most effective method for transferring competence is to participate in the acting process.

The concept of competence can be further divided into (i) professional competence and (ii) organisational competence (professional here refers to the core business activities of the firm). Sveiby gives concrete advice as to how professional competence can be increased and utilised. The objective is to decrease dependence on experts.

Employees of the firm can be classified into the next categories based on the level of their professional and organisational knowledge:

| | | **Organisational competence** |
|---|---|---|
| **Professional competence** | Professional | Leader |
| | Support staff | Manager |

*Table 12. The four personnel categories in knowledge-intensive firms (Sveiby 1997)*

There can be tensions among the representatives of the different categories due to their different level of competence and value system. This is harmful from the point of knowledge transfer therefore it has to be managed. A possible solution is the „tandem leadership" where both professional and organisational interests are represented on the same level.

Sveiby argues that it is not worth describing intangible assets with financial indicators. He believes that there is no objective indicator, and one considers financial indicators to be objective because there are relatively stable definitions and standards available. We need such a management information system that utilises financial and non-financial indicators at the same time.

Indicators are classified into three classes (i) indicators of growth and renewal, (ii) indicators of efficiency and (iii) indicators of stability. Sveiby gives a number of examples for these types of indicators. Indicators are ordered in a system by the so-called *„intangible assets monitor"*. A report on the values of the indicators over time can be part of the annual report of the firm. Based on these values required changes can be implemented.

Not everybody agrees with this approach. Fahey and Prusak think that insisting on the search for indicators is on of the *„deadliest sins"* as it can lead to misunderstandings, it separates knowledge from its use and users and it concentrates on catching the moment and not on the process (Fahey and Prusak 1998). I do not agree with this criticism, though in concrete cases it can be relevant. Representatives of the purpose focused school are aware of the importance of corporate culture and strategy (see for example Saint-Onge 1996), and they do not limit themselves to forcing and measuring indicators.

## II.4. Factors Enabling Effective Knowledge Management

Enabling the effectiveness of KM is an evergreen topic of the literature. Researchers use two approaches. One way is to list the enabling, catalytic factors and critical success factors that are either justified theoretically or are identified on the basis of experience. Another way is to put wrong practice in the pillory (listing *"dos and do not dos"*).

### *II.4.1. Catalytic Factors and Critical Success Factors*

The identification of enabling conditions for the knowledge spiral is part of Nonaka's dynamic theory of organisational knowledge creation. Nonaka defined three conditions at first (Nonaka 1994), then in his later works two more ones (Nonaka and Takeuchi, 1995).

- **Intention.** Organisational intention provides the most important criterion for judging the truthfulness of a given piece of knowledge. In order to get the necessary intention the commitment of employees is necessary.
- **Autonomy.** By autonomy the organisation may increase the chance of introducing unexpected opportunities. Autonomy may also motivate employees in sharing knowledge. Organisations ensuring autonomy may be depicted as self-reproducing , "autopoietic" organisations.
- **Fluctuation and creative chaos.** Appearance of new employees might give chance to question fundamental basic assumptions and to find new approaches. Tension as a side-effect of chaos might enable employees to handle crises situations at the best.
- **Redundancy.** Redundancy can be achieved in a variety of ways. Redundancy may lead to information overload which is harmful.
- **Requisite variety.** To achieve requisite variety each employee should have the fastest access to the broadest level of necessary information, possibly in minimal steps

A common characteristic of the above mentioned conditions is that they are difficult to operationalise. One can argue for these conditions from a purely theoretical standpoint, however, it does not seem to be justified that these and only these factors contribute to the creation of knowledge.

Maybe it is Fukuyama's influence that the concept of trust became an often discussed question in management literature. Knowledge transfer is clearly connected with trust, therefore trust is a catalysing factor of KM. This issue was investigated by Huemer, von

Krogh and Roos, in the previously mentioned theoretical framework of Venzin et al. (Huemer, von Krogh and Roos 1998).

von Krogh, having presented the usual epistemological thoughts, looks for similar factors. von Krogh uses the concept of "*care*" that he applies in the context of organisational relationships, and suggests that the process of knowledge creation is different depending on the actual level of care. His typology of creating process is shown in Figure 10, investigating knowledge in individual and social levels. Social knowledge means knowledge shared among individuals, and it can comprise both tacit and explicit knowledge. He probably borrowed this expression from Spender, and group knowledge might have been a better term. von Krogh investigates how each subtype how can be facilitated. Among his proposals there are the introduction of a proper incentive system,, initiating mentoring programs, creating trust and openness within the organisation, starting training programs, using project debriefings and other forms of learning-oriented conversations and finally having social events. von Krogh shows the example of a multinational company.

| | | Knowledge | |
|---|---|---|---|
| | | **Individual** | **Social** |
| **Level of care** | **Low** | Capturing | Transacting |
| | **High** | Bestowing | Indwelling |

*Table 13. The processes of knowledge creation (von Krogh 1998b)*

Using the concept of care, von Krogh, Ichijo and Nonaka name five factors (similarly to the previous work of Nonaka, but in a little different way) (von Krogh, Ichijo and Nonaka 2000), which are:-

- instilling a knowledge vision,
- management of conversations,
- mobilising knowledge activists,
- creating the right context and
- globalising local knowledge.

Enabling knowledge creation can be investigated by using the idea of organisational culture. Nona and Konno looked at the creation of knowledge with help of "ba", a concept originally proposed by the Japanese philosopher Kitaro Nishida (Nonaka and Konno 2000). Nonaka and Konno defines "ba" as a shared space for emerging relationships. This space can be physical (e.g. office), virtual (e.g. electronic letter), mental (e.g. shared ideas) or a combination of these. Ba provides a platform for advancing individual and/or collective knowledge. In a later article they use a shorter definition when "*ba is defined as a shared context in which knowledge is shared, created and used*" (Nonaka, Toyama and Konno 2000)

Investigating knowledge on individual, group and organisational levels (that is, by Nonaka's ontological dimension), Nonaka and Konno develop the original theory of knowledge creation further.

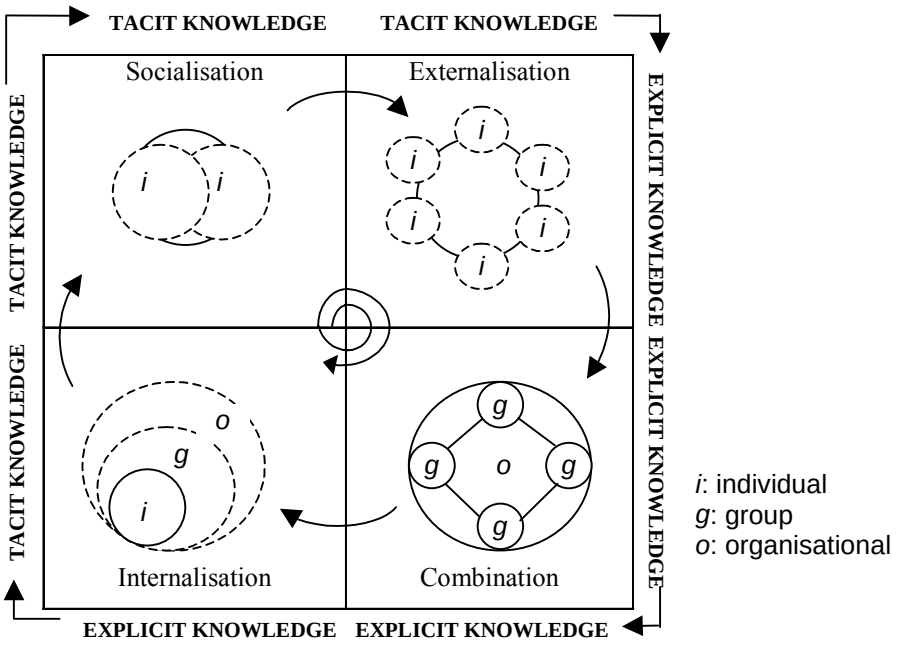


*Figure 11. Spiral evolution of knowledge conversion (Nonaka and Konno 2000)*

There is a different ba which fits to the separate quadrants in the SECI model.

- Originating ba suits socialisation. In originating ba individuals share feelings, emotions, experiences and mental models. Physical, face-to-face experiences are the key to conversion and transfer of tacit knowledge.
- Interacting ba suits externalisation. Selecting a right mix of people, dialogues in such teams, using metaphors lead to establishing this type of ba. Conceptual leaders are challenged to pursue their ideas.
- Cyber ba suits combination. This ba is a place of interaction in a virtual world instead of real space. Combining new explicit knowledge with existing information and knowledge generates and systematises explicit knowledge of the company. This process is most efficiently supported in collaborative environment utilising information technology, that is why it is often referred to as a "virtual" world.
- Exercising ba suits internalisation. In this ba stress is on active participation until it becomes tacit knowledge.

Skyrme and Amidon identified the following critical success factors during a KM initiative (Skyrme and Amidon 1999):

- It should be strongly linked to a business imperative.
- There should be a compelling vision and architecture.
- A knowledge champion is needed in the company
- The culture of the company should support knowledge creation and sharing.
- There should be continuous learning in all levels of the company.
- A well-developed technology infrastructure is needed.
- Knowledge processes should be systematically organised.

Davenport and Prusak identified nine factors that lead to the success of a KM initiative (Davenport and Prusak 1998:153).

- The corporate culture should be knowledge-oriented.
- There should be proper technical and organisational infrastructure available.
- Top management is expected to support the initiative.
- The initiative should be linked to a business interest.
- There should be a modicum of process-orientation of the initiative.
- The vision and language should be clear.
- Non-trivial motivational needs should be met.
- The knowledge of the company should be properly structured which enables its usage.
- There should be available multiple channels for knowledge transfer.

*II.4.2. Pitfalls to be Avoided*

Fahey and Prusak speak of the eleven deadliest sins of KM (Fahey and Prusak 1998). They think the next situations should be avoided (they give some justification, but without reference to practice)

- Not developing a working definition of knowledge.
- Emphasising knowledge stock to the detriment of knowledge flow.
- Viewing knowledge as existing predominantly outside the heads of individuals.

- Not understanding that the fundamental intermediate purpose of managing knowledge is to create a shared context.
- Paying little heed to the importance of tacit knowledge.
- Disentangling knowledge from its uses.
- Downplaying thinking and reasoning.
- Focusing too much on the past and the present.
- Failing to recognise the importance of experimentation.
- Substituting technological contact for human interface.
- Seeking to develop direct measures of knowledge.

Lucier and Torsilieri claim to have discovered four mistakes in KM programs, on the basis of a large consulting firm's experience (Lucier and Torsilieri 1997):

- Only general aspirations are set such as „improve co-operation" without pointing out a specific business objective.
- The program is not complete, it does not build on the natural dynamics of the organisational changes and/or the creation and usage of knowledge.
- Strategic objectives are not taken into consideration.
- There is top management involvement, but there is no active, continuous management participation.

# III. ASSUMPTIONS AND DEFINITIONS

In the previous chapter I have shown the approach of contextualised theory building advocated by Venzin et al. 1998. And because it is also my view the objective of this chapter is to define explicitly the underlying assumptions of the thesis and to lay its theoretic foundations.

## III.1. The Interpretation of Knowledge and Connected Terms

In order to define the term "knowledge" for the purposes of the thesis, I do not intend to rely on a single phrase which can be interpreted in numerous ways (e.g. Nonaka 1994:15, or Davenport and Prusak 1998:5), and I discard lengthy explications, too (see for instance Wiig 1993:18). My objective is to make my assumptions regarding knowledge unequivocal in the most important issues (see the sub-chapter discussing the approach of literature to the basic terms) during expounding the concept of knowledge. For this reason I have chosen to define the term "knowledge" by listing its characteristic features (at least, in my view).

### *III.1.1. Basic Assumptions*

As a starting point I adopt the ecological concept of knowledge, which could refer both to the company's internal and external knowledge. This approach fits in with the connectivist approach described in the previous chapter, which I primarily agree with. According to the connectivist approach the company comprises of individuals, the activities are self-organised and conform to numerous expectations and intentions.

In the course of providing a description for the concept of knowledge I make partial use of cognitivist elements as well (Venzin, von Krogh and Roos 1998:39), when, in my understanding, the goal of knowledge mapping is that the company must be put in a position where it depends the least on the knowledge of its members. This is actually fairly close to the mechanistic concept of the organisation (Morgan 1998:17), but I do not consider the company a machine only because of the oversimplified nature of this approach.

### *III.1.2. Data, Information and Knowledge*

The definition of data and information is less open to controversy. When using the terms "data" and "information" I understand the following:

- data by itself is a senseless series of signals stored somewhere in writing, as image or in the mind of a person.
- Data becomes information when it can be interpreted in a certain context, that is, it has semantic characteristics.
- Information is an object, which, depending on its form, can be codified.

Based on the assumptions described above, regarding knowledge I accept the following:

- Information is part of the term knowledge (that is, I consider information to be knowledge). Furthermore, in my view, knowledge includes experience, practice and competence (professionalism) as well.
- Knowledge other than information can be found in the heads of experts and in their networks. Certain parts of knowledge can be fully codified (e.g. data listing), while other parts cannot be codified at all (e.g. knowledge of professional programming).
- Knowledge presents itself in many forms within the company (in the form of knowledge or information ecology).
- Knowledge is almost always transferable, but in exceptional cases it cannot be transferred.
- I consider "company knowledge" to be an independent term, by which I understand a system based on the knowledge of the company's employees and the company's codified knowledge. Company knowledge is qualitatively more than the simple sum of the knowledge of the company members.
- New knowledge is only created at the level of the individuals.
- The value attributed to knowledge depends on the person evaluating it and this value changes in time.

*III.1.3. The Knowledge intensive Company*

Following the Starbuck's ideas, a company is knowledge intensive if knowledge is considered an important resource for it (Starbuck 1992). In this sense, the companies in the case studies all qualify as knowledge intensive.

*III.1.4. Knowledge Management*

KM is a series of activities executed by the company in a planned manner, which

- map the relevant knowledge of the company and the outside world on the basis of a given set of aspects,
- evaluate the possibility of capturing, recording and transferring of mapped knowledge and the feasibility of doing so,
- provide for the planned securing and transfer of the knowledge elements[2] selected for the purpose,
- terminate the processes that ensure the securing and transfer of the selected knowledge elements.

**Knowledge management should not have and end in itself.** In the course of setting-up and operating a KM function, senior management must pay special attention to the economy of the KM function, that is, the benefits of setting-up and operating a KM function must exceed the related costs. For this reason the introduction of a KM function is an activity that can be managed and planned in the form of a project. The underlying aim of the thesis is to explore the „management of KM", more precisely, to explore some of the issues of the management during the introduction of KM.

[2] The definition of the term "knowledge element" is to found in Chapter V.

# IV. INTRODUCING KNOWLEDGE MANAGEMENT ON THE BASIS OF A MATURITY MODEL

This chapter covers the results of investigations on the first steps of introducing a KM function. There are two assumptions behind the word "introduction": firstly, it assumes a conscious process; secondly it assumes the existence of a **top-down**, planned process based on managerial commitment resulting in an institutionalised KM function. Description and schedule of the introductory actions belong to planning. We could also say that before introduction one is expected to write a project plan for the KM introduction. This is basically a structured approach.

There are various approaches of how to address the establishment of a knowledge management function in the literature (Davenport et al. 1998, Skyrme 1998, Davenport and Smith 2000). The plan of introduction varies from organisation to organisation. Similarly to contextualised theory building (Venzin et al. 1998), assumptions, interpretation of the concept of knowledge and clearly the company's culture will determine what is to be included exactly in such a plan. There are also precedence rules that must always be followed during the implementation of knowledge management. One such a rule is for instance, that only institutionalised processes can be optimised (Demarest 1997). These rules are very general by nature and an existing company should prepare a plan at a more concrete level in which, naturally, the general rule will be obeyed.

Conscious introduction is based on making underlying assumptions explicit. Maturity modelling is a structured tool which projects assumptions on high level activities and objectives. I shall investigate the application of this technique in the field of knowledge management.

As I have already mentioned , the structured approach is an application of the engineering approach. A profound example of the engineering approach is the process of building a house: the architectural designs must be drawn up first, these then must be authorised, then comes the process of implementation. Processes can be divided into sub-processes, in this example during the planning process the engineers design the internal workings of the house and the interior design separately. Among these steps, however, there are natural dependences.

The creation of a maturity model will define the actions of the KM initiative. There are activity models though that are not based on a maturity model. For example, the Know-

Net Esprit project (EP 28928)[3] proposed such a model. Within the framework of this project a more difficult task was tackled: beyond an activity model, a tool was also developed. With the assistance of this tool the internal knowledge of the company can be described, developed, implemented and assessed. The Know-Net activity model is based on the top-down approach (similarly to mine), and it starts from the basis of strategic planning and moves forward to implementation.

Having a maturity model is also important as it projects a clear vision of future for the employees of the company. A clear, well-articulated vision will contribute to the success of a KM initiative, according to different authors (see chapter II.4.).

The mechanistic application of the structured approach for an organisational problem can be criticised from several points. Such an approach would not take into consideration the human factor, and therefore, it is based on a machine-like interpretation of the organisation. It would give rigid prescriptions and this would often make it impossible to adapt to a specific situation. There are, however, a range of advantages of this simple view. It forces a precise definition of the techniques, concepts used throughout the implementation and enables planning - which was the original objective.

## IV.1. The Abstract Concept of Maturity Modelling

(Discrete[4]) maturity models describe the development of an entity over time from one well-defined point of view. The entity in question could be a person, a process or a function of an organisation.

The common features of maturity models are the following:

(i) it describes the development of a single entity with the help of a small number (at most four-six) of levels;

(ii) from a given level up to the uppermost one (this latter is the „perfection" level in respect of the given aspect) levels are completely ordered;

(iii) the development proceeds through the levels starting from the initial level. In the course of the development no level can be left out;

(iv) different levels can be characterised by defining requirements. In order to reach a level the entity must conform to the requirements posed at that level.

[3] More details are to be found at http://www.know-net.org/

A maturity model can also be viewed as a life cycle model. During its life the entity marches towards „perfection". Hence a maturity model can be used on the one hand to plan the next steps and on the other hand it can clearly become the tool for benchmarking.

A well-known example of maturity modelling is the Maslow hierarchy. Maslow suggests that there is a hierarchy of human needs starting from physiological needs up to self-actualisation needs. During progress through the hierarchy of needs all levels must be achieved (Bakacsi 1996, original: Maslow 1943).

Another widely known example is the Capability Maturity Model (CMM) for software development published by Software Engineering Institute of Carnegie-Mellon University (Paulk et. al 1993). The central assumption of CMM is that quality can be cultivated through control. In this case, the entity is the software development function. CMM describes five levels. Maturity levels in CMM indicate process capabilities and contain key process areas. Key processes represent goals to be achieved by the software developer organisation. Key processes are organised by common features which are based on key practices. The full model gives a path of improvement (Paulk, Weber and Curtis 1995).

A more complex example is the model concerning the creation of organisational knowledge, proposed by Nonaka. In this model the entity is the piece of knowledge which will be of public utility (Nonaka 1994:21).

In order to avoid misunderstandings let me show an example which is not considered to be a maturity model according to the aforementioned definition. The periodic table of elements devised by the Russian chemist Mendeleyev *is not* a maturity model. In the Mendeleyev system separate entities (elements) are under scrutiny and they are described with chemical characteristics.

SEI applied the maturity modelling technique to other areas, too. E.g. the People CMM devoted to improve the work force of an organisation dealing with software development, or there is the Integrated Product Development CMM which enables the application of more maturity models at the same time.

There are continuous maturity models, too. In these models key processes and maturity levels are separated, furthermore the notion of "process area" is introduced. For each

[4] The concept of the countinous maturity model will be discussed later.

process area there are specific goals and techniques and there are also general goals and techniques that are independent from any areas. Maturity is defined in the context of a process area. This way the organisation can develop in different directions simultaneously. Groups are formed from process areas on the basis of their natural cohesion, as the implementation of process areas are absolutely independent from each other. A continuous maturity model will not prescribe the sequence of actions but it will depict what the next steps will be in a specific process area.

## IV.2. Maturity Models for Knowledge Management

In fact, industry and academia has already created maturity models for knowledge management. Proposals from the industry (KPMG, Microsoft) are problem solving oriented and practical. The academic model I know is more cautious and proposes a holistic approach.

### *IV.2.1. The KPMG Model*

KPMG, a consulting company proposed a five-step model, called *Knowledge Journey*. This model runs from the chaotic level through to knowledge centric. Entrance criteria for each level can be assessed on the basis of fifteen activities that are classified into four areas (activities are part of the "KM program"). Levels can be achieved as

- knowledge chaotic. three or fewer activities;
- knowledge aware: four or more activities from at least two areas,
- knowledge focused. six or more activities from at least three areas,
- knowledge managed: for each area at least two activities,
- knowledge centric: all activities

Activities and areas are the following:

| **Area** | **Activity** |
|---|---|
| People | implementing KM training/awareness (e.g. workshops or roadshows)<br>appointing knowledge officers and creating knowledge centres<br>incentivising and rewarding knowledge working<br>building and developing "communities of practice"<br>establishing formal KM networks (e.g. dedicated workers in discrete groups, or communities of KM practice) |
| Process | benchmarking or auditing the current situation<br>creating a KM strategy<br>implementing new systems for "communities of practice"<br>designing other KM processes |
| Content | creating a knowledge map<br>implementing knowledge policies<br>measuring intellectual capital |
| Technology | carrying out a knowledge system audit or assessment<br>implementing ways to share best practice<br>use of KM software (either dedicated or Intranet or Groupware software) |

*Table 14. Assessment criterion in the model of KPMG*

This model is only normative as it does not prescribe an exact sequence among the activities. It can be applied in different manners.

The model was used during surveys for benchmarking purposes in Great Britain (KPMG 2000a) and in Hungary (KPMG 2000b), too. In Great Britain the research was done twice, in 1998 and in 2000. It was a complex process, 423 organisations with a yearly turnover of more than 200 M£ were asked in 2000. Questions were posed to senior managers (CEOs, CFOs, marketing managers, managers responsible for KM). Roughly half of the surveyed organisations are based in the English speaking regions (United States of America, Great Britain). The survey dealt with a snapshot of the situation of KM and its problems, with possible benefits, with the role of technology and with the KM steps already taken, and therefore it was more than a simple benchmarking exercise.

Unfortunately, the size of the Hungarian sample (18) does not allow statistical investigation. The result of the survey also demonstrated that few Hungarian companies are pursuing the problems of KM.

*IV.2.2. A Model from Microsoft*

A very detailed model was born in the information technology industry at Microsoft. Microsoft calls its model *„Knowledge Management Landscape"*. It has eight maturity levels ranging from unaware to leading. Microsoft's underlying philosophy is: *"The*

*framework is based on the premise that organisations typically progress through a series of stages in using knowledge-management tools and techniques. During this process, the major focus of using knowledge management evolves from efficiency to effectiveness to growth. At the same time, the base of know-how and technology within the enterprise grows through a combination of learning from other organisations' experiences and experimentation"* (Microsoft 1999)[5].

A firm can assess its current position by filling out a questionnaire model, that has 77 evaluation criteria on the current practices. Each criterion is measured on a four-level scale from poor to excellent. These criteria are classified into 20 categories, categories are grouped into 3 areas (people, processes and technology, business relationship management). Scoring is assisted by a software, not surprisingly Having scored the different criteria, with the help of certain rules, the firm is ranked in the "landscape", and prescriptive measures are proposed.

Criteria overlap due to their large number. It's worth pointing out how many human, marketing and other evaluation criteria are used by Microsoft though this firm is technology focused[6].

The software tool offered by Microsoft makes it possible to assess for different people at the same company at the same time and they can consolidate their views. In this sense Microsoft went well beyond the technology-focused approach, accepting the subjective nature of the assessment and the necessity of negotiations. In fact this leads to the acceptance that knowledge is socially embedded, in this case - the subject of knowledge being the current state of the KM practices of the company.

[5] Unfortunately since this thesis was compiled Microsoft has rearranged its website and I have been unable to relocate the *IT Advisor for Knowledge Management* tool.

[6] In 1998 Microsoft was awarded the *"Most Admired Knowledge Enterprise*" (MAKE). This prize has been awarded annually since 1997. More details are available at http://www.knowledgebusiness.com/

| Position | Description |
|---|---|
| Unaware | Organisations consider the management of their organisation's knowledge to be either irrelevant or esoteric and have not invested in learning what is possible. Often this reflects an organisational view that places little value on either knowledge or information technology as a source of competitive advantage. |
| Random Initiation | Organisations in this phase have a number of individuals who have become enthusiasts for knowledge management through their own interest and efforts. There is little encouragement and direction given to them and their efforts. As a result, these organisations have acquired a little knowledge-management experience and technology but in a purely haphazard manner. |
| Acceptance | Organisations in the Acceptance position have had sufficient successes in using knowledge management, consequently the credibility of the concept has reached a critical mass. Leadership is deliberately is put in place to begin to exploit deliberately the capabilities that have been demonstrated through the efforts of individuals. |
| Building Effciency | Organisations harness knowledge-management tools and techniques to increase operational efficiencies, applying these tools to well-understood processes to reduce costs. With limited executive support for a common approach, these organisations have started setting standards and developing an information architecture. |
| Controlled Experimentation | With the use of knowledge management for cost reduction under way, organisations explore how knowledge management can increase the effectiveness of business processes. With this focus on adding value comes recognition of the importance of the intellectual capital that the organisation can leverage. |
| Adopting for Efectiveness | Organisations have learned through experimentation how to apply knowledge-management practices to add value to business processes. Knowledge management is applied widely, with tools generally available for any knowledge worker. Typically, a formal knowledge-management program is in place, sometimes led by a Chief Knowledge Officer. |
| Focused on Growth | Knowledge management is highly developed and stable and smaller business units are pushing the envelope. Here, leaders are focused on creating additional value and developing new businesses. The core is very much the customer rather than the company, and the enterprise is creating new processes based on embedded knowledge-management tools and techniques. A key characteristic at this level is the use of knowledge management between enterprises to create complete value chains. |
| Leading | The creation and exploitation of intellectual capital is booming and knowledge management tools and techniques are pervasive. The boundaries of the organisation are deliberately porous, enabling the continuous exchange of knowledge with the outside world and creating an extended and more competitive virtual organisation. |

*Table 15. Maturity levels in the Microsoft model*

### *IV.2.3.Gallagher and Hazlett's Model*

From academia, Gallagher and Hazlett intended to provide a tool for measuring knowledge management capabilities of firms as well as the effects of a KM initiative. These authors, agreed with Earl's opinion - who considers KM implementation as a joint process of technical and social relations (Earl 1994) -, and therefore they believe that that there is no single way to build a knowledge management function. They set up the "Knowledge Management formula, KM*f*" in which knowledge is handled as an object.

Knowledge is investigated from the viewpoints of culture *(knowledge culture,* ***Kc****)*, infrastructure *(knowledge infrastructure,* ***Ki****)* and technology *(knowledge technology,* ***Kt****)*. They claimed that to achieve results these three components should be developed in synergy according to their model.

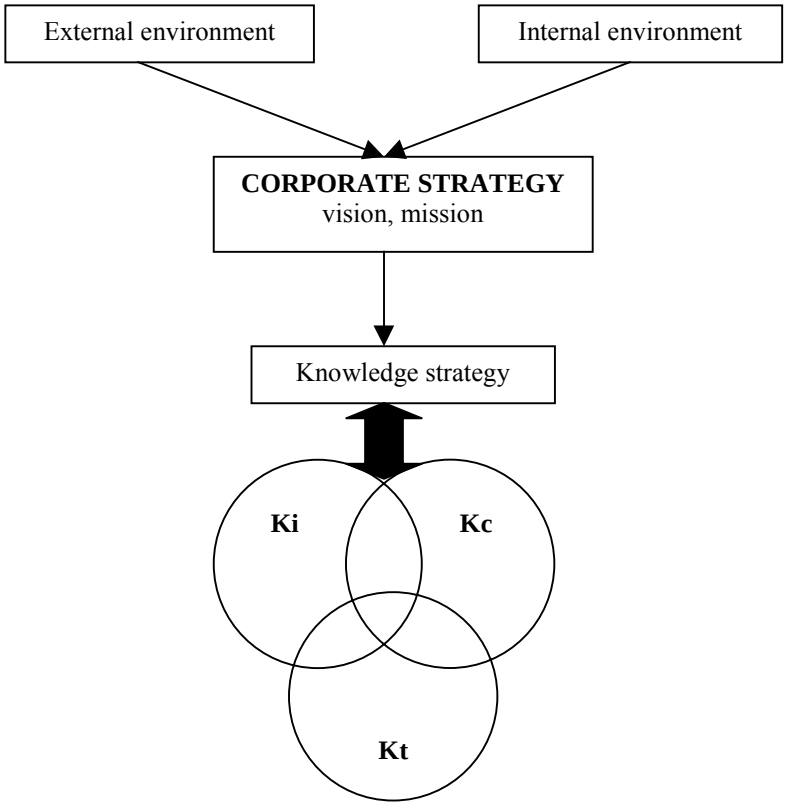


*Figure 12. The Knowledge Management Formula (KMf) (after Gallagher and Hazlett, 1999)*

Their maturity model *(Knowledge Management, Maturity Model, KM*$^3$*)* consists of four levels as *K-aware, K-managed, K-Enabled* and *K-optimised.* They proposed to use Rockart's method of critical success factors (Rockart 1979) in the previously mentioned three dimensions in order to decide where a firm is on the ladder (Gallagher and Hazlett 1999).

## IV.3. Advantages and Drawbacks of Using Maturity Model, Generalisations

Writings on the success of KM initiative often mention the necessity of a clear vision of future. One of the greatest values of a maturity model is that it depicts an understandable picture which is easy to communicate. A useful feature of such a model is that it can quite easily be graphically represented often with a series of boxes directed from the bottom to the top (see next subchapter). In such a way transfer of knowledge can happen

on more knowledge levels. In short, the roadmap to be followed by the company becomes clear.

Another advantage of such models is their simplicity which makes them easy to understand. Simplicity, an asset in itself by its very nature often leads to debates, as it happened in the case of the above mentioned examples. Maslows's hierarchy was heavily criticised. CMM was also challenged on the basis of case studies.

The technique of maturity modelling itself can be developed further in different ways. The usage of the previously mentioned continuous maturity model would partly provide defence against criticism based on the normative nature of the model. Such a continuous model would not prescribe what the next step is though it will describe the next steps on specific areas.

The model can be generalised by putting forth slightly different forms of the model based on the values of situational factors. In the case of the SSADM systems analysis and development a similar approach was chosen (CCTA 1996). The main difficulty of this contingency approach lies in defining and operationalising situational factors. Concrete models can be proposed for concrete cases accordingly. A common difficulty of such models is their clumsy nature as they lose the advantages stemming from simplifying the situation.

A further generalisation possibility arises if we do not require strict ordering but only a partial one. This would permit different ways of development as opposed to a single way. Such models do exist, for example the transformation levels of the application of information technology described by Venkatraman (Venkatraman 1994). In his model there are five levels, and only the achievement of the first two levels is required before attempting to move up to higher levels (as business process redesign, business network redesign and business scope redefinition). Similarly to the previously proposed generalisation possibility this could make it difficult to use the model.

A model might become irrelevant due to the development of our knowledge. This phenomenon could be illustrated with help of the next example: in order to describe the maturity of the application of managing data processing, Nolan and Gibson proposed a four stage model, starting from initiation and ending at maturity (Gibson and Nolan 1974). However, the stage of "maturity" as the ultimate level seems to be meaningless

today – in fact the usage of the term data processing is diminishing as we moved to new concepts. The modification of the model will not solve the problem!

KM does not belong to the real (existing) activities of the company in the sense that they are traditionally not separated from other activities - e.g. there is usually no separate dissemination process. On this basis maturity modelling can also be challenged; is it a true reflection of an existing development in reality, or is it a projection of an artificial view which would limit our understanding. We can view it as an example of socially constructed reality (Berger and Luckmann 1991). To put it differently the question is whether the maturity model is a description of existing processes or it is an artificially constructed picture which shapes reality. Having accepted the right for such oppositions, it is my belief that practice needs ideas of where to start from when one wants to introduce a KM function. All in all the tool of such a proposal is a normative model which depicts a possible route of development.

## IV.4. A Possible Maturity Model

In conclusion, I maintain that

- a maturity model is a suitable tool for introducing a KM function, for articulating and depicting a vision
- the concrete content of the maturity model can vary from organisation to organisation. **The model itself is not important, it is the process of the common preparation and acceptance of the model which is relevant** as it will reflect the mainstream ideas inside the organisation with respect to the concept of knowledge.

Having clarified the basic assumptions I shall show another possible and acceptable maturity model in order to illustrate how the method works. Suppose that

- knowledge management is to be implemented in order to improve the efficiency and effectiveness of the firm.
- The parties concerned agreed that the first step of the implementation should be the exploitation of existing knowledge. Only after this step shall the creation of new knowledge be considered.
- The existence of both individual and organisational knowledge is accepted.
- The maturity model is expected to be easy to communicate.

On the basis of these assumptions a KM maturity model can be proposed that has the following levels:-

- **Initial.** Managers of the organisation do not attribute any specific importance to knowledge. Knowledge management is often considered as black art or lip service, and its activities are simply equated to managing information. The challenge on this level is how to attain the awareness of the management.
- **Knowledge Discoverer.** At this level the organisation is aware of the importance of its existing knowledge but still considers it as a form of information management. The primary focus of interest is defining, scanning and distributing the existing knowledge. The main challenge is how to codify and deploy the discovered knowledge. The approach of the implementation is mainly technology-based. Typical technology-based tools needed on this level are textual database management systems, intranets, decision support systems.
- **Knowledge Creator.** At this level the organisation is seeking the creation of new knowledge in order to build new competitive advantages. Management accepts KM to be justified and provide the necessary resources. The primary focus is on finding the required new knowledge that serves the interest of future business. Top level management is committed to knowledge management and accepts its existence. The challenge is how to understand future business needs and to make forecasts on the business environment. Exploration of knowledge is reached by broad-based approaches like brainstorming, mentoring programs, core competencies approach, learning organisation approach and human resource approach (see Wiig 1993). Technology plays only a secondary role.
- **Knowledge Manager.** At this level knowledge management is institutionalised in the organisation. There are individuals and/or organisational units dedicated to knowledge management (there is a knowledge management function). The knowledge management function has formal, documented processes. Knowledge processes are measurable, therefore quantitative control is possible. Knowledge management interfaces with the quality management function. Primary focus is on balancing the available resources between discovery and creation of knowledge. Knowledge management is expected to support preserving competitive advantages

as well as creating new ones. Sophisticated technology-based tools of knowledge creation like knowledge engineering data mining are consciously applied.

- **Knowledge Renewer.** At this level the scope of knowledge management is broadened to the alliances of the organisation. The primary focus of interest is to share knowledge with other organisations, and to exploit common ways of knowledge creation. It is done for the sake of common business interests. The KM function improves itself continuously.

Table 16. summarises the characteristics of the levels from "Discoverer" to "Renewer".

| | **Discoverer** | **Creator** | **Manager** | **Renewer** |
|---|---|---|---|---|
| **Focus** | Scanning existing internal and external knowledge. | Creation of new knowledge | Optimal allocation of resources | Inter-organisational co-operation |
| **Key processes** | Scanning<br>Appraising<br>Capturing<br>Transferring | Commitment<br>Understanding business needs<br>Innovation | Institutionalisation<br>Documentation<br>Measurement | Sharing |
| **Challenge** | Codification, transfer | Understanding the environment and the trends | Integration | Achieve confidence |
| **Tool** | Technical | Non-technical | Technical | Non-technical |
| **Pitfall** | Wrong appraisal<br>Dependence on technology | Waste of resources | Having an end in itself | Vulnerability |

*Table 16. Characteristics of the levels of the example maturity model (excluding "Initial")*

This model reflects the assumption that certain precedence rules must be followed, i.e. one cannot speak about institutionalisation until well established processes exist inside the company. We cannot speak about inter-organisational KM until KM is established within the organisations. There could be other possible ways of the introducing a KM function, i.e. to build an appropriate, stimulating environment for knowledge sharing (Davenport, de Long and Beers 1998), but this would contradict with one of the stated assumptions.

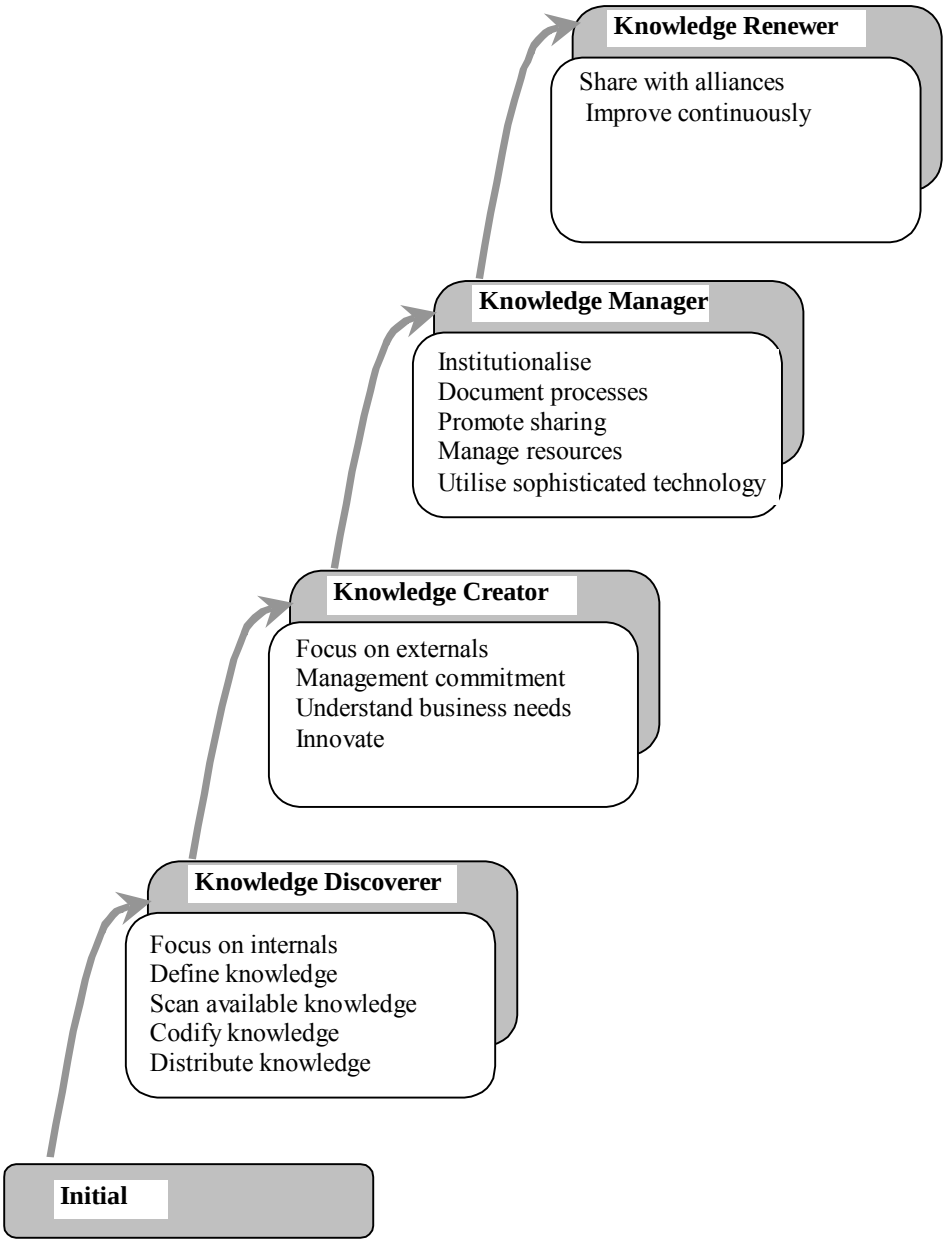


*Figure 13. A possible knowledge management maturity model*

# V. THE PROCESS AND THE DELIVERABLE OF MAPPING

This chapter deals with the description of the mapping process on one hand from a theoretical point of view and on the other hand on the basis of the investigated case studies. The comparison of the theory and the resulting experience can be found in Chapter VI. (case studies).

The basic idea is that the mapping of knowledge can be carried out similarly to the analysis of requirements during information systems analysis (CCTA 1996). Requirements are collected and compiled in a structured catalogue during requirements analysis. The deliverable of this work is a requirements catalogue. In this catalogue requirements are described in textual form; for each catalogue entry it is documented who and why posed that requirement and there is also a hierarchy and cross-reference of entries based on their relationships.

On the basis of the analogy of requirements analysis the deliverable of knowledge mapping is the ***catalogue of knowledge elements***. I use the expression "knowledge element" instead of "knowledge" because it expresses better that I speak of a certain part of the existing knowledge of the company. It should be noted that this interpretation of "knowledge element" is different from what Wiig calls "knowledge element" who uses his concept within the context of a specific case, as a part of it. During the preparation of the thesis the expression "knowledge asset" was also considered. This expression would reflect that it is an asset which is valuable for the company. I considered this expression a little bit clumsy, it also would pinpoint the stress on viewing knowledge as an object. I concluded to the consistent usage of "knowledge element".

A knowledge element can be viewed both as an object and as a process. Blackler has the view that knowledge should be investigated as a process (*knowing*) rather than an object and it should be examined from the following aspects: (i) *knowing as mediated:* it is manifested in systems of language, technology, collaboration and control; (ii) *knowing as situated:* it is located in time and space and specific to particular contents; (iii) *knowing as provisional:* it is constructed and constantly developing, (iv) *knowing as pragmatic*. it is purposive and object-oriented (Blackler 1995). Therefore one has to describe a knowledge element both as an object and as a process.

A knowledge element is to be entered in the catalogue only if it is required by business objectives (from this point of view it is the same as a requirement). Putting it another

way, activities related to a knowledge element should always be connected to business objectives and interests[7]. For example if a knowledge element happens to be identified during mapping which serves the interest of such a business branch which is to be sold in the near future then there is nothing to do with that knowledge element.

The catalogue of knowledge elements will not describe the content of the element in a formal way, it ***identifies*** that element instead. I.e. if the knowledge element is "agent knowledge" of a merchandising company, then only its characteristics should be described in the catalogue but its content needn't be elaborated on (see V.2.2.). The decision of what to do with individual knowledge elements can be made with the help of the catalogue.

Collecting knowledge elements into one single catalogue serves the purpose of creating the same understanding of this concept among the employees of the company. The commonly accepted and shared understanding of the concept can contribute to the success of the KM initiative (see II.4). In the spirit of the approach of Venzin et al. (see II.2.1.) it is not important what the concrete common understanding is. What is relevant, though, is that the shared concept should be used in a consistent manner. The existence of the catalogue helps this process.

Knowledge elements can stem from inside the company (including its members and groups) but they can stem from the outer world. A typical example for such outer elements are the competitive intelligence systems.

## V.1. Types of the Mapping Process

The company has to clarify what knowledge elements are within the scope in any case whether be it about to start a KM initiative or to implement a KM function. We can say that in such situations the mapping process is ***project-like***. A set of activities I call project-like if (CCTA 1998):-

- it is a one-off (not repeated) set of activities,
- the activities result in predefined deliverables,
- there are predefined resources for the activities,
- deliverables are to be made according to predefined quality requirements.

[7] This view was supported by all case studies.

The ultimate deliverable of a project-like knowledge mapping is the catalogue of knowledge elements which is to be managed later on. The catalogue contains elements within the scope of the mapping project.

One must ensure maintenance of the catalogue of knowledge elements, too. Maintenance is an ***institutionalised*** activity rather than a project-like one. During maintenance elements that do not serve the interests of the business any more should be abandoned; new necessary elements should be entered. In this way we can distinguish between two types of knowledge mapping: project-like and institutionalised ones.

*V.1.1.Project-like Mapping*

In the case of project-like mapping the common project management techniques should be implemented in the context of knowledge mapping. The project should be prepared: its scope should be set; the company should be divided into areas of investigation (business areas); a project organisation should be set up; previous related activities should be investigated; project plans should be created and, finally, the project should be started.

***Roles in the Mapping Project***

As in all projects, members of the organisation should fulfil different roles during the project. The following roles are needed:-

- **a project sponsor** whose interest is that the project should be successful. It is expected from the sponsor to support the activities of the project. In an ideal case the sponsor is committed to the project and he believes in its success.
- **a project board** where there are senior representatives of the business areas. This committee has the task to provide quality assurance for the catalogue of knowledge elements.
- **business area nominees** who participate in the work of the mapping project team. This is a very important role that should be fulfilled by confident and reliable persons who could be counted on serving the interests of their own business area. Knowledge of the business area is a necessary prerequisite (sine qua non). Business area nominees help the team to get trust on the areas. Note that in most cases it is not enough to have business area nominees, it pays if an external viewer can help the process.

- **a project manager who** is responsible for the project. Her/his most important task is to ensure that the catalogue of knowledge elements is created on time, with the resource constraints and on predefined quality levels. The project manager writes the project plan and she/he reports to the project board.

### *Scoping and Planning*

The task of the scoping and planning stage is to define the describing structure of the knowledge elements as well as to work out a detailed plan of the mapping activities. Before attempting the project it has to be made clear why the management of the company considers starting the mapping process to be important. Having done that there is need for decisions in certain questions:

- which areas of the company will be within the scope of the mapping. The scope might be restricted - i.e. only the financial area will be investigated. The decision is up to the momentary needs of the company.
- in what manner will the business areas be defined. Relevant personnel will be needed from each area.
- what is the time horizon of the knowledge elements. It is rarely worth planning for shorter than three years and longer than five years in such strategic level planning.
- what roles should be fulfilled, what will be the organisational background.

Having set the time horizon and the scope of the project a detailed project plan should be prepared. Before or during writing the plan it is possible to collect relevant data from all parties within the scope of the project and to collect the names of the possible interviewees. Interviewees will help in the identification of the knowledge elements, however, they do not have to provide a detailed description of their contents.

### *Starting the Project, Collecting Previous Results*

The first step of a mapping project is always to collect, process, analyse and systematise the existing data. A large proportion of the data will refer to codified data (databases, systems etc.), however, it can be tales or gossip, too.

***Fieldwork, Description***

Knowledge elements should be identified with help of the previously named interviewees and business area nominees. Knowledge elements should be individually categorised and characterised according to their business importance (see later).

***Approval of the Catalogue, Project Closure***

A necessary condition of the project closure is that the project board approves the catalogue. For each knowledge element a responsible persons should be named. However, elements can be grouped, too in such cases subject matter specialists (who are responsible for the groups) are to be appointed.

*V.1.2.Institutionalised Mapping*

If there is a catalogue of knowledge elements then it should be kept up-to-date. This can happen basically in two ways:

- the responsible person for a certain area can propose to enter a new element or to abandon an existing one. This is a bottom-up process in which employees working in the area could be involved.
- In areas considered to be important by the top management managers can request to enter new elements or to delete certain ones. With this mechanism it is ensured that elements in the catalogue serve the interests of the business.

Institutionalisation can be implemented with the help of internal rules and job descriptions.

Institutionalised mapping is like taking an inventory. Having verified the basic assumptions, that is the business objectives, each knowledge element should be separately investigated whether it is needed and its current description fits into the current requirements. Starting from the objectives and activities of the company and it should also be investigated if a new element needs entering. All in all the outcome of the institutionalised mapping can be:-

- changes in the description of certain knowledge elements,
- deletion of some elements from the catalogue and
- insertion of new elements into the catalogue.

## V.2. Description of Knowledge Elements as Objects

Knowledge elements as objects can and must be characterised from different aspects. The importance of the knowledge element must be based on a business objective. If a knowledge element is considered to be important, it must be ensured that it can be transferred to others and for this purpose, it is necessary to examine the characteristics of transfer. Finally, it is necessary to determine the current holders and owners of the knowledge element in order to retain it.

### *V.2.1. Classification of Knowledge Elements According to Importance*

The basic characteristic of an identified knowledge element is its importance from the aspect of the business objectives. The classic Boston-matrix technique, where one dimension is the current importance of the knowledge element and the other dimension is its future importance, is well suited to determine that importance. It is essential to identify this characteristic for each knowledge element, since management can use it to determine the necessity and level of knowledge preservation. For instance, if the company is engaged in the implementation of enterprise resource planning systems (ERP) the related knowledge could be very important now, but due to the decrease of the green field ERP market, the importance of this knowledge element could decline.

An other aspect of the examination is the business branch or activity for which the given knowledge element is important. I suggest the use of the matrix technique for this purpose, too, with the rows being business branches and the columns identified knowledge elements. A matrix cell is to be marked if a certain knowledge element is important for a certain business branch. With the help of this matrix it must be recorded in the knowledge element catalogue which knowledge element is important for which business activity. Should this matrix an empty row that would mean that no important knowledge element has been identified for a business branch, and should it have an empty column that would mean that a certain knowledge element is not important for any of the business branches. With the suitable permutation of the rows and columns, the matrix can probably be transformed into a quasi block-diagonal matrix, which means that each business branch group has its well defined set of important knowledge elements.

Finally, the examination of the relation between business goals and knowledge elements could also be important, especially if the business goals are well articulated. As in the previous case, the rows of the matrix are the business goals and the columns represent

the identified knowledge elements. A cell of the matrix should be marked if a given knowledge element is important for a certain business goal. With the help of this matrix it must be recorded in the knowledge element catalogue which knowledge element is important for the achievement of which business goal. Should this matrix have an empty row that would mean that no knowledge element has been found for a certain business goal, should it have an empty column that would mean that the knowledge element is not important for any of the business goals.

### *V.2.2. Description of Knowledge Transfer of the Knowledge Elements*

Snowden classifies the knowledge elements identified as a result of knowledge mapping into the usual explicit-tacit dimension (Snowden's term for knowledge elements is *knowledge assets*). The purpose of this classification is to identify the suitable modes of knowledge transfer. In Snowden's view, the storage media (*artefact)* should be identified and used in the case of explicit knowledge elements, whereas in the case of tacit knowledge, it is necessary first to determine whether this knowledge can be made explicit, and if not, the community bearing the tacit knowledge should be created or sustained (Snowden 1998a, 1998b).

In summary it can be said, that a single feature of the knowledge element, namely whether it is explicit or tacit will determine how the knowledge element could be transferred or shared. This idea can be further elaborated by using a multi-faceted characterisation of the knowledge element as object, instead of the explicit-tacit dichotomy. In the classification scheme proposed by Collins and Blackler there are five features of knowledge as (seeII.2.2):-

- encoded;
- embodied;
- embrained;
- encultured and
- embedded.

Two additional features of the Collins and Blackler classification must be considered for practical purposes. Firstly, a knowledge element can have several characteristics simultaneously (from the five categories defined above), that is, the classification is actually ***multispectral***. To illustrate the multispectral feature of the classification, sup-

pose for instance that there is a shortage of good traders at the company, that is, the necessary knowledge element is *„agent knowledge"*. In this case, this knowledge element will have

- an encoded feature: the agents must know at least superficially the features of the products to be sold;
- embodied feature: agents must have proper empathy to convince wavering potential customers;
- embrained feature: the agent must understand the requirements of the customer, and must picture it on the product palette offered by him,
- encultured feature: the agent must know the characteristic habits, notions of the target group in order to have successful communication with them and
- embedded feature: the agent must know the reporting mechanism, the ordering procedure of the company.

Let's look at another example. The homepage of a company should be taken care of, that is, the required knowledge element is the *"webmaster knowledge"*. Supposing that the webmaster must get the data and prepare it for displaying. This knowledge element has the following features

- the encoded feature: the webmaster must know the software element used to modify the homepage and the HTML language used to make the homepage;
- embodied feature: a suitable speed in the handling of the homepage making software is needed (e.g. the need for fast typing) ;
- embrained feature: both the readers of the homepage and their needs must be known;
- encultured feature: in an ideal case, a homepage fitting to the company image must be developed and
- embedded feature: the computer operation order and the time and procedure of the meetings held by the marketing division must be known.

Let's take the third example from a software company engaged in application development. Correct understanding and overviewing correctly the requirements are key issues for the development of software applications. This explains the great demand for ex-

perts in systems analysis and thus „systems analyst's knowledge" is a knowledge element of critical importance. Therefore it is necessary to have

- knowledge accessible in an encoded manner: the systems analyst must know the system development methodology used at that company, the technique of its documentation and the tools required to prepare the documentation;
- embodied knowledge: the analyst must inspire confidence to ensure good working environment in the course of the interviews hoping for greater success;
- embrained knowledge: an analyst should have good analytical and abstractive ability and capacity;
- encultured knowledge: the effective application of the system development methodology depends on the receiver company culture and
- embedded knowledge: in what way and detail and how often it is necessary to report on the progress of the work and in what detail.

Returning to the example about the agent: if his company deals with technical products the encoded part of the knowledge might be of the utmost importance. However, the embodied part of the knowledge could also be the most important part for instance for a company selling luxury articles.

Thus, we can speak about the *importance* of the different features - in the above sense - of knowledge, evaluating them on a scale of five: unimportant – slightly important – important – very important – essential. The concrete value of importance depends only in part on the transferable knowledge, it actually depends on the place, context and the evaluator. The context can always be defined within the knowledge of the company's interests and goals.

The importance and value of knowledge within a context, just like beauty, exists only for those who see them. The knowledge of the COBOL programming language for instance nowadays is rare, it is curious and worthless for many companies. Where legacy systems operate however, which were developed in COBOL language, this knowledge could be worth a fortune until those obsolete systems are replaced by new systems developed with new technologies. The relativity of the value of knowledge shows that the classification of Collins and Blackler is temporary, provisional or in other words ***temporal***.

The temporal character of the classification means that the weight of the different features, i.e. what the most necessary aspect within the examined knowledge is, depends on the momentary needs of the company.

Having identified the knowledge element and studied all the five features, each feature can be scored by importance on a scale of five. The result of the classification can then be shown in a radar diagram. The common point of the diagram axes corresponds to the ”not important” value while their end point to the ”essential”. By marking the importance of the different knowledge features on the radar and connecting up the marks of the neighbouring grids, a pentagon emerges, reflecting the characteristics of this particular knowledge element at a certain time. The use of this technique provides a possibility for fast overview. This technique has been used in the field of KM for other purposes as well (Earl and Scott, 1998, Earl and Scott 1999).

For the example of the agent, the pentagon could for instance be like this:

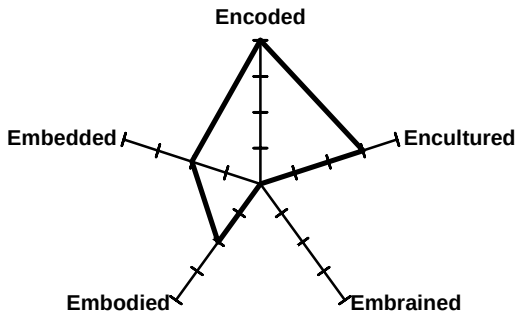


*Figure 14. A radar diagram showing the character of a knowledge element*

According to the above figure, the encoded character is the most important feature in the agent’s knowledge, that is, product knowledge, and the good knowledge of the customers’ language, habits. He should also have a certain persuasiveness.

A radar diagram like the one above will help to decide how the transferability of the knowledge element can be ensured. During the course of preparation of the knowledge element catalogue when knowledge elements are described as objects, a radar must be prepared for each knowledge element. The actual scoring, the classification along the different dimensions will depend on the situation and the environment.

*V.2.3. Description of the Knowledge Element by its Holder*

The description of a knowledge element as an object includes the designation of the person or group who currently is in possession of that knowledge. The level at which the owner of the knowledge is should also be recorded.

The designation of a group does not necessarily mean the designation of an organisational unit. Owners of a knowledge element are often concentrated into informal communities. ”Communities of practice (CoP)”, the term used in literature, fits these communities. Thus, the analyst must be fully familiar with the place when mapping the knowledge elements.

It is important to designate the person or group in possession of the knowledge element as whenever new individuals wish to learn this knowledge element, the help and cooperation of that person or group will become necessary. It is not possible to separate the actual contents of the knowledge element from its holder, for instance if a person is versed in statical planning this does not mean that he also knows the rules of thumb of architecture or the novelties of the profession not taught at school.

It is not easy to determine the level of knowledge, either (see Wiig 1993, Chapter II.2.2), since proficiency in the field is needed to determine it. The accumulated experience measured in years and the application of that knowledge in distinctly different areas may help the classification..

## V.3. Description of the Identified Knowledge Elements as a Process

When one describes the identified knowledge element as a *process,* the manner of the creation, conservation, development and change of the knowledge element is to be considered.[8]. The primary instrument for the process-based description is the textual documentation. Should there be a sequence or parallelism in the process, it should be displayed graphically, too.

Returning once again to the example of the agent, the process for the development of the agent's knowledge could be the following (if the agent is a freshly graduated university student):

- the new agent is trained at a five days sales training;

[8] None of the examined cases (Chapter VI.) described knowledge elements according to their process aspects.

- the new agent accompanies an experienced agent to his negotiations for three months;
- the three months are followed by a three months trial period (as junior agent). During that time he must report weekly to his boss. All other junior agents receive the written version of his report.
- If the junior agent proves himself, he is employed for a year. He has to take part in the agents' meeting every quarter, where everybody must tell an interesting story connected with his work. The colleagues give scores for the stories and the person who told the best story wins a two persons' holiday.
- From time to time the agent receives information about new products. After receiving such information everybody must take a test on the properties of the new product.
- Once a year the company's experienced agents with lots of practice overview the new tricks of trade and hold a two days' practical training for the others.
- From time to time experienced agents are coaxed away from the competition and they must give account of their sales practice.

It can be seen that at this (hypothetical) company serious attention is paid to the permanent training of the agents and to the homogenisation of knowledge. Consequently, it will take a longer time, even years, a novice to reach the average agent's performance.

The example above also demonstrates how important it is to note the actual level of knowledge concerning certain knowledge element, as this reference point helps to define the required level of knowledge where a given person or group is to be taken (see Wiig 1993). Characterisation of the knowledge element as an object helps in defining the way to reach the desired level of knowledge.

The following aspects must be taken into consideration during the description of the process:

- how does the initial level of knowledge, from where the person or group starts, evolve,
- do we deal with individual or group level knowledge,

- which are the regular activities that serve the understanding and forming of that knowledge element;
- in what way does the knowledge element develop and who participate in the development.

Taking up once more Blackler's ideas, when describing a knowledge element as a process, i.e. as knowing, besides the aspects described above, the following feature must be examined, too:

- *knowing as mediated,* as it manifests itself in language, technology, collaboration and control systems. In the agent's example this could mean that the agent can get very detailed marketing data about his territory by querying suitable databases or that he himself provides data continuously to the customer relationship management (CRM) system of the company and uses data from it. Thus, agent activity becomes more and more complex.
- *knowing as situated.* In the agent example it is important to examine the regular agents' meetings, and their meaningfulness.
- *knowing as provisional.* In the agent's example this is the aspect of the permanent review of knowledge.
- *knowing as pragmatic.* In the agent's example this refers to the examination of the agent's sales.

The results of the examinations must be documented (in textual form) in the knowledge element catalogue. This description will have a special problem, namely who its target audience is. In other words, what is the expected knowledge the reader must have in order to understand the content of the catalogue. When a knowledge element is described as an object this problem either does not arise or, if it does, it arises in part only.

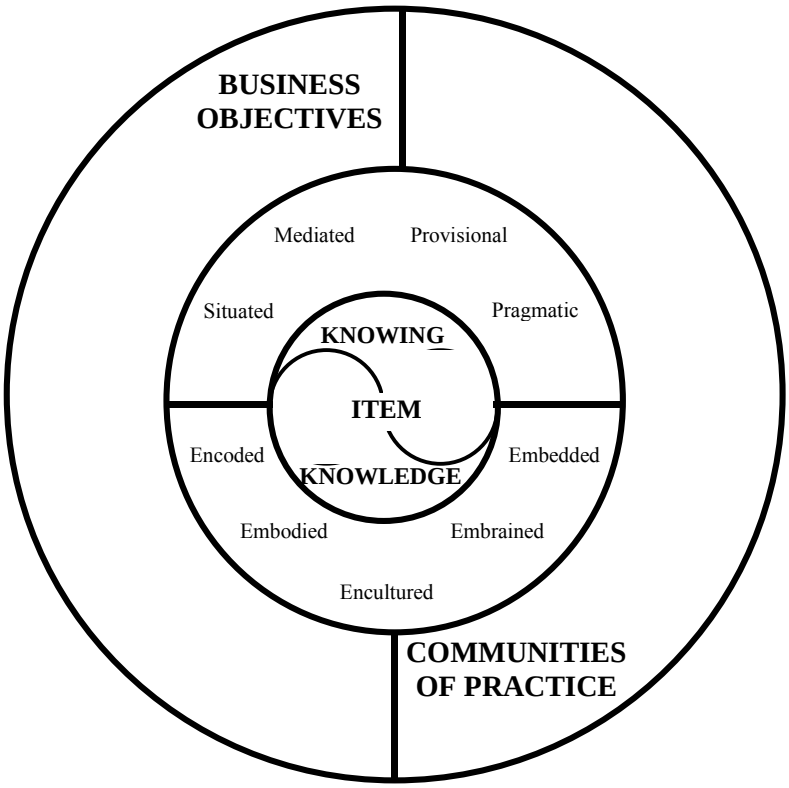


*Figure 15. Description of knowledge and knowing.*

## V.4. The Volume of Resources Devoted to Mapping

I have assumed that knowledge mapping is the first step in any kind of KM initiative. Thus, all factors which have a positive effect on a KM initiative or project will have a similar effect on knowledge mapping, too.

It is common to quantify the intensity of the innovative activities directed at the creation of new knowledge. The number of patents submitted each year for instance is extensively used to characterise it but there are other indicators, too (e.g. the ration of R+D expenditures to the annual revenues or the annual profit, see Winter 1987, Bierly and Chakrabarti 1996). A company, proven to be innovative (when established by figures), for instance is often worth more. The valuation naturally depends on the company's business sector. For a company in the pharmaceutical industry innovative capacity could have far more weight than for one in agriculture.

Knowledge mapping is similar to the literature investigation phase of a research-development, to the activity laying the foundation for the creation of new knowledge. While the researcher reviews and systematises articles and new research results, the

manager surveys and then evaluates the important data, information and knowledge of the company and the relevant external environment.

Since the research focuses on knowledge mapping, it seemed obvious to examine if the companies quantify the volume of resources expended on the mapping, and measure the intensity of knowledge mapping (IKM for short). If the company expends resources on knowledge mapping the question of the returns of the activity aimed at knowledge mapping will obviously arise. Expenditures should be measured in order to show returns. The use of the term "intensity" means the projection of the expenditures onto a certain basis, theoretically this would render the efforts of the companies comparable (leading towards the notion of comparison, i.e. benchmarking of knowledge mapping).

Indicators suitable to measure the volume of resources expended on knowledge mapping are for instance:

- the ratio of the time expended on knowledge mapping to the total working,
- the absolute or relative rate of material expenditures expended on knowledge mapping (according to wage per hour, etc.).

The measurement of IKM assumes that the company is able to identify and monitor the periods when knowledge mapping is in progress. Without this, no authentic picture can be drawn. In this aspect knowledge mapping is very different from R+D activities. While the latter is usually carried out in from of projects only, and under strict resource control, KM does not always appear as an independent, designated activity, but activities pursued for other reasons are given this label. This is especially true for knowledge mapping not carried out in project form (not institutionalised). Consequently, the measurement of IKM in practice seemed a very hard task.

### *V.4.1. Factors Affecting the Volume of Resources Expended on Mapping*

There are a number of factors that could affect the volume of resources expended on mapping, such as:

- **The size of the company.** I used the number of employees to measure the size of the company. The large number of employees is often accompanied by the geographic dispersion of the company, which causes communication problems. Where there are a lot of employees, finding the knowledge and delivering it to the proper place at the proper time always represents problems. Thus, the larger size of the

company causes a relative increase in the volume of resources expended on knowledge mapping. The relatively large size of the company results in a „larger" amount of knowledge accumulated in the minds of the employees (in a shannonian sense, Shannon 1948). This is the basis for the assumption that the efforts expended on mapping the knowledge of a „large company" are relatively bigger than in the case of a smaller one – irrespective of the company's activities being knowledge intensive or not. Thus, we can count on the fact that activities, which are currently called KM have already been carried out at the company.

- **The knowledge intensive nature of the company.** A knowledge intensive company sells knowledge to its customers. The more times it can sell the same knowledge to the more people, the bigger the revenue is the company can realise. This is why resources expended on knowledge mapping at a knowledge intensive company will be greater. Actually, there is a single common factor behind the size and the knowledge intensive nature of a company: the complexity of production. Thus, another way of formulating the expectation could be that the more complex the production at a company is, the more attention will be paid to knowledge mapping.
- **The approach of the competition to KM in the company's business sector.** This is an organisation institutionalist approach statement: if the cultivation of KM had become a condition of competition and customers expect it, then this would be an requirement to the access to the market. In the market of professional consulting companies for instance, all actors of the market worth mentioning already have some sort of KM function.
- **The commitment of the senior management to KM.** The start-up of a dedicated KM project or the appointment of a Chief Knowledge Officer (CKO) for instance, would indicate management interest. The senior management decides resource requirements. If the field is important to the senior management, a greater inclination will be shown for the allocation of resources.
- **The monitoring of intellectual capital indicators.** For companies where the magnitude of intellectual capital is defined by indicators, the improvement of the values of the indicators will become an objective. One of the ways of the improvement is through the better utilisation of knowledge, which presupposes knowledge mapping.

- **The fluctuation of the company's staff.** According to my basic assumption part of the knowledge required for the operation of a company will always remain in the minds of people (see Chapter III.1). Therefore if the number of people leaving the company and the number of new entrants is relatively high this will probably demand that knowledge be mapped. If the new entrants are to occupy mid or senior management positions, transparency will be especially important for them. One of the results of knowledge mapping is exactly that it ensures a better understanding of company goals and activities.
- **The connection of the company's core activity to IT.** The closer the company's core activity is connected to IT the more often it is thought that knowledge equals to information, and thus, technical KM solutions are sought. Therefore, in the case of companies with a closer connection to IT, the intensity of knowledge mapping will probably be greater, as the IT tools are available.
- **The quality orientation of the company.** The consequence of a company's commitment to quality is that the available knowledge must be continuously recorded. The possession of the ISO 9000 certification, the presence of a separate quality department or quality related body (for instance quality circle) are signs of quality commitment.
- **To what extent does company culture support knowledge sharing.** All reports describing KM applications deal with the importance of the existence of a proper company culture. The knowledge sharing culture quite naturally contributes to drawing up a more exact picture of the knowledge available at the company, that is to relatively more resources being expended on knowledge mapping.

Unfortunately, none of the companies I have examined measured any indicators regarding the intensity of knowledge. Thus, it was not possible to carry out any concrete examination of the above expectations.

# VI. CASE STUDIES

KM is not very well known among Hungarian companies (KPMG 2000b). Thus the selection of the companies to be studied was not easy at all.

A pioneer conference *„Knowledge Management, Knowledge Economy"* organised in Budapest in April 2000 by a company engaged in organisational development and human resources consulting was of great help in finding suitable companies. (Since then a similar event was organised by the EVK specialised college of our university in 2001). In this conference, besides international experts, three Hungarian companies also presented their views. It seemed an obvious choice to study their practices.

- At the first company, the conscious implementation of the KM function is in progress. A project has been set-up for the purpose, the implementation of KM began within this framework after exhaustive preparations.
- At the second company, the conscious building-up of a KM function is absent. The size and complexity of the company, however, has long led to the necessity of homogenising and institutionalising the available knowledge. I studied this company in connection with the use of Lotus Notes, often referred to as a KM tool in literature.
- The third company met KM in the framework of a project started in consequence of a concrete problem.

All case studies start with the presentation of the company, using data provided by the company reports (these were easily available as the companies are listed in the Budapest stock exchange). Next the company KM institutions are described, followed by facts observed and experienced. The case studies close with a summary evaluation.

## VI.1. First Case: Conscious Building-Up

The company in question is an integrated oil and gas company, one of the determining actors of the Hungarian economy, whose shares are traded in the Budapest and the Luxembourg stock exchange, as well as in the London SEAQ. The company's majority owners are foreigners. The company's activities include oil and gas exploration, exploitation, refining and marketing both for corporate and retail customers. In 1999 the company owned a total of 447 filling stations in the region. In Hungary, prices in the oil business are uncontrolled, whereas they are controlled by legislation in the gas business. The company is part of a larger company group engaged in related services.

The net revenues of the company totalled 634.2 billion HUF in 1998 and 742.6 billion HUF in 1999, and it employed 18,000 people full time in 1999.

The globalisation of the oil sector posed a number of challenges to the company. Multinational companies are looking for expansion opportunities in the Central and Eastern-European region, and Hungary's approaching accession to the European Union has brought new tasks, too. Globalisation permits comparison as benchmarking data are available about the companies of the sector. The goal of the examined company is to achieve a performance level positioned in the upper quarter of the sector.

For efficiency reasons the company is in the midst of a large scale staff cut-back, the number of employees was reduced by 1700 in 1999, and it is the company's intention to effectuate an annual average reduction of 12% (at group level) in the number of employees.

Furthermore, a cost saving program was initiated to reduce administrative and organisational costs. The goal is to attain a yearly reduction of 100 million USD until 2002. The improvement of capital efficiency is to be achieved through the introduction of strict resource allocation regulations. Company hierarchy levels have been reduced from eight to five, the number of organisational units has been halved. Professional people with experiences acquired at international companies were appointed to senior management and mid-management posts. The company intended to increase retail trade in an aggressive manner while reducing operating costs. A business process re-engineering project was started and certain support services were outsourced.

The company focused its business branch portfolio. Rationalisation was carried out in the fields of supply, refining and logistics, plants operating with a high overhead were closed down. The chemicals portfolio was rationalised, too. The exploration portfolio was narrowed down to domestic exploration to achieve risk reduction.

Acquisitions were carried out during the course of regional expansion, which is part of the company's strategy. The goal is to attain a regional consolidating role. The criteria of strict capital efficiency, simplicity, efficiency and transparency must be complied with during the course of investments.

The objectives of health protection, safety and environmental protection are points of special importance within the objectives of the company, annual reports are published about them.

*VI.1.1. The Background of Knowledge Management at the Company*

It is known that the multinational companies of the sector (Shell, BP see for example Davenport and Prusak 1998, Wakin 1998, Brennemann et al. 2000) had initiated KM programs earlier. The importance of the matter was obvious for the senior management arriving from multinational companies, and thus, on their initiative, the Knowledge Application Project was kicked-off at the end of 1999. The aim of the project was the development of the company's (and not the company group) Knowledge Management Strategy White Paper, with a time horizon of three years.

An outside (Hungarian) expert versed in the matter was appointed to manage the project. This expert had participated in the work of a scientific consortium[9], with the aim to prepare a KM methodology financed by the European Commission, and thus he had arrived with ready made plans on how to prepare the knowledge strategy. As a result of the support received from the senior management, the company's larger divisions made part time staff available to him, and ensured contacts with the parallel projects aimed at the recasting of the company.

The project for the preparation of the knowledge strategy document presented their findings after four and a half months, expending a total of 12 manmonths' work. The document was approved by the senior management in March 2000. In the introductory part of the knowledge strategy they defined the meaning of knowledge and knowledge management in their usage, as well as that of the related basic terms such as the balance of intellectual knowledge and the knowledge process map. Later the emphasis was put on concrete activities and interpretation of the basic concepts was not further discussed.

The classic gap analysis technique was used in the strategy. During the elaboration of the vision, the company used the business goals of the company as a starting point, to which knowledge management objectives were subordinated. For the purpose of assessing the knowledge needs, knowledge elements at the divisions were mapped out.

The document presented four general knowledge strategies, and the most suitable one was selected from among them. The general strategies differed in the order allocated to knowledge sharing and in the expansion of use. The authors of the document proposed the company to focus first on the utilisation of knowledge, and this meant the setup of a knowledge inventory.

[9] Referring to the Know-Net Esprit project (EP 28928) mentioned earlier.

The document went beyond the framework of a traditional strategy by including a detailed tactical (implementation) plan, too. The authors proposed a holistic approach and did not stop at technological developments only. An action plan, in order to build-up a proper environment, was submitted where among others the organisational issues of KM, the development of the culture promoting knowledge sharing, and the selection of the suitable technology were discussed.

The knowledge strategy document included ten potential pilot application fields. Two were chosen from among the potential applications by the senior management on the basis of their effect on business, the availability of existing practice and resources, as well on risk factors. Quick success was an important aspect. For both chosen applications the objectives set-out were the strengthening of existing work processes and the improvement of their efficacy and efficiency. One of the applications chosen was the competitive intelligence project (CI project for short) and the other one was the EU regulatory and lobby knowledge base (EL project for short). I had the opportunity to observe the process of knowledge mapping in the latter.

The company appointed a knowledge management officer, KMO, subordinated to the chief information officer, CIO. The knowledge management officer came from the human resources management field and hence, had a balanced view of the field of knowledge management, that is, was he not biased towards technology. The CI and EL project plans were planned by the knowledge management officer.

*VI.1.2.Description of the Project and the System*

The users of the EL system are scattered in Hungary and work in a number of plants, thus contacts and knowledge sharing have always represented a problem. The EL system could be understood as a system that made the previous technical infrastructure for knowledge sharing more sophisticated. Earlier only a network file server with common access was used, where file structures reflecting time sequence were set-up. Information retrieval was cumbersome for users from the file server. The data suppliers of the EL system, that is the users acting as experts are a team with a long record of common work.

The EL project turned out to be a purely technical project, namely the development of a system in Lotus Notes. The system can be accessed through the company intranet with

the use of a browser (in accordance with the Notes architecture). Other technical actions identified in the knowledge management strategy, however, were not present here.

The kick-off of the EL project and the allocation of the necessary resources were carried out in conformity with the internal procedural regulation of the company. The project had a project sponsor versed in the activities of the area and he was committed to the successful implementation of the system. The overall objective of the EL system was to help the people in the company involved in preparing and making decisions to become acquainted with the national regulatory environment and with that coming from the European Union, and to enable them to overview quickly the external and internal background material in connection with the preparation for prospective changes. Thus, on the whole, the system was intended to improve the efficiency of decision preparation.

The reference data required for the operation of the system (databases in Lotus Notes terminology) are the following:

- database of system users and the involved staff of the company,
- database of company facilities,
- database of external contacts (the contact data of the institutions and their contact persons connected to the company).

The above reference data are static, hardly showing any change with time. Each database has a designated data owner responsible for its contents. The reference data were taken from other computer records already available at the company. The substantial databases are the following

- the database of regulatory updates, which includes the sources of law, standards and their analysis, in connection with the company's activities, and
- the database of lobby issues which links up the reference data.

The issued were categorised into topics. Each topic had already had a person responsible for it (for example a topic is the issues relative to the quality of oil). Due to the geographic dispersion of the users it is the responsible person for a topic who is in the position to check if the data relating to the issue were entered into the system. People responsible different topics meet in person once per month.

An issue can only be put into the system with proper manager authorisation. The issues, besides being categorised into topics, are marked with keywords from a three-level thesaurus, in order to aid retrieval.

Update of the reference data is institutionalised, and solved through directives and compliance with procedures similarly to the procedure followed concerning the important details of transactions. It is for instance an objective to capture electronically all letters which were sent to a governmental authority, and this is achieved through the directive of a corresponding regulation.

The users can be divided into two categories, those responsible for the preparation of decisions and the decision makers. The scope of system users is being enlarged gradually. The initial group of users were trained in organised training and will further train new users eventually. Initially the staff responsible for processing the cases, and those working in the preparation of decisions were involved in the use of the system.

The measure of the EL system's success would be the number of cases entered into the database and the number of times the material and documents in the system were read. At the time of writing the thesis the system was being uploaded with cases and decision makers were being gradually involved into the use of the system.

The project, though the technical tool used (Lotus Notes) was new for the company, was implemented in a very short time. An operating version was achieved in four months.

### *VI.1.3. Mapping Knowledge in the Case*

We can talk about knowledge-mapping several times in the case of the company and elements of the proposed theoretical model could be clearly identified.

#### ***Knowledge-mapping in the course of the development of the knowledge strategy***

During the preparation of the knowledge strategy document a knowledge element mapping exercise was carried out concerning all business branches within the scope of the strategy. As a result 44 key knowledge elements were identified. In order to ensure the full scale analysis of the field, the so called "360 degrees" criteria system was used.

From the aspect of the model presented in Chapter V. this was a project-type mapping, where knowledge was identified as an object. Attention was paid to ensure that the term "knowledge" had an identical meaning for all participants of the project and for this

purpose the following definition was used *"Knowledge is interpreted, subjective information within a context, which involves understanding and is mostly tacit, not explicit and manifest in capacity to act. Knowledge can appear in the form of thoughts, insights, ideas, lore, lessons learnt, practices, experiences undergone.."* Knowledge management was understood as: *"Knowledge management means the manner of managing the different manifestations of knowledge. This demands that knowledge be recorded when created, be shared among the people and be used in the business processes. "*[10].

By the setting-up this project the company was able to record all relevant knowledge elements of a given relevant field into the knowledge catalogue. In practice during the description of the knowledge elements the participants were close to the cognitivist view, that is they understood knowledge elements as codifiable information.

The identified knowledge elements were classified in a scale of one to ten in accordance with their business importance, the extensiveness of their use within the company and the manner of their use. The description of the process creating the knowledge elements was not tackled. The knowledge process flow map used as the instrument for analysis characterises the knowledge element in the dimensions of the use and dissemination of knowledge, but it does not describe the how it evolves or changes.

It is impossible to separate the amount of human resources utilised for the process of knowledge mapping from that used for the development of the knowledge strategy document. The costs of preparing the document can hardly be measured against the annual revenues of the company, consequently the costs of the strategic level, initial knowledge mapping were negligible, too. A lot of factors supposedly affecting the intensity of knowledge mapping many can be recognised at the company:

- The company is a big company by Hungarian standards, where newly recruited professional managers came into the first and second levels of management. In such cases the new managers' demand of for fast, non personalised orientation opportunities is almost automatic, and it emerged in this case, too.
- Multinational competitors in the business sector of the company have already made advances in the field of knowledge management, and this fact combined with the ambitious goals of the company, proved to be a driving force.

[10] Source: the knowledge strategy of the company

- The company's senior management recognised the need to set up the KM function and thus promoted the development of a knowledge strategy.
- The monitoring of certain indicators describing the size of intellectual capital through measurable indicators has already been the task of the unit responsible for human resources.
- The fluctuation of personnel had accelerated at the company as a result of staff reduction, moreover special attention had to be paid to avoid allowing bearers of knowledge of strategic importance to leave the company in the course of the cutbacks.
- Quality management is an important issue for the senior management and therefore, the dissemination of knowledge to all areas, the homogenisation of the available knowledge gives the organisation an independence from the movement of top management.

***Knowledge mapping in the course of the project studied***

In the course of the EL project both project-type and the institutionalised forms of knowledge mapping could be identified. Knowledge here has the same meaning as defined previously by the company, which essentially equals it to (factual) data though the formula might suggest a far broader interpretation. The reason for reducing knowledge to data is probably that in the present business situation the most important feature of knowledge was its coded nature and thus the additional characteristics described by Blackler (V.2.2 chapter) were not important that time. Another justification for reducing knowledge to data was that data can be far more easily managed as other aspects do not arise.

After the definition of the reference data needed for the EL system the real challenge was to find the authentic data records. For instance, the case of property records, although there was a specialised record, oddly enough, finding it took up a lot of time.

The creation of the system of keywords can also be seen as knowledge mapping. This provides a new retrieval opportunity in comparison to the old support infrastructure. The initial keyword system was also set-up in the form of a project.

I could observe continuous knowledge mapping in the course of the entry of new cases and cases in progress. The tactics used for data uploading was to enter all new cases and

those in progress into the system, while old cases were entered whenever somebody wanted to handle them. This was basically the institutionalised form of knowledge mapping in the model.

The amount of resources dedicated to knowledge mapping was not measurable in the EL project.

***Summary evaluation of the case***

Thanks to the attention paid by senior management, the KM initiative based on a knowledge strategy was closely connected with the company's business objectives and interests. As it became clear during a conversation conducted with one of the managers, for the company executing a strict cost reduction program and comparing itself to the leading multinational companies of the sector it was evident, that all changes must serve the business. The measures formulated at tactical level could be considered as a maturity model (however, they did not use this term in their local terminology).

The only criteria for identifying knowledge was that it to should be needed by more than one person in the company. Practical and simple methods were used for the collection of knowledge (data). Knowledge mapping was carried out both at company and strategic level and in the course of the EL project.

As the understanding of knowledge used in practice was almost identical to data it was essentially simple to find the knowledge (data) designation. A knowledge element catalogue was prepared, where knowledge elements were associated with knowledge intensive areas. Recommendations were made for the support of these areas with a suitable IT application. Accordingly, a knowledge element was described as an object only and the creating process was not explicitly examined. The purpose, business effect, those affected, prospective resource requirement of the proposed development, expected benefits of the application, and consequences of omission from the development were described. This went far beyond the concept of knowledge catalogue described in Chapter V.

It seems to be an apt decision to subordinate the KM officer to the chief IT officer since the implementation of KM had a clear IT orientation. This solution supported the starting "incubation" phase of the development of KM, as the tools and set-up of the systems were connected basically to the responsibility area of the CIO. However, neither

the background of the manager responsible for the development of KM nor the previous experiences of the knowledge management officer (human resource management) is the only solution. A KM manager of business background could have supported the area as well as the company handles KM as a horizontal, cross-functional activity.

In this way the CIO received first hand information about the status of the EL project, and if necessary, he could have intervened. It is curious that when the strategy was approved, the developers of the knowledge strategy considered the non technical activities even more important.

## VI.2. Second Case: a Tool Based Approach

*VI.2.1.Background Data on the Company*

The company studied operates in the telecommunications sector and is one of the determining companies of the Hungarian economy. Its shares are listed in the Budapest and New York stock exchange. Retail and corporate customers alike make up the clientele of the company. The company is a member of a larger company group engaged in the provision of related services.

The earnings of the company totalled 318 billion HUF in 1998, 384 billion HUF in 1999 and 445 billion in 2000, the number of full time employees was almost 12,000 in 1999.

In the early nineties in consequence of the low level of fixed line telecommunication supply in Hungary, the company began large scale extensive developments and realised extra profit. Meanwhile mobile service providers emerged, and through their replacing services they began to narrow down the market. As a result of Hungary's accession to the EU, the telecommunication market will soon be liberalised, which will pose a number of new challenges for the company. The multinational competitors are already present in the Hungarian market, and have not yet started fierce competition only because of legislative restrictions.

The company partly continued its earlier extensive market development strategy and became involved in foreign professional capital investments. At the same time intensive development began, too: for efficiency reasons large scale cut-backs were carried out, the number of employees decreased by 6.5% in 2000. In the course of restructuring the activities portfolio of the company 150 organisational units and 170 management jobs were terminated.

Furthermore, a cost reduction program was also initiated to decrease administrative and organisational costs. Certain support activities like the provision of IT services were outsourced.

The business portfolio of the company was focused. The independent business branches were organised into legally independent economic entities.

The organisation of the company was broken down into "back-office" and "front-office" activities in line with an organising principle often applied by the banking sector. The "front-office" group comprises of the organisations that participate in a direct manner in the planning and dissemination of company services and in customer relations. The organisations in the "back-office" group are those that provide legal, economic, human resources and technical background for the services.

*VI.2.2.The Background of Knowledge Management at the Company*

The company has no written knowledge management strategy. There are two teams doing work on the topic, the staff of the documentation directorate and that of the IT directorate. Both teams understand this term as an object, an element which is codifiable. The professional investor owner of the company has KM function (in the form of centre of competencies), and this clearly affects the developments in Hungary. The centre of competencies refers to systems where data are stored about the competition and internal projects under the term KM applications.

In order to capture the attention of the company management, the IT organisation, together with the representatives of the documentation section organised a “knowledge management expertise day” at the beginning of 2001, and invited the representatives of other organisations who had started to introduce knowledge management as guest lecturers. As the company cuts down its workforce, this could justify the implementation of KM on its own.

Except for considering knowledge an object, the approaches of the documentation and IT teams are different. The representatives of the documentation section view KM from the aspect of the librarians. In their view the objective of KM is the creation of new value, which can be achieved through the mobilisation, systemisation and sharing of the knowledge available at the company, making it accessible perspicuous and retrievable based on different criteria. From among the knowledge elements available at the company, they focus on those which can be used at several places or can be used for the

purpose of aiding decision making or orientation. They expect that KM will increase company efficiency, which is especially important in the current intensive development stage of the company. They view the efficiency of KM embedded in the company culture, recognising the importance of the knowledge sharing approach and the essentiality of management commitment. Regarding implementation of KM their notion is of intranet systems, "infoteka". The role of the librarian in the infoteka is to systemise, transfer and disseminate information (knowledge). Their philosophy is:

*"The librarians, as the supporters of knowledge are those who collect, make retrievable and convey again and again the knowledge, which a constantly changing organisation must have about itself, its environment and the world."*

Their plans include the setting-up of a competencies database often mentioned in the literature ("Yellow Pages", based on the company's human resources management system), and an application of summarising lessons learnt from projects.

The staff of the IT section want to proceed based on a tool often mentioned in the literature as the typical and successful KM tool. This tool is Lotus Notes, positioned by its developer as a KM product.

***The characteristic features of Lotus Notes***

Lotus Notes is often referred to as one of the tools that support KM (Davenport 1997, Davenport and Prusak 1998, Wakin 1999). Notes is a text database management technology based tool dedicated to support team work. Notes supports the storage of information together with its environment, one of its tools is full text search capability. At the same time, Notes has the tools for handling structured data too, allowing thus criteria based document retrieval and viewing. Furthermore Notes provides electronic mail and diary functions, co-ordination mechanisms and fine tuned authorisation, access, monitoring and encryption services, too. Notes supports the Web display of documents stored in it (Lotus Domino), moreover, certain functions can be used through the browser without the use of client side software.

Notes uses the so called replication technique. A Notes database can have copies on several places, which can have independent lives as long as their content are synchronised through the replication technique. This technique has been surprisingly successful.

The direction of the development of Notes is shaped jointly by the parent company, Notes, IBM Research and IBM Institute for Knowledge Management[11]. At the level of business goals KM is considered as a discipline which systematically takes knowledge and expertise to the appropriate places to enhance the company's *responsiveness and innovation capability,* to increase *competencies* and *efficiency*; this is the RICE model).

According to Lotus KM support is based on five technical technologies: *business intelligence*, *collaboration*, *knowledge transfer*, *knowledge discovery* and *expertise location*. These technologies can be accessed through a common portal through the intranet.

Three basic elements of the KM infrastructure are identified as people, places and things, stressing the primacy of people. People include staff, customers and all persons that are important for business. Places are locations where people communicate and learn. And finally, things are data, information and processes created, captured, classified and shared within the organisation.

The manufacturer positions Notes as a KM tool, as indicated by the name of the new product "Lotus K-station", which is a tool for accessing company knowledge, and Lotus Discovery Server, which supports and automates, in part, the mapping activity. The Discovery Server categorises the stored documents according to their contents and monitors the work of the users.

*VI.2.3.The Use of Lotus Notes at the company*

The company's management is not aware of the possibilities offered by Notes. Notes was used first as a mailing tool at a few distinct locations and later as a standardised (required) tool. Because of the possibilities offered by Notes an office automation system was set up on it. Currently more than 1,500 databases are available in the Notes environment, which could more or less be considered as applications. More than half of them are electronic filing systems (office procedure management applications) and there are also several project logs too. Some of the applications are so called "major applications", for instance the senior management calendar and a decision support system, where the documents of meetings are entered. Besides those, there are some less important technical applications, too.

[11] Source: Lotus and IBM Knowledge Management Products. A Lotus Development Corporation White Paper, January, 2001

The use of Notes is significantly affected by the manner the IT was outsourced from among the company activities. Electronic mail was considered to be supporting activity, and as such, was outsourced. On the other hand, the management of the databases which form part of the company's core activity remained with the company's own IT staff.

New Notes databases are currently set up on an ad-hoc basis with no concise contents definition phase. When the need for an application emerges – after a suitable business justification – it is created, that is, a fully reactive approach prevails.

*VI.2.4. Mapping Knowledge in the Case*

Several knowledge mapping events could be identified at the company. As in this case knowledge was taken as a synonym for (stored) data, knowledge mapping was carried out in the course of Notes system development projects, in project form.

If there is need to create a new database which has a template already, the request can be placed through the IT help desk of the company. In this case the help desk can decide which data should be stored and helps to set up the necessary data categories, too. The owner of the stored data is always the person responsible for that data

Should the need for the development of a completely new database and application emerge, the funding for that must be sought in line with the general practice of the budget planning cycle. For a new application, the evidence of direct business benefit is required, in the absence of which it is hard to obtain funding. In general, there is no internal application development, this is mostly left to outside developers.

Outdated, out of use databases (knowledge) are mostly identified in the course of technical maintenance: the database that was not used for a year is archived. Archiving is necessary because of the outsourcing of the IT since the lump sum contract placed with the service provider is for the operation of a given number of Notes applications and if that number is exceeded, a special accounting system will enter into force. As new applications will be developed this might sooner or later result in the quota being exceeded.

At present it is not possible to establish the volume of resources spent on the mapping of existing knowledge.

*VI.2.5. Summary Evaluation of the Case*

A spontaneous, bottom-up KM implementation strategy can be observed within the company thus we can speak of no apparent structured, project form or even a maturity model based approach. However, the technicist, Notes based approach of the IT directorate complemented with the specific approach of the documentation directorate could prove to be a successful road. Notes is a tool, embedded anyway in the day-to-day work of the company, and with its innovative new capabilities, it could provide significant advancement.

Knowledge mapping is carried out in an ad-hoc manner, based on the principle of "where the need is the biggest". Mapping covers the cases often referred to as examples in literature, like for instance competencies database *(Yellow Pages)*.

## VI.3. Third Case: Approach Forced By Necessity

The company is engaged in the supply of IT tools and solutions. The company's shares were the first among IT companies to be traded in Budapest Stock Exchange and London SEAQ. The company's activities include the marketing of communication systems, hardware and software integration, service and support, as well as training and the provision of business solutions and consulting.

The net revenues of the company totalled 12.46 billion HUF in 1999, 14.24 billion in 2000 and the number of full time employees in 2000 was 500.

The IT market showed dynamic growth until the previous year, and the company grew with it. The strategic goal of the company is to attain a determining role in the Central-European IT market. For this reason horizontal diversification was used through the acquisition of one of the IT companies of a neighbouring country. The slogan of the company is: *"Always one step ahead of the others"*.

Lately the company realised losses, the probable reasons were on the one hand the recession of the IT market experienced world-wide, and the exaggerated and broad company portfolio on the other. Because of the losses, a cost and staff rationalisation program was started significantly decreasing inventory and operating costs. Moreover, due to an accident, several leading managers of the company died, which contributed to the severity of the problems.

*VI.3.1.The Background of Knowledge Management at the Company*

KM was almost unknown at the company. Even those few, who knew the word, considered it more of a slogan, a word without any underlying meaning than an objective worthy of implementation. From the seller' point of view, however, inherent business opportunities were recognised. The company already had an information system to homogenise knowledge, for the purpose of storing the data evolving and collected by the marketing staff of the company and to ensuring their accessibility *(Sales Force Automation).*

A staff member of the marketing department commissioned with press clipping noticed that there was a significant overlap in the written documents acquired by the staff during their visits abroad and the journals ordered. The idea occurred to him that if there was a central register on what was available and accessible at the company it would reduce superfluous expenditures.

The state of affairs was caused by the organisational structure of the company, too. The company has a matrix organisation structure where the professional organisations, marketing and the functional units are separated. Accordingly, it is not sure that the information arriving through different channels is delivered to all interested parties. For instance, a bit of professional information received from the manufacturer of a product is often delivered to the merchant, who is only partially interested in it. The members of the professional organisation for whom the information is actually interesting do not receive it.

*VI.3.2.The Virtual Library Project*

The problem raised by the marketing department was recognised. A working group was set up to overview the situation and the basic problem identified was that information within the company *"...can be accessed at far away points only"*. Based on that the following general objectives were formulated:

- everybody at the company should have a clear picture of the available documents and of the documents that are not accessible,
- it should be made clear whether the knowledge bearers required by statutory requirements and quality assurance requirements are available,
- the same information should not be stored superfluously in unknown numbers and places,

- all experts should have access to the internally available albeit unknown knowledge.

The company intended to achieve these objectives through the creation of a virtual library (SVK). The virtual attribute indicates that certain materials would not necessarily be stored in the library, only the data of the person responsible for them would be stored; these were the so called ″off-line materials″. The library (records system) would be accessible through the company intranet. Certain documents were intended to be placed on-line.

The plan of virtual library covered the whole company. In their own formulation, the company intended to put “abiding” sources (in the above sense) in the library, but not the small value or short life material. Information – knowledge according to their notion - was classified in groups, namely:

- IT, market, legal, economics information,
- general information (dictionaries, encyclopaedias etc.),
- short term economic and market information, invitations to tender,
- reports on company experiences, travel reports, description of important projects, company studies, bid documents of important projects,
- domestic political issues, and related personnel changes and
- day-to-day political and economic news.

The intention was to classify and to group into categories the information arriving at the company by their form. One of the goals of the project was to establish a suitable system of topics (that is, a classification system) to allow the staff to search easily within the SVK. The survey of the current data media helped to set it up, and so the SVK covered the already available materials as well.

For the purpose of operating the planned system, a responsible person was appointed, the SVK Administrator, ”*librarian”* for short. The librarian performs the job on a part time basis, his other task being filing. This the advantage that the majority of the books, CDs and papers arriving to the company can be entered immediately into the SVK as they pass through filing. The knowledge bearing media in their physical form should have been centrally stored at the filing station.

Responsible persons had to be appointed at the different business branches who were to carry out the classification of the knowledge media developed or delivered to their territory on a part time basis.

The company has ISO 9001 qualification. Thus, the tasks concerning the library were initiated in a project from together with the necessary formal and documentation requirements. The tasks and responsibilities of the participants were set and defined by means of written instructions and the operating mode and processes were regulated as follows:

- If a bit of knowledge media to be entered into the library arrives by post, the librarian asks the competent person in the addressee organisational unit to classify the material. The consignment can only be delivered to the addressee if it has been classified by the competent person at the addressee organisational unit and the librarian has entered the material.
- If the knowledge media arrives in a direct manner, that is through personal contacts, travel abroad, events, etc., the person who acquired the material is responsible for its classification.
- The staff member who is given the material after its entry into the library will be financially responsible for safekeeping the knowledge bearing media. Should this person lend the material to another staff member, he will be responsible for proving receipt in a reliable manner and for having the material returned on time.
- Any staff member who doesn't wish to be encumbered with the responsibility and administration of knowledge media, can deliver the information material to the librarian, who will take care of organising the physical movement of the material undertaking the responsibility described above, as long as no other person demands it for prolonged use, that is, he acts as a real and not as a virtual librarian.

Actually, the operating model of a library was used.

*VI.3.3. Mapping Knowledge in the Case*

The company chose and ad-hoc approach that is, conscious, planned building did not take place. In the course of implementing the concrete IT system both project-like and continuous, institutionalised knowledge mapping could be observed. The scope of the library system was written down, the one-off start-up survey was the task of the persons

responsible for the area. The elaboration of the initial topic groups was assigned to a separate responsible person. It was not possible to establish the amount of resources expended on the mapping of the available knowledge

*VI.3.4.Summary Evaluation of the Case*

After a number of deadline postponements the library was not completed until the time the thesis was written. The main reason was that the importance of the project was minor in comparison to the other problems faced by the company, and thus it received an ever decreasing attention. The importance of the library software decreased for the company who undertook the development, too.

KM appeared for the company as an issue posed by the day-to-day practice, and did not start upon the proposal of a consulting company or inspired by management literature. The activities in this case (too) were closely connected to the business objectives of the company. The project did not reach the size and support which a senior management supported, top-down conscious strategy driven approach could have achieved. This is perhaps the most important experience: a “slinking”, non-conscious approach provides less chance of success.

# VII. SUMMARY AND CONCLUSIONS

The thesis examined the first steps of the introduction of the KM function, knowledge mapping and the intensity of the activities carried out. My objective was to collect useful and at the same time theoretically well-founded techniques and approaches, which could help Hungarian companies just starting to introduce knowledge management. The investigation was based on my own notions and ideas formed after studying the literature and the three case studies.

The thesis was based on the assumption that the systematic mapping of knowledge is the basis on which all knowledge management activities rest. The knowledge available at the company can be assessed by mapping and exploring, including both the company's internal knowledge and the knowledge of the outside world relevant for the company.

There is no single route for the introduction of KM function according to the literature. In the three case studies I investigated, one company conducted a conscious, planned, up-to-bottom introduction, while in the two other cases the day-to-day problems led to a down-up initiative.

I studied both the processes and the product (knowledge element catalogue) of knowledge mapping. The different types of mapping processes (project and institutionalised, described in Chapter V.1), were identified in the cases studied. I encountered in practice some of the descriptive techniques for knowledge elements, while some other techniques I proposed (describing knowledge as a process, identification of the community of practices, describing the characteristics of knowledge transfer) were not used. The intensity of knowledge mapping was not measured in any of the cases and the expectations in this regard were not confirmed.

## VII.1. Novel Findings and Personal Deductions

For studying the introduction of the KM function I used the structured approach with the help of the application of the maturity modelling technique. I formulated the abstract concept of maturity models raising the possibility of its generalisation, too. When using maturity modelling in the context of KM I pointed out that this tool will reflect the expectations of the company and the picture of knowledge formed by the company. A model jointly developed prior to the introduction on the one hand provides a vision and on the other hand it sets out the main activities of the introduction.

During the study of mapping processes I differentiated project like and institutionalised processes.

I proposed that a knowledge element catalogue should be developed as a result of the mapping, and – in line with references in the literature –a knowledge element should be described both as an objects and as a process.

When a knowledge element was described as an object I used known techniques (Boston-matrix, investigation of the links with business objectives and fields).

In order to promote knowledge transfer I proposed to describe this nature of the knowledge elements as well. For this purpose I extended Collins and Blackler's classification by pointing out its temporal and multispectral character. I proposed the use of the grid diagram technique to visualise the nature of the knowledge element from this point of view.

In the description of a knowledge element I suggested the identification and documentation of the respective community of practice. This information will be necessary for the transfer of knowledge.

When a knowledge element was described as a process I put forward to use Blackler's aspects of knowing.

## VII.2. Possible Supplements to the Research

I can see four possible directions for continuing the research, three of them connect organically to the thesis, while the fourth derives from one of the part fields.

- A certain approach for knowledge mapping evolved as a result of the research, where techniques to be applied as well as a product to be prepared (the catalogue of knowledge elements) were determined. As not all instruments were used in the case studies, **an experiment with the full method in practice seems to be an obvious step.** Knowledge management is just becoming known in Hungary and thus companies (including a significant number of large companies) are just beginning this process, consequently such an investigation is justified.
- It was not possible to measure the intensity of knowledge mapping in the three cases studied. Nonetheless, I still believe that this is an issue which merits attention. It would be rewarding to find a company willing to try to measure and quantify the re-

sources spent on knowledge mapping. For this work the KMI indicators that I proposed could be used.

- The primary objective for mapping of knowledge is *identification* and not *description* of the knowledge elements. A possible subsequent step could be the **codification of the contents** (i.e. description) of suitable and worthy knowledge elements. The refined toolset of artificial intelligence could be successfully used for this purpose (this is the so called "hard" approach). The Information Systems department hosting the research accumulated years of experience and research potential in the use of the CommonKADS methodology (Schreiber et al. 1998), which is suitable for the extraction of knowledge. A possible route for continuing is the description of the contents of knowledge elements on CommonKADS basis. This process should be incorporated in the proposed method.
- Further investigation of the communities of practice to be identified during the characterisation of knowledge elements as objects could also lead to interesting questions. We must ask: what is the relation of these communities to each other both from the aspect of power and organisation, and how could this be featured. A graphic visualisation of the relations and the development of some kind of group-map technique might be useful.

# VIII. APPENDIX

In the model of Microsoft (see: Chapter IV.2.2) there are the following evaluation criteria:

| Areas | Categories | Evaluation Criteria |
|---|---|---|
| **People** | Organizational Values | Principles<br>Policies |
| | Collaboration and Sharing | Access to information<br>Collaborative behaviour |
| | Empowerment | Process for creating new knowledge<br>Process for contributing new knowledge<br>Process for seeking answers<br>Empowering people to share knowledge |
| | Recognition and Reward | Measurement System<br>Reward System |
| | Competency Management | Competency Map<br>Skill benchmarking<br>Training<br>External contributor management |
| | Human Resource Management | Workforce profiles evolution and distribution<br>Performance Management<br>Recruiting, Developing, and Retaining |
| **Processes & Technology** | Places & Spaces | Geographical dispersion<br>Physical places for people to come together<br>Facilitation tools<br>Buildings |
| | Organizational Design | KM vision<br>Authority<br>Responsibility<br>Extended community |
| | Business Processes | Knowledge needed for business processes<br>Capture of knowledge resulting from business processes<br>Knowledge enabling of key business process<br>Codifying and maintaining business-process knowledge as a corporate asset |
| | KM Capabilities | Non-intrusive knowledge capture and delivery processes<br>Cost-efficient knowledge capture and retrieval systems<br>Automated publishing and distribution |
| | Technology Infrastructure | Architecture and Systems portfolio<br>Infrastructure Capabilities |
| | Content Management | Content Architecture<br>Containers<br>Version control<br>Configuration Management<br>Distribution Processes<br>Distribution Status<br>Access Controls |
| | Measurement | Capacity<br>Activity<br>Observed behaviour<br>Content Value |
| | Organizational Memory | Source Integrity<br>Audit Trail<br>Decision History<br>Organizational Learning<br>Simulation |
| **Business Rela-** | Customer Value Man- | Knowledge-sharing interfaces |

| **Areas** | **Categories** | **Evaluation Criteria** |
|---|---|---|
| **tionship Man-agement** | agement | Value Based Relationships<br>Reflective relationships<br>Mass customisation |
| | Customer Relationship Management | Customer-relationship management<br>Customer-event management<br>Selection and presentation of relevant information<br>Proactive delivery of information<br>Community development |
| | Partner Value Manage-ment | Awareness of knowledge-sharing interfaces<br>Sharing business knowledge<br>Ease of partner feedback and of doing business with organisation<br>Partner-community value and segmenting<br>Customised knowledge transfer based on segment<br>Knowledge-transfer measurements |
| | Partner Relationship Management | Measurements of partner relationships<br>Partner-event management |
| | Product Value Man-agement | Measuring of brand to customers<br>Neutral-party verification of brand value<br>Monitoring of brand reputation<br>Support of partners' post-sales issues<br>Sharing of relative product information with partners<br>Product feedback loop<br>Joint-business opportunity awareness |
| | Competitors | Competitive intelligence |
| Areas | Categories | Evaluation Criteria |
| People | Organizational Values | Principles<br>Policies |
| | Collaboration and Sharing | Access to information<br>Collaborative behaviour |
| | Empowerment | Process for creating new knowledge<br>Process for contributing new knowledge<br>Process for seeking answers<br>Empowering people to share knowledge |
| | Recognition and Re-ward | Measurement System<br>Reward System |
| | Competency Manage-ment | Competency Map<br>Skill benchmarking<br>Training<br>External contributor management |
| | Human Resource Man-agement | Workforce profiles evolution and distribution<br>Performance Management<br>Recruiting, Developing, and Retaining |
| Processes & Technology | Places & Spaces | Geographical dispersion<br>Physical places for people to come together<br>Facilitation tools<br>Buildings |
| | Organizational Design | KM vision<br>Authority<br>Responsibility<br>Extended community |
| | Business Processes | Knowledge needed for business processes<br>Capture of knowledge resulting from business processes<br>Knowledge enabling of key business process<br>Codifying and maintaining business-process knowledge as a corporate asset |
| | KM Capabilities | Non-intrusive knowledge capture and delivery processes<br>Cost-efficient knowledge capture and retrieval systems<br>Automated publishing and distribution |

| **Areas** | **Categories** | **Evaluation Criteria** |
|---|---|---|
| | Technology Infrastructure | Architecture and Systems portfolio<br>Infrastructure Capabilities |
| | Content Management | Content Architecture<br>Containers<br>Version control<br>Configuration Management<br>Distribution Processes<br>Distribution Status<br>Access Controls |
| | Measurement | Capacity<br>Activity Observed behaviour<br>Content Value |
| | Organizational Memory | Source Integrity<br>Audit Trail<br>Decision History<br>Organizational Learning<br>Simulation |
| Business Relationship Management | Customer Value Management | Knowledge-sharing interfaces<br>Value Based Relationships<br>Reflective relationships<br>Mass customisation |
| | Customer Relationship Management | Customer-relationship management<br>Customer-event management<br>Selection and presentation of relevant information<br>Proactive delivery of information<br>Community development |
| | Partner Value Management | Awareness of knowledge-sharing interfaces<br>Sharing business knowledge<br>Ease of partner feedback and of doing business with organisation<br>Partner-community value and segmenting<br>Customised knowledge transfer based on segment<br>Knowledge-transfer measurements |
| | Partner Relationship Management | Measurements of partner relationships<br>Partner-event management |
| | Product Value Management | Measuring of brand to customers<br>Neutral-party verification of brand value<br>Monitoring of brand reputation<br>Support of partners' post-sales issues<br>Sharing of relative product information with partners<br>Product feedback loop<br>Joint-business opportunity awareness |
| | Competitors | Competitive intelligence |

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