KNOWLEDGE MANAGEMENT AT

CAP GEMINI NEDERLAND

- MSc Thesis-

Marie José Vlaanderen, 1994/1

PREFACE

This thesis is the final requirement for the MSc programme in Knowledge Technology of Middlesex University, London, and Kenniscentrum CIBIT, Utrecht.

It was a pleasant experience for me to have a closer look at the knowledge management of a large organisation. I would like to thank Cap Gemini Nederland, and in particular the Finance Division (FI) for giving me this opportunity.

My best helper was my company coach, Hans Goedvolk, knowledge manager at FI. He has set up all the facilities and took care that I could conduct my research as I had planned.

Arno Teigeler, manager business support of FI, spent an amount of time to give me a better understanding of the business processes of FI. His and Hans' brainstorming helped me formulating the final outcome of this project. Hans and Arno put also great effort in the critical reading of this thesis.

A score of persons have been generous with their time and attention. Without their efforts a survey like this could not have materialised.

Nani Stam did me a great favour by making my English more readable. She was also helpful in diverting my attention from this thesis during our weekly rounds of golf.

I have enjoyed the one and a half year of courses at CIBIT. The learning experiences from most teachers and from fellow students have been challenging my brains.

Last but not least, Rob van der Spek, my study coach, made me enthusiastic about KM during the courses he taught. I have relied on his critical remarks and guidance in the formulation of the project plan and writing the thesis.

I would like to thank very much all of these persons for their help and care, sine qua non.

Marie José Vlaanderen,
October 1998

A journey of a thousand miles begins with one step.
Lao-Tse

MANAGEMENT SUMMARY

The theme of this thesis is knowledge management (KM) at an organisation that provides information technology (IT) services. It is based on the results of a KM-survey of the Finance Division of Cap Gemini Nederland (CG), conducted during the spring of 1997.

The problem

Advanced Technology Services (ATS) of CG wanted to have more understanding of how an organisation can become a learning organisation (LO). The assumption that KM facilitates a LO makes sufficiently obvious the need to conduct an investigation on KM. One of the divisions of CG, Finance Division (FI), was chosen as a trial field. The knowledge manager of FI and I agreed that my research would concern how and how well KM at this division is conducted. From this survey, problems and bottlenecks would be revealed and, together with the aims of the division, solutions would be proposed.
Another request of ATS was to propose a general method for KM for this type of organisation, or, for what is called, knowledge-intensive organisations.

Method

I have chosen an integrated method to cover as many aspects for KM as possible.
This method is composed of

1. The learning cycle approach: review/observe; conceptualise; reflect; act; review.

2. The management focus on knowledge processes: the cycle of creation of new knowledge, consolidation, distribution, and combination of knowledge.

3. From the CG approach the 3 spheres: technology, culture, and organisation.

4. The 3 levels of an organisation: strategic, tactic, and operational.

5. A combined toolkit of techniques, such as interviews, questionnaires and a systematic analysis of the business process (the knowledge charts).

During the *review/observation* phase I have spent time interviewing, reading company material, and surfing the company's Intranet. This gave me a general impression of the company and of FI. It became clear what aims FI has for its KM. During this stage also priorities for business support were formulated. Efficiency, effectiveness and re-use of knowledge were defined as the primary aims.

In the *conceptualisation* phase I had a closer look at the aspects of KM at FI as well as other divisions. By means of interviews and questionnaires a directed survey of KM at FI was conducted. I used the results that were gathered so far for a SWOT analysis.

The *reflection phase* resulted in a list of eight recommendations. These recommendations are based on the problems that were found, on the priorities that were stated, and on general KM practices.

The recommendations

The following recommendations have been evolved from the priorities of the division's KM, the SWOT analysis, and the given context:

1. Develop knowledge repositories for saving and sharing the knowledge which is needed.

2. Stimulate people to use them. Management must provide the conditions and directions to facilitate the use of and contribution to knowledge repositories.

3. Let knowledge socialise. This can be achieved by coupling novice workers to experts; by arranging intervision sessions; by providing company's yellow pages.

4. Perform a knowledge analysis on the business-process level.

5. Place knowledge capital on the balance, or at least in the annual report.

6. Use intelligent agents to search the Internet (but also CapCom and Galaxy) for new knowledge and discussion groups; use them also to distribute this pro-actively to the right people.

7. Cherish front runners.

8. Create a CG tool-kit (self-developed or licensed existing tools) for KM problems.

From here on the division can take action and use the learning cycle for evaluation and improvement.

Reflection on the project

The used method proved to be satisfying for this survey. During my research I did not meet difficulties that could not be solved with the tools I had. I would recommend this method for KM surveys in knowledge-intensive organisations in general. For KM solutions a tool kit of shells, such as the structure of the knowledge repositories, can be developed.
Method and tool-kit will be the basis for KM advices for CG and its clients.

1 INTRODUCTION

1.1 ABOUT THIS THESIS

During the spring of 1997 I was invited by the Finance Division (FI) of Cap Gemini Nederland to conduct a survey about their knowledge management (KM). They were already working on KM and a knowledge manager has been appointed. An outsider and a student of knowledge technology would complement their view on the future of KM. In addition, the Advanced Technology Services (ATS) division of CG requested - in addition to this survey - to look for a method of KM that could be standardised for similar knowledge-intensive organisations (KIO's). After conducting many interviews and analyses (see section 1.6 for the used method) I could draw conclusions about the KM situation of the Finance Division and propose solutions.

The thesis is basically composed of the results of

* my survey on KM,

* theoretical aspects of KM,

* the used method and its justification,

* statements about KM for KIO's in general.

The remainder of this chapter is an introduction to KM and several theoretical issues about knowledge and about the learning organisation (LO). It further describes the actual problem that has been investigated and the methods that I have used for KM.

In chapter 2 the existing KM practices, tools, and methods at CG and the outcome of my interviews are reviewed. The chapter concludes with a SWOT analysis.

Chapter 3 presents recommendations to improve the KM of FI.

In chapter 4 an evaluation of the conducted survey is given and a proposal has been made for a generalisation of KM methods for KIO's.

1.2 WHAT IS KM

During the last decades companies and organisations have faced numerous threats and opportunities in rapid succession. More expensive manpower, greater demand for quality, more competitors and globalisation happen on the one hand; the race for more profits, more gain, healthier companies, on the other hand.

Although managers have always been aware of the importance of knowledge (in simple things, like hiring qualified personnel), they rarely regarded knowledge as a part of their industrial and organisational assets. Today there is a growing awareness which sometimes emerges from quality management or sometimes from the possibilities that information technology (IT) offers. Nevertheless, the managing of information and of knowledge has clearly entered the scene.

The importance of knowledge is obvious in the race for shares in the market between competitors. The urge to be ahead paves the way for innovation, which is the application of new knowledge. Another urge is to work efficiently and make use of all available resources. These developments lead to preserving and distributing of knowledge in order to re-use knowledge. The shorter life span of employees with one company - since life time employment is an extinct phenomenon - is a reason to capture knowledge before it walks away to the competitor. The enormous amount of new information and the knowledge that it generates is another reason to be aware of the importance "to do something" with knowledge. These developments have lead to KM.

Van der Spek and Spijkervet (1995) state as the core of KM the organisation of processes in which:

* new knowledge is developed

* knowledge is distributed to those who need this knowledge

* knowledge is accessible for future and collective use

* domains of knowledge are combined.

These processes will be realised depending on the type of organisation, the purpose (e.g., business-process re-engineering (BPR)), commitment of the management, and the like.

I shall use this view of KM as background for this paper.

There are, of course, other approaches of KM. KM, for example, is considered nothing more than quality management, or IT management, or the use of knowledge technology, or business intelligence. These are all aspects or aids for KM. KM should be regarded as an integrated whole of a structured method with many aspects depending on the purpose and situation.

I shall explore the basics and aspects of KM more extensively in section 1.6.

1.3 INFORMATION AND KNOWLEDGE

Somehow the discernment between information and knowledge is vague.
Nonaka and Takeuchi (1995, p 58) think that the two have similarities and distinctions. Knowledge is about beliefs and commitment. Knowledge is a function of a particular stance, perspective, or intention. Knowledge is about action. And Nonaka adds: It is always knowledge "to some end". He continues with comparing knowledge and information that they are about meaning; it is context-specific and relational.

I would like to elaborate on this approach. Information is interpreted data. Knowledge is applied information. Information is typically focused on facts. "Water boils at 100 C". Knowledge is focused on the application of facts (or information) in a special situation: "This water does not boil yet, so the temperature is still under 100 C"; but knowledge is also about the combination of information and the right application, such as "This water contains certain minerals which may affect the boiling temperature."
The reason why we are able to combine information lies in our training, education, intelligence, intuitions, and such. This combining of information is the creation of knowledge. Since this creation is so highly dependent on the situation, it makes knowledge not a product from the shelf like information, but something tailor made, again and again.

Thus, I do not agree with Weggeman (1996) that **knowledge** (my emphasis) is used but not consumed. It is **information** that is used but not consumed. With each situation one has to build up the necessary knowledge from available information (from the shelf, so to speak) applied for this special situation with the aid of intelligence or other skills of the person involved. This knowledge can be preserved in written form or in a scheme or drawing, but then it becomes information. Only after the application in a new situation it becomes knowledge again. There must be an agent that "knows" that the stored information can be used. (In knowledge technology this agent are the rules in a knowledge-based system.)

In this view it is difficult to speak of knowledge as an asset. An organisation that has a good quantity of information stored but does not apply it or does not know how and when to apply, has in fact no knowledge assets. I would emphasise this point because it helps to understand why KM is more than filling databases.

In this paper, however, the terms knowledge and information are used as they are used in our daily discourse.

1.4 THE LEARNING ORGANISATION (LO)

The LO is often mentioned in organisational strategies in combination with KM. That is the reason to dedicate a few remarks on learning organisations.
Organisations cannot learn; people learn. However, under certain conditions organisations can be regarded as organisms with memories and learning abilities. The necessary conditions for a LO is that people learn and that through the specific conditions that the management offers the employees improve the quality and quantity of knowledge. The combined result is better than the sum of the individual efforts. This is also the synergy concept of CG's vision.

Most publications on LO (Argyris and Schön 1978, Garratt 1994, Senge 1990, Weggeman 1995) deal with the attitude of the management. CG has a positive attitude towards organisational learning according their statements. However, there are more necessities for a LO. On a tactical level questions such as "what must be learned?" need answers. From these answers KM approaches can be formulated. In other words KM facilitates the learning processes. After implementing KM solutions, one can evaluate whether or not the organisation has learned. That is, if performance has improved.

FI has formulated measures for better re-use, more effectiveness, more efficiency of knowledge use. These are the learning goals for the division. If these aspects have improved after a period of time, FI will become a LO.

1.5 THE PROBLEM

1.5.1 BACKGROUND

The Advanced Technology Services division was my first contact with CG. The question they were asking was about how to create a learning organisation. As prerequisite was needed an answer to the question how does KM work and how well does KM work, and what are the problems. A follow-up would be the implementation of the solutions to these problems in order to create a good learning organisation. And finally the evaluation: has the performance improved and the proposed goals reached.

This project would cover a full cycle in a KM survey. That would take much more time than was planned for this thesis. The aforementioned question was reduced to how and how well does KM perform in a certain division; what are the bottlenecks and what solutions can be recommended. For the survey the Finance Division (FI) was chosen.

1.5.2 DESCRIPTION OF THE PROBLEM

At FI the urge to pay attention to KM is explicitly present. Especially in the early stage of a project one has to know what sort of knowledge is needed and where it is available. Knowledge is also crucial in supporting complex projects. And, of course innovative knowledge is important for IT and for business consultancy. The focus for this project, however, is the use and re-use of knowledge in the various stages of the business processes of FI. Notwithstanding the efforts which this division has already given to KM, it is wondering about its effectiveness. The division needs to reflect on the aims of its KM. Within that view a survey of KM needs to be executed. The larger problem, or the context of the KM problem in general is the creating of a learning organisation.

1.5.3 THE GOAL OF THE PROJECT

The context and aims of the division's KM should be clear.
A KM survey will lead to

* a general impression of the KM,

* a list of problems and bottlenecks.

From these data

* practical solutions will be developed.

It is also the intention to suggest

* a more systematic approach to KM that can be used in other divisions and be offered to clients.

1.6 THE METHOD

1.6.1 INTRODUCTION

As yet not so many theories and methods for KM have been developed. Van der Spek and De Hoog (1994) state that various aspects of, e.g., the CommonKADS methodology have not been established and that the method of Wiig (1995) needs supplementation.

KM is more an activity and strategy than a theory. The activities need structure in the form of methods. These methods, however, may have their rationale in a theory or view.
The methods I have used presuppose the view that:

* knowledge is an asset as much as other production factors

* knowledge can be created, stored, distributed, and combined

* knowledge can be tacit or explicit, can be a skill, an expertise, can be in documents, in people's heads

* knowledge can be vague and transitory

* knowledge has various levels of importance

* KM is a part of organisational management and not an extra gimmick.

The method that I have used is a combination of established methods (at CIBIT and at CG) and an analysis of the knowledge on the business-process level.
In this research I rely on the following methods:

* 1. The learning cycle approach

* 2. The cycle of creation of new knowledge, consolidation, distribution, and combination of knowledge

* 3. From the CG approach the 3 spheres: technology, culture, and organisation

* 4. The 3 levels of an organisation: strategic, tactic, and operational

* 5. A combined toolkit of techniques, such as interviews, questionnaires and a systematic analysis of the business process (the knowledge charts).

The choice of these methods are based on several considerations.
First, the main frame in which the survey is conducted - the learning cycle - is a well established sequence for any kind of improvement or learning route.
It is based on:

* assessing the present situation and defining how you would like to perform

* what is wrong

* what can be done about it

* carry out what has to be done

* see if the situation has improved.

Of course this cycle can also be used in many other operations, like quality improvement, increase of production, BPR, and the like.

Secondly, for a learning cycle about KM in particular, aspects of knowledge are used. Aspects of the creation of new knowledge, consolidation, distribution and the combination of knowledge entail 4 elements that are considered as the basic processes of KM (Van der Spek and Spijkervet 1995).

Thirdly, these aspects of knowledge are embedded in an organisation. Improvements of KM are thus focused on the possibilities that an organisation can offer.
At CG one has already used these focus points or spheres, as they call them. They distinguish technology, culture, and organisation. A good technological infrastructure, for example, is less worthwhile if the company's organisation does not emphasise its use. Another example, in an open-minded culture more attention will be paid to innovative knowledge; however, poor technology might diminish its pay-off.
In other words, considering these three spheres of KM are important on their own, and even more important in their interaction.

Fourth, the levels of an organisation (strategic, tactic, and operational) are the strata that can provide (or prohibit) the conditions for a good KM. For example, when on a strategic level good KM is considered an essential part of the organisation, means of support will flow to the lower levels. But, the lack of ideas on how to use these on a tactic level will discontinue the use of KM tools on an operational level.
The aspects of spheres and the aspects of levels of organisation are elicited during observation and interviews. More specifically are they revealed by the questionnaires.

Fifth, to support the elicitation of the above-mentioned aspects several tools need to be used. Open and structured interviews will reveal the contexts in which the survey takes place. Questionnaires (in written and oral form) are used to depict the KM situation in general terms; for example, "too much specialised knowledge is not saved". A structured analysis of KM aspects of the business processes will pinpoint more precisely the gaps and possible solutions. For this analysis I have developed the knowledge charts. They have emerged from knowledge-acquisition techniques. A domain expert works together with a knowledge engineer to describe the knowledge processes for each of the business processes. In addition to knowledge contents also management aspects of knowledge are added. Thus, questions about actors and their level of competence, updatedness of knowledge, importance of saving and distribution of particular pieces of knowledge and the like are noted down. Analysis of the answers will lead to other procedures, or perhaps, other actors, and so on. These knowledge charts have been augmented and improved during the brainstorm sessions with the FI business support manager (the domain expert in this case).

A fully description of the method is given as a manual in chapter 4.

I have applied these various methods and aspects as an integrated approach. As they cover all points of view in KM, the possibility to overlook important gaps becomes very low.

With the survey at CG I intend to show that this combination of methods forms a satisfying method for KM audits at KIO's in general.

This study is concerned with an analysis of the current KM situation, the bottlenecks and solutions. There will be no evaluation because that can only take place after solutions have been implemented. And, there will be no actual monitoring of the forthcoming activities. This makes that for this research aspects of methods have really been used, while others are only mentioned.

1.6.2 THE KM CYCLE

Argyris (1978) used a cycle to show how learning and improvement in general can be depicted.
Van der Spek and De Hoog (1994) adapted this cycle for KM:
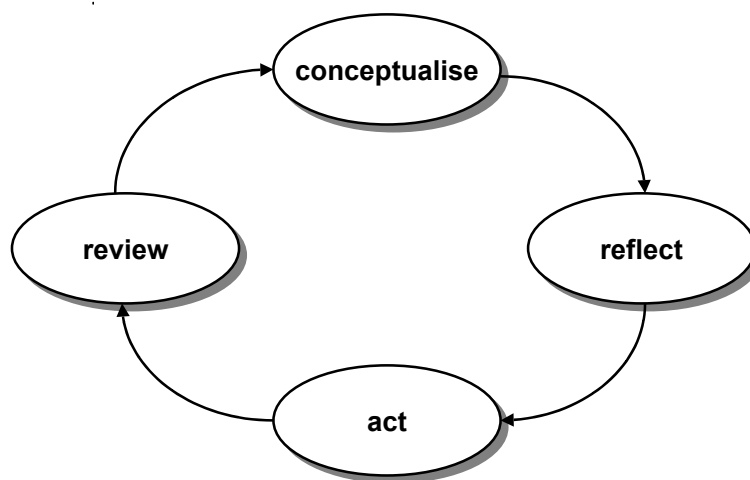
(fig. 1) The learning cycle

* 1. Review. This is also a starting point in terms of "observe". What is the situation now? And how would you like to perform?

* 2. Conceptualisation. In this phase one gains insight into the problem, the context, and the actors.

* 3. Reflection. This phase is focused on questions like: What are the bottlenecks? and What are the solutions?

* 4. Action. In this phase solutions are implemented.

* 5. Review. An evaluation takes place: How does the current situation compare to the situation before? Do we perform better?

From the evaluation the cycle can be run again with conceptualisation of new, or not yet solved, problems. The basic idea is that the cycle should be used as a continuous instrument of learning and improving. The cycle is recursive, so within each phase or subcycle the entire cycle can be projected.

In each subcycle the following aspects and points of view can be found: the management aspects of knowledge, the levels of the organisation, the aspects of culture, technology, and organisation. I have not used a systematic scheme to reveal these aspects. During my survey many of these aspects fell together like a jigsaw puzzle. However, these aspects and the specific aspects of KM (new, saving, distributing, combining) are the main themes in the questionnaires and knowledge charts.

In this research I have used 3 subcycles:

* Review: observation of the present (KM) situation in the organisation.

* Conceptualisation: insight into the problems and context; an analysis of the weaknesses and strengths of the knowledge situation.

* Reflection: what solutions are feasible and what can be recommended.

Owing to the short period of time available the subcycle of acting (implementation of the solutions) and a review to see if the situation has improved, could not be executed.
I would recommend that these will take place in the near future. And, as I have already mentioned, the whole cycle should be continuously passed through.

In the following paragraphs I describe the stages of my research in more detail.

1.6.3 THE REVIEW/OBSERVATION PHASE

To review a situation, it makes a difference if one is an outsider or not. An outsider may overlook things, but has a fresh view; an insider has blind spots but knows more ins and outs. As an outsider to this organisation I sought my information through all strata in the organisation to gather as much information as possible. To get to know an organisation is a process that continues during the whole stay, but the global impression formed during the first weeks is essentially the best picture. The organigram, the business processes, the available technology and the culture become clear during interviews and reading of documents. In this KIO, specifically in the department that I have reviewed, the business process can be reduced to selling and delivering services. How deep and how wide this process should be explored depends on the sort of problem and the solutions that are aimed. It is always possible to go into more detail in a next cycle. The same (that is, the depth in which the review is done) applies for the technology and culture.
Besides gaining a better insight into the organisation's processes, technology and culture in this phase also questions about performance must be answered. Are performance indicators available that can be compared in a next review phase after solutions have been implemented? Are these performance indicators already used in a benchmarking project? Has the organisation set specific goals that need to be reached?
In this organisation KM is already in practice, therefore KM could also be observed through interviews with the knowledge manager and documents.

The outcome of this review / observation phase is described in section 2.1.

1.6.4 THE CONCEPTUALISATION PHASE

In this phase more specific instruments are used to grasp the KM situation.

Starting point in this present survey is the information given by the business support group and by various people who happen to hear about my work and volunteer to give their opinion. That settles the first impressions and topics that needed more attention.

Two more formal methods will be used to make a systematic inventory of the KM situation: the questionnaire and the knowledge charts.

The questionnaire

The processes of knowledge: the creation of new knowledge, consolidation, distribution and combination of knowledge form the basis for a questionnaire with questions about these 4 stages of KM in addition to questions about strategic background. This questionnaire covers also the 3 spheres of technology, organisation, and culture; and the 3 levels of organisation (strategic, tactic, and operational).

I chose two groups of people: managers of units and of Centres of Excellence and ad random chosen persons who work in these units. The choice of the persons to be interviewed was led by their position or by their known interest and concern about the KM situation. In general there were no significant different answers. Where that happened, however, a special situation was the cause (for example, the distribution of knowledge in a small group of 2 or 3 people working in the same room is never a problem; it sure is for large group of consultants who each work at their client's place).

The questionnaires which were answered during an interview gave the interviewees and me the opportunity to spend more time on issues that were deviant from an average answer. Sometimes suggestions to improve things were proposed. The answers are not explicitly mentioned in this paper; however, they have been all used for the analysis.

In sum, the time spent on these questionnaire/interviews was most helpful.

The knowledge chart

The other instrument is the knowledge-processes analysis.

The outcome of the questionnaires and the impression of the KM situation give a rather bird's eye view. The conclusions can only be drawn from general statements (e.g., specific knowledge is only in the heads of 1 or 2 persons). From these statements it is not clear what impact they cause (e.g., this specific knowledge can be captured in a few days by special training; or: loss of that knowledge is critical and can mean the loss of a project). To be able to solve bottlenecks and to enhance good practices one has to analyse knowledge processes on a much more basic level. From the knowledge-technology elicitation practice I have developed knowledge charts that can contain aspects that one needs to create a knowledge-based system, and can be used to improve KM. The chart is filled in for each atomic business process, that is, a process that cannot be divided in smaller processes without loss of meaning. Often such atomic processes can be described with one single concrete verb. It is not unlike the smallest units that object-oriented programming presupposes.

The charts that are developed for KM purposes have the name of the business process and the corresponding knowledge process.

The charts have room for 5 sections:

* descriptive aspects

* management aspects

* quality aspects

* problems

* solutions

The descriptive-aspects section is the most important part of the chart because it is directly related to the business process. It reveals the sort of knowledge, when and where it is needed; who are the actors; it makes also links to the profiles of the actors; what are the sources or carriers; what are the deliverables.

The management aspects correspond with the cycle of the creation of new knowledge, consolidation, distribution, and combination of knowledge. These aspects are less related to the business process, but implicate actions for the knowledge manager.

Quality aspects are about the up-to-datedness of knowledge; about what goes wrong if knowledge is missing; about learning aspects and about performance. The quality aspects are important to the manager of the business process. They affect the quality of the product or service.

The problem aspects speak for themselves. Also, there is room to mention reasons for not doing things. These are signals for the knowledge manager to take appropriate action.

Finally, there is room to make suggestions for solutions.

Filling in all the questions forces to think, or even to contemplate, about the many impacts that bad use or lack of knowledge can cause. It also reveals the weak spots and their relevance to other parts of the process. This leads to find priorities and solutions. It may also lead to redesign of (parts of) the business process. Examples of these knowledge charts can be found in Appendix A.

To conclude, knowledge charts are powerful tools for KM as well for business management.

The analysis of the questionnaire and the knowledge charts is the basis for a SWOT (Strengths, Weaknesses, Opportunities, and Threats) overview.

The outcome of the conceptualisation phase is described in sections 2.2 and 2.3.

1.6.5 THE REFLECTION PHASE

Until now enough material and impressions have been collected to describe the SWOT analysis, to pinpoint the bottlenecks, to find priorities, and to suggest solutions. Most solutions emerge during the previous phase; some are made up during a brainstorm session with the business support people. Also, other knowledge can be incorporated, like literature about KM. The approach in this phase depends partly on the results of the analysis and partly on the constraints that are set by culture, technology, and organisation. It also depends on the wishes and suggestions that are already existing in the department. Solutions that cause a great impact need different consideration and a longer time to reflect than solutions that are easy to implement. Also is suggested to keep the 3 spheres and the 3 levels of organisation in mind; it helps to distinguish the various solutions and eases the process of choosing priorities.

The recommendations that came forward from this reflection phase are described in chapter 3.

1.6.6 THE IMPLEMENTATION/ ACTION PHASE

This phase depends on the solutions; they can be of any sort and impact. When, e.g., a knowledge-based system is proposed, a new cycle of observation, conceptualisation, reflection, action, and review needs to be covered in order to check its functioning. Other tools are then used to elicit knowledge. When only the technological infrastructure is poor, other actions need to be performed.

The review phase is in fact the observation phase of the beginning, but now for the altered situation. From here on the whole cycle can be repeated again. Within each phase the cycle can be used recursively.
This cyclic process is a reliable instrument for learning and improving. It can be used in many more situations.

2 KM AT CG

This chapter describes the results of the review/observation and the conceptualisation phase of the KM cycle.

2.1 THE REVIEW/OBSERVATION PHASE

In this paragraph the organisation CG in general and the FI division in particular are described in terms of their activities and goals [1].

The Cap Gemini Group is an international organisation based in Grenoble, France. It employs about 30.000 people. At Cap Gemini Nederland (CG), a subsidiary, 5.300 people are employed.

The goal of Cap Gemini - the reason for its existence - is to perform professional services in the field of information technology (IT). Emphasised is the developing role of IT in our society.

The mission of Cap Gemini is "to help our clients achieve change through rapid, proven and cost effective delivery, by leverage of our IT and sector know-how, while always respecting their freedom".

The activities of CG cover a wide range of professional IT services; from mere technical support to strategic advices, integrated systems and full coaching of business redesign.
CG emphasises the importance of being able to combine both business-process redesign and the application of IT.

Besides these activities CG develops products and tools in the field of IT that support the quality of their services.

Three pillars are supporting the activities and profile of the company:

1. In the rapidly evolving field of IT improvisation is a strategic tool. Employees and the organisation have to be alert, creative, motivated and result-driven. This adds an important value towards the customer.

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[1] from The Cap Volmac Company Atlas, 1995

2. Innovation as inspirator. Cap Gemini Nederland is market-leader in the Benelux. From this position it feels responsible to actively lead the development in its field. Besides the development of methods and techniques it also participates in public forums, scientific research, and innovative tracks with clients.

3. Internationalisation for expanding knowledge and services. The expertise of so many employees is available through the networks between the national divisions.

The culture of the company is based on the following key-words: honesty, solidarity, courage to dare, freedom, confidence, simplicity and fun.

Cap Gemini is a typical example of a knowledge-intensive organisation.
The products are services in the IT field in the broadest sense. Cap Gemini is a provider of manpower (outsourcing) as well as adviser on the implementation of total IT systems, and also of IT management - and business consultancy.
The products and services are based on highly professional impact. Knowledge is the source and the output of the products and services. But CG also regards its employees as its prime means of production and therefore its "capital".

As an outstanding profile between its competitors CG has chosen a client-driven (or market-driven) approach in which it exceeds as masters of excellence in certain selected fields.
Its core competence moves towards strategic advice and the establishment of business processes. To distinguish themselves from companies in the same line of work CG must continuously innovate and strengthen its core competence.

The process is the basis of CG's method of service delivery. The effectiveness of the processes is the measure for the realisation of the goals of CG. The support for this is the structure of the organisation.

The following core processes can be distinguished:

* organisational development

* human resource management (HRM)

* business development

* marketing & sales and delivery.

The first two processes are supporting and give infrastructure to the last two.

CG puts its strengths in the combination of qualities that are present in the company: its synergy.

To keep up with the demanding market and the changing trends CG must be a learning organisation.
There are, however, constraints why professionals do not easily share their expertise with colleges. Professionals are ambitious and have learned to solve problems on their own. They are thus less alert to apply existing knowledge and to share and save their knowledge. Besides, it is difficult to grasp the expansion of knowledge. It is often a combination of insights from various domains that leads to innovative knowledge.
To save and distribute the know-how of the individual employees, active KM is necessary. This encompasses:

* the accumulation of knowledge (from intern and extern)

* the formulation of knowledge (= testing and translating of implicit and explicit knowledge)

* the facilitation of knowledge (= distribution).

The learning organisation needs a flexible structure as well a flexible method of operating. To support this flexibility KM should emerge into knowledge networking. This is a capability of the individual employee to participate in re-use and sharing of knowledge and especially to be aware when and how to apply re-usable components.

Besides the emphasis on learning organisation and knowledge networking, CG participates in various quality driven processes.

I conclude this synopsis of the company with the statement (on p.23):
The employee must have the capability to share: "knowledge is power" is replaced by "synergy increases power".

The Finance Division [2]

Within Cap Gemini several business units are operating, each devoted to a branch of the market or to a certain support. The Finance Division (FI) is a business unit that concentrates on products and services for the financial market, such as banks and investment companies. Business units have a rather wide freedom to operate and to set up their strategies. The FI is eager to make the best use of the knowledge available and has created several instruments to make KM work. The business support group consists of a manager business support, a quality manager, a knowledge manager and an information centre. These people are involved in the maintenance of knowledge and quality control.
This unit consists of 420 professionals plus 80 staff and management. Roughly one fifth is back office staff; the rest are IT-professionals, business consultants and technology consultants.

The structure or concept for the processes and products at FI are specified in Quatro, the change process through which FI is going.

The processes are

* commercial process

* operational process (financial and administration)

* HRM as means

* management

These processes are specified depending on the quadrant.
The division has 4 cornerstones of services to offer, the 4 quadrants:

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[2] based on interviews with the division manager and the manager business support

Q1 - Professional services (detachment or outsourcing); CG delivers capacity and is responsible for the capacities of the employee.

Q2 - Realisation of information systems; the delivery of products and services conform specification; advice for IT; IT-projects. CG is reponsible for the final results and the monitoring of the realisation in terms of time and money.

Q3 - System Integration; realisation of Q2: the lay out of integrated services and infrastructure. CG is responsible for the result as well for the implementation in the organisation.

Q4 - Business solutions and business systems transformation; business consulting: combination of IT and business strategies, including BPR; long-term relation with client. CG and client work together as partners. The emphasis is on the profit of the solution and the shared responsibility for that profit (fitness for purpose).

Q1 is for CG still important due to market demand, but might be of less value in the future. The core competence is focused on Q 2, 3 and 4. The division's strategy (and also of CG) is to move more to consultancy, which is in Q 3 and 4. These quadrants are most depending on KM.
Owing to the complex nature of the domains in Q 2, 3 and 4 the need to pay more attention to better support has been addressed: awareness of KM, quality improvement, and change management towards a learning organisation are current focus points.

At the onset of the project the aim was to find out if CG is a LO. If not, how does it become one. As one of the conditions for a LO KM was chosen as a target. To narrow the scope of the project even more only the Finance division (FI) of the company was chosen to perform a KM survey. In other words, the aim for this present survey is to find out how well knowledge at FI is managed. This might seem a very broad perspective for a KM survey, but there was nothing more specific on which to rely. There were no problems in terms of declining profit, annual turnover or market share. There were no complaints from clients or from employees. The only remarks that would warrant a KM survey concerned "feelings" that knowledge could be used more efficiently and about " worries" about innovative knowledge.
CG is a market leader focused on innovation and high quality, market-driven towards its clients. It regards its employees as its capital. It aims to become a LO which needs a good KM and quality improvement supported by the synergy of the employees and the structure of the organisation. Using this as starting point for the learning cycle for FI there are no quantitative data that can be compared at the end of the first cycle. The questions that can then be asked are "has KM improved at FI" and "does FI perform better". Figures like higher profit per employee does not say much about how well knowledge is managed, since other factors, like market demand, are also involved. Business support managers will have indications that knowledge is used better (or not) but this might be too vague to justify a continuation of KM. Therefore, I suggest to compare the data on the knowledge charts as they are now with these data after a year. For example, if, at the moment, the needed knowledge for a certain (sub-)process is not stored for later re-use, but after a year this knowledge is stored indeed, one can speak of an improvement. However, if the knowledge is saved but never re-used, one must consider how important the saving of this knowledge in fact is or why it is not re-used and what can be improved. This comparison will show where and how often in the business process knowledge is managed better. It will pinpoint precisely the improvements and the shortcomings.

Strategy on KM at FI

Vision on KM at CG is in an early stage of development. There is consciousness about the necessity of KM and so far initiatives have been circulating among the several knowledge managers. From these first drafts I would like to capture the essentials.

The short-term goals of FI for KM are the care that employees and projects have access to knowledge in order to perform well. This is mainly focused on the preserving and sharing of knowledge.
Long-term goals of KM are aimed at core competence management. KM should promote that CG now and in the future have unique expertise at its disposal, in order

* to maintain a distinguishing position from other organisations

* to be able to offer services and products that are needed by the clients and that contribute to the market position and the continuity of the client.

KM must be part of a regulated change management.

Presently, KM activities are focused on the use of the intranet called CapCom. This CapCom is regarded as an important KM support. It preserves and distributes knowledge; it applies knowledge; it prevents "re-inventing the wheel"; it provides an increase of quality.
The message is that the attitude towards CapCom has two aims: communication and information sharing. CapCom is very much a means of communication between employees, and offers access to all sorts of information; and as useful by-products: paperless office, flexible information (time/place).

As benefits for the professional services are mentioned:

* better market position through information sharing

* synergy and communication

* better repartee through knowledge exchange and knowledge creation

* more effective and efficient services

* business advantage.

2.2 THE CONCEPTUALISATION PHASE - THE CURRENT INITIATIVES AT CG[3]

This section lists an inventory of existing practices of KM within FI in particular and within other divisions of CG.

2.2.1 TECHNOLOGY / INFRASTRUCTURE

For almost two years CG Nederland uses its intranet (CapCom) for messages, news, gateway to in-house knowledge bases, to Internet sites, etc. It is linked to the international CG intranet Galaxy which provides basically the same. It is advertised as "the unique entry point to all CG knowledge". Galaxy combines a set of knowledge servers, each dedicated to a certain aspect of CG. There are servers about innovation at CG, human resources, CG documents (reference sheets, research reports), SAP; there are servers for the business sectors, such as finance, telecom, and the like.

This technical infrastructure should be regarded as essential for any good KM, but certainly for a huge organisation like CG, that has branches throughout the world. However, during my review it turned out that not everybody was able to use the intranet, partly because of security problems. Consultants who are with clients most of the time should be able to consult the intra/internet wherever they are. This problem is solved since September 1997.

The main activity in KM at FI at the moment is to give CapCom a good structure. The pages are chosen in tune with the short-time goals. They are also a start to an active preserving and sharing of knowledge (see 3.2.2 about the knowledge pump). Among the interesting pages I mention:

* knowledge wanted; request for knowledge for projects or hot issues

* guide; what KM can do for you (and you for KM); where to find what; how to submit knowledge

* endeavours; about divisions and links to the actual pages

* proposals; the procedures, etc.

* sales and marketing information

* business and IT knowledge

All these pages give short descriptions about the topics and links to more information.

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[3] from documents and interviews with unit manangers

Still open are questions how to stimulate employees to submit to CapCom and to use it effectively. Another issue that is not mentioned yet is the role of the knowledge manager in the future.

2.2.2 NEW KNOWLEDGE - CENTRES OF EXCELLENCE

KM first emerged from the need of knowledge about new products, such as electronic commerce and the switch to the EURO. The developments of new products are now centred in Centres of Excellence which are small groups of people who work together on one particular product until it is ready for the market. These people are business consultants and IT-specialists. They are also part of the group of consultants (have their rooms in the same hallway) and thus know the market and the clients. The existence of a Centre of Excellence depends on the success of its product(s). When a new possible product is noticed, a new centre will be established. Detecting new subjects is a creative and not a guided process. Ideas emerge in problem-solving situations, with clients, in discussions, from literature. They are captured by the creative knowledge workers and reviewed for possible development.

In general one is satisfied with the organisation of these centres. The interaction between R&D (new products), the consultants, and their market and clients is intensive enough to prevent knowledge erosion. When the need for, or success of a certain centre diminishes, it will be soon discontinued.

2.2.3 HUMAN RESOURCE MANAGEMENT (HRM)

CG offers a wide range of training and courses for its clients. From this fact I conclude that the training and education of its own personnel are on an equally professional basis. Since CG recruits its personnel from various disciplines - there is a high shortage of information specialists - training is an essential item. Later, employees are encouraged to spend time on courses as much as they need them.

The business units keep track of the CV's of their employees. To find the right person for the right job these CV's are used. Some special IT training and consultancy skills are given within the business units. Training in social skills is given on division level. Only other training is intermediated by the HRM. It is hard to get grip on new developments and on what is necessary to have enough qualified personnel for a given time. It is too broad and too vague.

There are plans to guide career paths, depending on the individual worker. This is still done only occasionally.

2.2.4 KM AT RAPID+

Within the Finance Division a group of 80 people (partly from CG, partly from elsewhere) works on the re-use of IT components. This work itself is a kind of KM, but that is not the issue here. The fact that I want to mention this unit is its organisational structure that deals with KM in a special way.

The backoffice is directing and driving power for its mission: self-directing teams and re-use.
Work is done in small (every now and then rotating) groups. The groups are formed by means of mind design. Profiles of employees are made in terms of theoretical background, reflection, experience; and

supplementing profiles will work together. The interesting thing here is that no knowledge is preserved. Knowledge is in the heads of the people. But, much knowledge is transferred to each other and thus strengthened (combined knowledge).

Since certain conditions must be realised before this concept of KM works, change of attitude is essential and compelled. People are urged to share their know-how. To facilitate more contact, people are not working in rooms, but in larger areas.

The reasons to handle KM this way are:

* the group is small enough to ensure that knowledge is shared and large enough to complement knowledge. Besides, there is rotation among subgroup members.

* people who do this kind of work are too creative to bother with preserving knowledge

* the domain of knowledge is clearly to survey.

The location of the coffee machine in an office is often the marketplace for gossip and news, but also the place where knowledge is exchanged. The situation at Rapid+ is a concept of KM that can be seen as a sophisticatedly directed adaptation of the "coffee-machine exchange".

Since this change of organisation started only in January 1997, little can be said about the success of its KM method. A possible drawback is that in a group like this some people always know much more about a certain (sub)field than others. Often there is no need to share this knowledge during a period of time, until it is too late, and a person with special expertise has left the company. Nothing is documented and nothing can be asked any more; the unit has lost important knowledge. It must be considered how often this might happen and how fast this gap can be replaced. It is also possible that knowledge in this domain is so rapidly aged that no harm is done.

Another drawback is the reliance on "front runners". These people often discover new knowledge first, owing to the fact that they have more intuition, are inventors, or surf intensively on the Internet. At the same time these people must be able to share their knowledge in such a way that others can learn. If these front runners are absent in a group, or when they exist but cannot share their knowledge - nothing will be learned.

To conclude this section, this type of KM can be applied when:

* the group's size is such that knowledge can be shared and innovated

* the domain is small and distinct

* the discipline to learn and to innovate is present

* one or more front runners are able to share their knowledge.

2.2.5 KM AT THE TELECOM AND SERVICES (T&S) DIVISION

The T&S division is also working on their own KM.

Its main goals are that knowledge capital must be consolidated and be used, and that most value is given to the efficiency improvement of the primary production process.

They put efforts into the implementation of these goals. It is important to promote knowledge sharing as a common thing to do.

In the Galaxy intranet project references are filed. There will be an obligation (because it is part of the quality procedure) to submit project references for larger projects (more than 3 persons, or more than 3 months work, or more than fl 300.000). The references must be submitted in a special format. The same will be done for project proposals, however, these will be protected because they are confidential. Clear directions are a first condition.

There is an ongoing debate on who has the right to actually put data in a knowledge bank. The most probable solution would be to allow access to everybody to submit material, and later some selection can take place.

At the time this survey was made the T&S division had just started its KM efforts; therefore, little can be said about its success.

2.2.6 KM AT THE PUBLIC SECTOR DIVISION

The principle of KM that this division maintains is the structure of three spheres of organisation, technology, and culture (developed at ATS, see 2.2.7). And further, one takes account of the strategical, operational, and individual levels of an organisation.

At the moment several ideas about a better KM are under consideration. One of these ideas is the knowledge spiral (Nonaka and Takeuchi 1995). The consultants work on a very individual basis and knowledge sharing is low. It would be an improvement to attach a junior consultant to a senior. The socialisation of knowledge is effected when a senior consultant transfers implicit skills and expertise to a novice. This is one important benefit; but also the lower cost of a junior (who can do less complicated parts of the project) will compensate for - possible - more time involved in the socialisation process. It can also result in a much more team approach of working.

Domain managers have extra time to preserve knowledge. There is a policy to actively record knowledge. Somehow this does not appear to be appreciated. Distribution of knowledge used to happen at theme-evenings, but now there is CapCom. A couple of hours per month are devoted for intervision sessions about ongoing projects, which is also a means to share expertise.

Also at this division it is too early to draw conclusions about their results.

2.2.7 KM AT ADVANCED TECHNOLOGY SERVICES (ATS)

Since the divisions of CG have rather independent strategies, methods for KM are developed within each division. There are, however, mutual consultations between the divisions, and the aim is to converge the methods.

At the ATS a Centre of Excellence for KM has now been established. Its goal is to develop Applied KM for CG's clients and Intern KM for use within CG.

The principle are the 3 spheres: organisation, technology, and culture. These aspects are essential for good KM. ATS is also still in a developmental stage. One of its focus points is searching for technological solutions, although KM does not yet know straightforward IT or KT solutions.

An object of thought - which is mentioned at FI as well - is the idea of re-use: tailor-made solutions lead to off-the-rack solutions, which in turn can lead again to tailor-made solutions. This, together with lessons learned and best practices would be the core of KM.

Another aspect are techniques for knowledge acquisition and knowledge transfer. This can be done in co-operation with the human performance group.

The application of the routine to share and re-use knowledge should be part of the training of new employees.

Further, extra time is mentioned. The investment to record and share knowledge can be too time consuming for employees. It is one of the extra things that they are supposed to do in their own time. Capitalisation of knowledge would be a good instrument to show that KM activities should be part of the business process and budgeted accordingly.

2.3 THE CONCEPTUALISATION PHASE - THE ANALYSIS OF KM AT FI

2.3.1 INTRODUCTION

After describing the existing KM practices at FI and at some of the other divisions, I continue with a more in depth examination of the KM at FI. Directed questions about various aspects of KM will reveal problems and good practices, which will result in a SWOT analysis at the end of this chapter.

The following analysis is based on 9 questionnaires[4]. The questionnaires were incorporated in an interview to be able, first, to get an impression of the (sub)department, and secondly, to obtain additional remarks. Five departments were chosen as representative for the Finance Division. The interviews were held with the managers of:

* The Business Unit Business Consulting

* The Business Unit Technology Consulting

* The Centre of Excellence Risk Management

* The Centre of Excellence Electronic Commerce

* The Centre of Excellence Lease.

In addition 4 persons were randomly chosen from various backgrounds in the FI (2 consultants, 1 account manager, 1 software developer). The answers of these 4 persons were on the average slightly more negative about practical issues (like the use of CapCom); the remainder was rather in tune with the view points of the managers.

The consultancy units (respectively 30 and 14 persons) are typical for the core business of CG; the centres of excellence (2 to 3 persons) are regarded as temporary R&D departments. The members of the CoE's have expertise with the clients and the field of research; usually the CoE's have a short existence depending on the market demand. All 5 departments consist of professionals in the field of financial management and/or IT. The mission of all departments is client-driven.

The questionnaires contain 70 questions about the strategy of KM, the development of new knowledge, the distribution of knowledge, the saving of knowledge, the combination of knowledge, and known bottlenecks. The questions regard also the aspects of the organisation, technical support and culture, and the levels of an organisation.

A compendium of the questions are mentioned in the manual (see chapter 4).

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[4] the questionnaires were initially developed by the Knowledge Centre CIBIT, Utrecht; for this purpose some questions were omitted or altered. Since the questions were incorporated in an interview, no overview of the answers were made.

2.3.2 RESULTS OF THE INTERVIEWS

Strategy for knowledge.

Each department has goals for KM; one of the main goals is to stimulate the professionals to use (passive and active) the knowledge bases. The practice is, however, that little is done in a structured or formal way. Each department does things its own way. The managers are clear about these goals. The other 4 persons who were questioned are less informed of the goals, although they are aware of the intentions about KM.
The company's culture is open and easy enough to provide possibilities to activate a better KM.

There seems to be a clear understanding about the basic-, the core-, and the promising knowledge. However, everybody gave different answers.
Promising knowledge is often too innovative, so that it will only be developed if there will be a market for it. Knowledge and supporting processes thrive on the informal network within CG. This is often regarded as sufficient.

Development and introduction of new knowledge.

New knowledge is never regarded as a problem. It is mainly created during the contacts with clients. No one in particular is responsible; everyone submits new knowledge. Internet and seminars as outside sources are mentioned. Contacts with universities are too few, but are regarded as satisfying, although the expertise is developed through practice.
There is no problem in the company's culture when it comes to developing new knowledge, but there is a tendency "to serve the client first" and "to earn money".
The occasional failures to introduce a new product were based on bad marketing: the product was too innovative, or the time to market was too long. There is too little time spent on the evaluation of the cause of mistakes.

The Centres of Excellence have a pioneering role in the development of new knowledge, but this has to be used for new products and services at short notice. The centres are not isolated in the organisation but have an interaction (through detachment) of professionals with the market and the rest of the company. This construction is regarded as very positive by the centres themselves as well by the clients.
Knowledge on the core- and promising level is well documented and is sufficiently available. Here the interaction with the centres of excellence is very important.
However, a bottleneck is that a lot of new knowledge is only in the heads of a few people.

Knowledge of the market, clients, and competitors varies by department ("too little" and "sufficient"). The bottleneck here is that the knowledge that is available, is in the heads of people: everybody knows something. As long as one knows whom to consult for certain knowledge, this is not seen as a problem. However, it does not seem to be a good practice as there is no overview of what is necessary knowledge and what is available knowledge.

Distribution of knowledge.

Distribution of knowledge happens in an unstructured way. The rationale of the present practice of dealing with knowledge is that "everybody knows where to find knowledge, or who knows what". However, there are many plans to improve this in a more formal way. One assumes that there is much

knowledge available, but difficult to obtain. Finding the right information on CapCom or Galaxy is regarded as "more luck than wisdom". Suggestions were made to improve keywords or other retrieval tools.

Ways of distributing are by meetings, e-mail, knowledge bank (CapCom), reports in written form, and occasionally orally.

Distribution of new knowledge happens within a department rather fast, because of the small groups of persons. Possible handicaps are lack of time and company's culture (client first).

Distribution of market knowledge to the rest of the organisation is to some of the interviewees not relevant due to the very limited scope of their expertise. Overall, there is no structured distribution of this knowledge.

New employees are usually introduced by their colleagues, read relevant material, and receive company training. However, there are doubts if this is enough to distribute knowledge to new employees.

The distribution of knowledge to other persons in the organisation is regarded as a critical success factor.

Preserving of knowledge.

Knowledge is usually saved in written or digital form, but not as a part of a structured process. Again: it happens occasionally. It is assessed as "not done at all", "mediocre", or "sufficient".
Availability and accessibility are not always sufficient. "You have to know how" and the informal network of acquaintances.

As a restriction for not optimal saving was mentioned: not knowing how to do it, time, money, and "it is a boring job".

Knowledge about the market, clients, and competitors is not or scarcely saved. There are plans...
It is regarded as important.

Combination of knowledge

Combination of knowledge (also from different departments) is seen as a normal way of doing things. It was even mentioned as a core competence of this organisation, but then done on an individual basis. It is also a critical success factor for the organisation.

Restricting factors are that it is not done in a structured way and - of course - it costs time and manpower.

Mentioned bottlenecks

* Mistakes have been made because of lack of necessary knowledge.

* Critical knowledge is in the heads of 1 or 2 persons.

* Knowledge is in the heads of many persons, but who knows what?

∗ Distribution of new knowledge: not structured.

∗ Knowledge about the market is insufficient.

∗ Knowledge is not saved and accessible in a structured way.

∗ Little use is made of the international CG knowledge.

and positive

∗ New knowledge is developed to a great extent.

∗ Personnel are sufficiently qualified.

∗ There seems to be no problem in the relation to clients when it comes to the knowledge of the employees.

∗ Internal distribution of knowledge is fast enough.

2.3.3 THE KNOWLEDGE CHARTS

The results of the questionnaire gave a broad view of the KM situation. To refine these results the business processes need a closer look. A detailed description of the business processes at FI is already available. The business process of marketing, selling, and delivering a service or product is divided in sub-processes and sub-sub-processes. To give an idea about the range: there are 10 sub-processes, each divided in 4 to 6 sub-sub-processes. Thus about 50 processes can be distinguished from each other in terms of action, actor or piece of knowledge. While sub-processes are described with abstract verbs, the sub-sub-processes, (or atomic processes) are described with concrete verbs.

Together with the domain expert (in this case the manager of the business-support group) I filled in the knowledge charts[5] for the first part of the business process. We did this on the sub-process level which is not recommended, after all, because the results are still too superficial. An initial evaluation with CG participants demonstrated many gaps, specially about CG's knowledge of its clients and that little knowledge is shared. The conclusion was therefore that a knowledge analysis on the sub-sub-process level should be one of the priorities on the solution list.

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[5] see Chapter 4 and the Appendix for details

2.3.4 THE SWOT ANALYSIS

The impression of the KM situation, the outcome of the questionnaires and the knowledge-processes analysis have led to a list of strengths, weaknesses, opportunities, and threats.
This list did not reveal many surprises. However, the research has given a reliable support to the already existing impressions. Another advantage of this research is that the KM situation is examined in a systematic way and it is unlikely that aspects have been forgotten.

Strengths

* Technical infrastructure is available and supported.

* Development of new knowledge is especially in the CoE strong.

* Basic, core, and promising knowledge are present.

* Training is sufficiently available.

* Informal (knowledge) networks are very much alive.

* A quality-management manual is available.

* R & D is an integrated part of the work force.

Weaknesses

* No structured ways of saving knowledge.

* No structured ways of distributing knowledge.

* Too much knowledge is still in the "heads".

* Too much specialised knowledge in only 1 or 2 heads.

* Market pull: professionals do not get a chance to save knowledge.

* Inefficient use of available knowledge costs time and manpower.

Opportunities

* Motivation: professionality; open-mindness.

* Company's culture: room for plans, room for innovation.

* Professional awareness that knowledge is important.

* Technical infrastructure can be used better, augmented and can offer structured and easy formats for saving and distributing knowledge.

* The use of internationally available knowledge can be improved.

* All the knowledge that is available in the "heads" is somehow available: something can be done with it.

Threats

* Motivation: everything else than creative things are boring jobs.

* Company's culture: client first.

* Lack of knowledge of the market, clients and competitors will be a threat in the future.

The headings (strengths, etc.) can be interpreted in various ways. First, the usual way of looking at them is that strengths and weaknesses are the present situation; opportunities and threats are possibilities. Secondly, weaknesses or threats that are consciously known are also opportunities because they will get the most attention to solve; opportunities that are neglected turn into threats.
Anyway, no matter how the headings are read, this is a list of domains of attention.

3 THE RECOMMENDATIONS

3.1 THE REFLECTION PHASE - INTRODUCTION

The data and impressions in the previous chapter are the results of the conceptualisation phase of the KM-cycle. At this point it is clear what the KM situation at FI is and what the strengths, weaknesses, opportunities, and threats are. This is also the moment that the reflection phase starts. This phase leads first to an appraisal from the business support group to determine whether the results match with their expectations. I regard this as an important evaluation. Because, if the results are surprising to them something would have been wrong: either my survey or their awareness of the KM situation. In the latter case management is too remote from the business processes and from their employees. This would have needed repair before serious KM could start. Fortunately this is not the case at FI.

Secondly, it is essential to consider priorities before working on solutions. Already in earlier conversations we had agreed that efficiency, effectiveness, and re-use are important issues. The priority for KM is focused on operational excellence. The SWOT analysis indicated that the degree of preserving and sharing knowledge was poor, while innovative knowledge - also of great importance in a KIO - did not seem to be a problem.

The recommendations in the following paragraphs have emerged from

     * the Swot analysis

     * a focus on efficiency, effectiveness, and re-use of knowledge

     * reflections on possible solutions within the business-support group.

They are based on

     * Priorities, feasibility, and continuation of projects that already have been started.

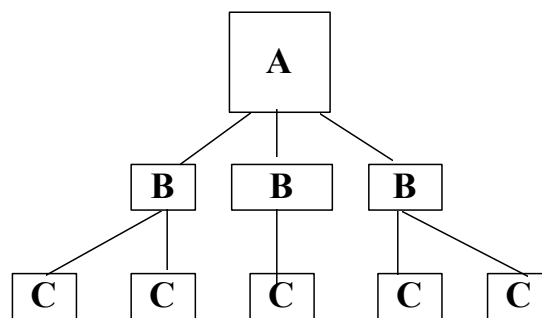The recommendations will be problem oriented and will fit into the division's culture, technology, and processes. This means that bottlenecks will be solved by using the possibilities the division can offer and with the consensus of the people involved. I mention this explicitly because in the present KM situation too much emphasis is put on the use of CapCom without realising what problems exactly have to be solved.

Efficiency, effectiveness, and re-use.

Because these aspects are important in the present survey, I want to explain these terms in detail. They have a tendency to be used indifferently.

Efficiency is focused on the management aspects of KM that takes care of efficient use of knowledge. Efficient use of knowledge can be deducted from the knowledge processes that are related to the business processes. This can be the re-use of knowledge that has been used previously (e.g., the budget: how did we account the same aspect last year with so-and-so client?) It can also mean the employment of the right person or the timely training of people who are not yet qualified.

Re-use is also the efficient use of knowledge, but here in the special meaning of "custom made based on standard solutions". To give an idea how this should be interpreted see fig.2, the problem/solution pyramid.

```
                    ┌─────┐
                    │  A  │
                    └─────┘
          ┌───┐    ┌───┐    ┌───┐
          │ B │    │ B │    │ B │
          └───┘    └───┘    └───┘
      ┌───┐  ┌───┐  ┌───┐  ┌───┐  ┌───┐
      │ C │  │ C │  │ C │  │ C │  │ C │
      └───┘  └───┘  └───┘  └───┘  └───┘
```

(fig.2) The problem/solution pyramid

A specific project (A) for a specific client is divided into a number of sub-problems and solutions (B). Each of these sub-problems is divided in rather generic standard problems and solutions(C). It is supposed that on level B more re-use can take place than so far has been done. The sub-problems should be recognised as standard problems that have been solved in previous situations. It is the task for the consultant to adapt the standard solution to the specific situation in combination with the other sub-problems and the rest of the configuration. The consultant should not re-invent the wheel. Instead, it is his expertise to realise that he may re-use the wheel invention, and his competence is to find out how many spokes are needed. To be aware of the standard solutions for these sub-processes is a skill that must be taught, at least must be emphasised in training. However, one can ask if consultants work as systematically so that they can recognise the sub-problems.

It is possible to think of constraints that prevent efficiency:

* the knowledge that has been used in previous projects is out of date, so re-use (or parts of it) leads to errors

* it takes more time to preserve knowledge than to find the same solution again

* people think that each problem is unique.

Only the first argument may hold in certain cases. Especially IT solutions have the tendency to change when new products have emerged. A possible answer to this problem is that as soon as new techniques are known, the knowledge database will be searched for old uses and these will be deleted or marked as out of date.

I regard effectiveness more as an evaluation of results. Effectiveness of the use of knowledge can be measured in cases when the saving and re-use of knowledge of projects have indeed contributed to a faster, more reliable and better solution.

The most important aspect of effectiveness is the choice of best solutions available. When KM tools are used, the chances that the best solution and the best professionals are chosen are higher than without them. This can turn out in a marketing argument: this company offers solutions based on best practices.

3.2 THE FIRST RECOMMENDATIONS

The weaknesses and threats which are mentioned in chapter 2 can be summarized:

* Saving and distributing knowledge is not done in a structured way

* Knowledge is too much in the "heads"

* Knowledge of market, clients, and competitors is lacking.

These are the most salient aspects. The first two are crucial to solving the aims for a better KM at the division, namely, effectiveness, effiency, and re-use of knowledge. The third is a threat for the market position of CG.
Another weakness is the fact that no time is structurally devoted to saving and sharing knowledge. From a cultural point of view emerged the attitude that these are boring jobs - at least in the present setting. This calls for solutions that are pleasant to use and rewarding for the users in the long run.

Fortunately, several strengths are already available and promising opportunities can be developed. Availability of a well maintained technological infrastructure (like CapCom) makes the building and maintaining of knowledge bases as an extension of an already common practice. This infrastructure together with the informal networks and a quality-management handbook serve as a solid, basic structure for the knowledge logistics upon which good KM can easily function.
The cultural infrastructure is also promising. The open-mindness and eagerness to learn and to apply the latest techniques facilitates the proposal of devices that will support a better KM. However, it is important to pay attention that the necessary discipline is maintained.

Thus, the first recommendations are:

1. Develop knowledge repositories for saving and sharing the knowledge that is created and/or needed.

2. Stimulate people to use them.

3. Let knowledge socialise.

3.2.1 THE KNOWLEDGE REPOSITORIES.

Several knowledge repositories on CapCom need to be developed for the various types of knowledge.

* Project references; complete references as well as best practices and lessons learned.

* Company's yellow pages; competence profiles of employees to be used by project managers and as extension of the acquaintances network for colleagues.

* Knowledge about the market, clients, and competitors; this can be commercial market reports (from the Internet), links to public information of clients and about competitors.

* "General" knowledge about own products and services; directories to manual archives; international CG knowledge. The links to these domains are partially already available, but people would prefer more structure and better retrieval of relevant material.

These knowledge repositories will supplement the knowledge that is lacking. They will make available to everyone the knowledge that is now exclusively in the heads of a few people. Certain techniques applied to these bases will facilitate the saving and distributing of knowledge from and to the right persons.
In sum, these knowledge repositories will solve the most urgent weaknesses and threats of the SWOT analysis. In the following paragraphs the contents and conditions for these bases are described in more detail.

3.2.1.1 Case base of projects

Preserving and distribution of knowledge in an organisation with many people who are also working "in the field" need to be handled in an IT- or KT-like system. The infrastructure is present (the intra/internet) and available for every employee.
An exact description of such a system requires a good knowledge-modelling process first.
Basically, the system must be able

* to store knowledge of projects or parts of it,

* to retrieve (= passive sharing), and

* to distribute (= active sharing) this knowledge.

For the storage part the following must be considered:

* what (or how deep) knowledge needs to be stored

* in what format

* what facilities and mechanisms are available so that knowledge workers can submit easily their knowledge (e.g., templates)

At the retrieval part:

* is there is a common vocabulary or thesaurus

* how can similar and analogous cases be found

At the distribution part:

* what is needed to transmit the information to the right persons.

And in general:

* is it necessary to subject the data to statistical procedures?

* how are best practices and lessons learned separated from the entire project references? For effectiveness and re-use are the most important issues (see 3.1 the standard solution for sub-problems).

* How and by whom are these repositories maintained?

I have mentioned several aspects of a case base, more or less as they come into my mind. However, to build such a system a systematic approach is needed. Also is important to consider the wishes and suggestions of the users.

3.2.1.2 Base of competences - company's yellow pages

During my research at CG I was surprised how much everyone is relying on his network of acquaintances to obtain information. This is a good KM practice, but it covers only partly the demand. The set of acquaintances one knows is limited; and moreover, most knowledge remains tacit and would never be used. To give the acquaintance network more structure and make it powerful a company's yellow pages bank is proposed.

For each employee an extended CV is made together with his special expertise and level of competence (see Wiig 1995, p 203). These CV's should be of a standard format and it should be easy to retrieve essentials.

The advantages are numerous: one's "acquaintance" network becomes much larger and thus leads to a larger recall when questions are asked; the yellow pages may also show that for certain expertise too few people are available (they will become permanent helpdesks), more people will therefore need training in that particular field. It also leads to better matching of people and projects. (The account manager as broker from an informal to a formal way.)

3.2.1.3 Knowledge repository about the market, clients, and competitors

In addition to a case base and yellow pages other knowledge needs to be stored in a structured way. From the SWOT analysis it was clear that knowledge about the market, the competitors, and the clients is scarcely present. Moreover, what is available, is in the heads of people. Since this knowledge is also regarded as a crucial success factor it needs much more attention. Knowledge that is needed is, for example, organigrams of clients; what projects have been already performed for this client.

It should be easy to submit texts about these subjects in CapCom, with good keywords. Most of the time will be spent on gathering and up-dating this information. The knowledge charts will reveal the gaps in more detail.

3.2.1.4 General knowledge repository and archive

Also knowledge about the company itself, about new developments (from the CoE's), interesting links to Internet sites should be made available in CapCom. This has already been done to a large extent, but can be improved by using good keywords and a thesaurus. For actively distribution a SDI[6] system or intelligent agents can be added.

In addition to data bases archive directories are needed. There are still documents that are not stored in digital format. Since there is no systematic record keeping system, these documents are easily lost. A simple reference system would be sufficient to locate documents.

All the mentioned systems need to be promoted and accessed through CapCom: "Knowledge about knowledge".

KIS

A combination of a case base, the yellow pages, and knowledge bank has been developed by Twijnstra Gudde (Nijziel 1993).
It is a system that enables the knowledge workers to discover who among their colleagues has knowledge and skills on a specific subject. Location of a person also means the location of 80% of relevant publications. Besides, this person can also inform you about details of existing projects about a subject.

This Knowledge Information System (KIS) has 3 modules with the following functions:

* to record the model of the primary processes, products, and markets of the organisation

* to relate the knowledge and skills of the consultants

* to search for the names of management consultants who meet the profile you enter into the system. The profile consists of values for processes, products or markets, or a combination of these. (p 450)

3.2.2 STIMULATE PEOPLE TO USE THEM.

Although this recommendation seems obvious, it is astonishing how several years ago the most sophisticated knowledge-based systems were not used by the people for whom they were developed.

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[6] selective dissemination of information

That gave knowledge technology a bad reputation for a long time. This problem can be eased from several points of view.

From a knowledge-technology point of view.
First, it is important to start with a good understanding of what sort of knowledge is needed and how this knowledge is modelled. Secondly, there must be a mutual understanding about aims and content of the knowledge repositories between the system builder, the domain experts and the end-users (the last two are probably the same). Thirdly, the result must be user-friendly, self-evident, and easy to maintain. Last but not least, give users room to make their best decision from a couple of choices.

From a management/processes point of view.
Checking of knowledge repositories for re-use or for matching competences should be part of the regular business processes.
It is important that employees have extra time dedicated for these activities. (see also Schiereck and Van Dijk 1997)

From an organisational/culture point of view.
Using data bases and submitting to them should be rewarded or at least be part of personnel evaluation. "What is in for me" should be changed into "what is in for the company".

These two last aspects can be supported by the idea that everyone is supposed to be his/her own knowledge steward. In other words, being a knowledge steward becomes a part of the job.

Briefly, there are 3 possibilities for the control of the knowledge repositories:

* A knowledge manager takes care of the knowledge base. This person decides the relevance of pieces of knowledge that have been submitted. This means that (s)he has a good knowledge of all the domains in the division.

* A knowledge steward who only registers the submitted knowledge in the right format is appointed.

* Everybody is his own knowledge steward.

FI opts for this last possibility. However, to make that work one has to satisfy the following conditions:

* Submission of knowledge should not be anonymous.

* People should be rewarded and/or it should be part of the evaluation of their functioning.

* People should be taught how to submit knowledge as part of their training.

* Most importantly, the designated system should facilitate the submittance and also the retrieval of knowledge. The success of the system lies in one's understanding of the advantages of the system. This observation came up during my interviews but was also mentioned as one of the conclusions in the report conducted at CG by Schiereck and Van Dijk (1997).

The coupling of QM and KM will also strengthen the urge to use knowledge repositories.

The existence of a quality manual as standard for the execution of the business processes makes it easy to attach KM procedures to quality procedures. The checklist of the quality manual can include statements about knowledge preserving and sharing and who is involved and/or responsible.

The (metaphor of the) knowledge pump.

The previous solution does not mean that the knowledge manager has to disappear. On the contrary, there will remain enough to make KM work. From Van Heijst et al 1997 I mention the metaphor of the knowledge pump. (see fig.3) This is a means to actively preserve and actively distribute knowledge among knowledge workers. It leads to effective use of knowledge. It leads to re-use. And thus, it stimulates the creation of a LO.
Active preserving and distributing should be assessed against passive preserving and/or distributing (all together 4 combinations). Most companies handle knowledge in one of these ways. The most rewarding is the active/active combination. It means also that the professionals have an active participation which leads to better use. To provide systems that offer those facilities, to monitor them and maintain them, one or more persons should be in charge. In paragraph 3.2.1 some of these systems are described.
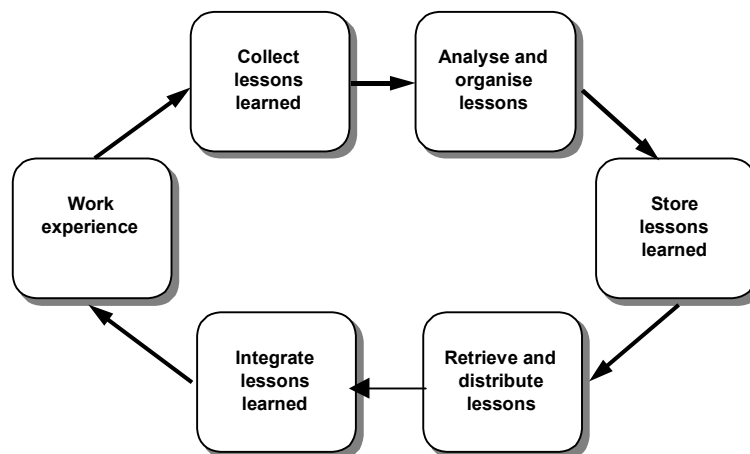
(fig.3) The knowledge pump

The knowledge manager has an active role in the collecting and distribution of knowledge. This happens through interaction with the persons who supply and need knowledge. On the strategic level, change management and change of culture need to back this recommendation.
Incorporating aspects of KM as a normal way of doing things, links KM and change management closely together. As I have previously mentioned the coupling of knowledge processes to business processes can lead to change or redesign of the business processes because of efficiency or better quality. Knowledge forces the business structures to change, or at least to be aware of possible changes.

Another change is in terms of people and culture. Consider these reflections of a consultant:
"This problem is unique; I have to solve it from scratch, besides my solution will be the best." or: "Certainly this problem has been solved before, but it will cost me hours to find it back." or: "Jones was an expert of this kind of problems, but he left the company."

And also there are considerations in terms of: "I am not going to share my high level of knowledge with anybody else." and: "Who will use it anyway? Besides it is a boring job to record my findings."

These and other tendencies of people's culture need to find other directions. These may also come forward from change management.

Concluding remark

Considering the outcome of the SWOT analysis,

* Professionals do not get a chance to save knowledge

* Motivation: everything else than creative things are boring jobs,

but also,

* Professional awareness that knowledge is important,

considering the importance of good development and maintenance of the knowledge repositories, and considering the importance of actively managing knowledge, I would recommend:

* to employ a knowledge manager who surveys all the aspects of knowledge logistics,

* to let the professionals be their own knowledge steward, provided certain conditions (p 39) are fulfilled

* to appoint one or more knowledge stewards who assist the professionals and the knowledge manager with routine and less demanding chores of knowledge management. These knowledge stewards can also fulfill the job of information specialist: the intermediair between professional and the information (s)he needs or provides.

This way of handling KM should be embedded and become part of change management.

In the observation phase was noticed that there is no real pressure to introduce a better KM (p 20). Business flourishes which causes the risk that professionals are not eager to spend extra time and energy to let KM work. The above-mentioned recommendation could be a solution for this situation, specially when the knowledge manager and the knowledge steward(s) are able to stimulate people in the right direction.

3.2.3 LET KNOWLEDGE SOCIALISE[7].

Using acquaintances for sharing knowledge is already a common practice. It will be increased by the use of the company's yellow pages. It will be intensified by intervision sessions, although organising these sessions is difficult in terms of available time. However, intervision is one of the backbones of synergy (the result is more than the sum of the individual efforts). Intervision sessions are also apt for evaluating mistakes. Compare intervision as the quality circles used in the Kaizen method (Imai 1994).

Intervision is regarded as organisational learning through communication. For complete KM it is not sufficient, but see the counter example at Rapid+ (see par. 2.2.4).
In its most simple form it is the coffee-machine network and the acquaintances network. In a more common form intervision is the regular meeting of knowledge workers who share their expertise and

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[7] Here, the term socialise is not used in Nonaka's sense.

evaluate their work. It is a problem that extra time is needed, and it is also difficult to find a time that everybody in a group is available. However, even if automated systems are at hand, personal communication is considered as important. In these meetings combinations of knowledge can produce new solutions; combinations of competences can produce new competences.

The management should also support a form of knowledge sharing that is called knowledge socialising[8] by letting novices work with experts. People should work in teams as often as possible rather than as individuals.

Another way to share knowledge in an active way is what Nonaka and Takeuchi (1995) call socialisation. They distinguish tacit and explicit knowledge. The transition of tacit knowledge from one person to tacit knowledge of another person they call sympathised knowledge or socialisation. To prevent that specialised, but tacit knowledge is only in the heads of 1 or 2 persons it is recommended that novice employees are coupled to these experienced people in order to learn on the job.

There are several advantages: the novice will eventually become an experienced worker; knowledge is shared, and thus preserved for the next generation; the novice can assist and be supervised in the project on a lower income than the experienced employees.

Both methods are forms of KM that can easily be implemented and only need some organisational effort.

3.2.4 JUSTIFICATION OF THE RECOMMENDATIONS

Each of these recommendations are good KM techniques, they fortify each other when used together and lead to even more powerful KM results.

These first 3 recommendations cover most of the weaknesses and threats of the SWOT analysis:

* No structured way of saving knowledge.

This will be solved by the knowledge repositories with project references, the company's yellow pages, and with "general knowledge".

* No structured way of distributing knowledge.

When knowledge is saved in a structured way in knowledge repositories, distribution of this knowledge is easier. However, the important issue here is the second recommendation that people are also facilitated and motivated to use these knowledge repositories.

* Too much knowledge is still in the heads.

The suggested knowledge repositories together with active contributing and consulting, proposed in recommendation 2, will diminish this problem.

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[8] This is Nonaka's term (see also 3.2.3)

    * Too much specialised knowledge is in one or two heads.

This can also be solved by knowledge repositories – in particular by the company's yellow pages. However this problem will be best reduced by recommendation 3. Socialising knowledge seems to be the most effective and cost-reducing way of proliferating specialised knowledge.

    * Market pull: professionals do not get a chance to save knowledge.

The conditions for submitting knowledge for the proposed knowledge repositories make saving knowledge a less time-consuming job. Also is recommended (recommendation 2) that employees are granted extra time for this task.

    * Ineffecient use of available knowledge costs time and manpower.

When the "available" knowledge (that is in an unstructured way or in the heads of people) is saved in an structured way in knowledge repositories the use will be more efficient. Moreover, when the checking of knowledge would be part of the regular business process (as is proposed in recommendation 2), the chance of missing important available knowledge is less present.

    * Threat of motivation: any task other than doing creative things is boring.

The conditions of the architecture of the proposed knowledge repositories concern the easiness to submitt and to retrieve knowledge. The time and effort to "do a boring job" will be reduced and therefore probably less threatening. From the strategic level a change in this culture of doing "only creative things" should be backed (recommendation 2).

    * The company's culture: the client first.

This threat should diminish with the second recommendation. When the organisation devotes time to check available knowledge and to save new knowledge, and when this becomes part of the business process, a change in culture will gradually take place.

    * Lack of knowledge of the market, clients and competitors will be a threat in the future.

This will be prevented by a knowledge repository about these items (recommendation 1).

In sum, these recommendations emerge from the weaknesses and future threats of this division's KM and try to solve them. The recommendations thrive mainly on the strong points and the opportunities to improve.

As innovative knowledge is abundantly available and eagerly obtained, and the distance between R & D and the performance to the clients is minimal, no specific action needs to be taken. However, it is advisible to keep monitoring this in order to prevent a possible let down in the future. Applying the learning cycle takes care of a periodical review of the present situation.

3.3 OTHER RECOMMENDATIONS

The first three recommendations are the recommendations that should solve the weaknesses and threats in a significant way. The next recommendations can be regarded as supportive for the first three.

On the business-process level

4. Perform a knowledge analysis on the business-process level.

The knowledge charts (see par. 1.6.4 for their advantages) must be filled in on an operational level. The charts give insight into the deficiencies of knowledge during the business process track. For specific projects they lead the way to detect at an early stage what personnel or what training is needed; also will become clear if, and how, re-use is possible. This is the logistics' approach of efficient use of knowledge.
This analysis takes time and must be done by a domain expert, probably together with a knowledge engineer. It is likely that conclusions toward IT or KT solutions can emerge. Another conclusion may be that the exact order of the business process needs to be changed.

This is also an instrument to find the knowledge that is needed to fill and refine the knowledge repositories mentioned in the first recommendation.
It is already a plan of the division to perform this. It will reveal specific knowledge gaps. It may even lead to alter the current business process. My suggestion would be to use the knowledge charts to cover as many aspects of KM as necessary, according to priorities.
Evaluating these aspects after a period of time will give insight into the effectiveness. This evaluation is an important aspect of a LO.

On the management level

5. Place knowledge capital on the balance, or at least in the annual report.

This recommendation is mainly suited to emphasize the importance of KM, and therefore also a supporting recommendation for the first three. It may change the attitude to devote time to knowledge saving and sharing. It may change motivation and culture of this organisation into a "knowledge-concerned" (or learning) organisation.

This recommendation can be brought up from the KM platform to the general management. Methods how to calculate human and knowledge capital are available from various sources.

Knowledge is the main asset and the main product of this company. The value of knowledge and human competence should be expressed in capital. These data can be added in the annual report and annual plan. Several publications deal with capitalisation of knowledge, such as those by Stewart (1997) and Edvinsson and Malone (1997).

Stewart devotes an appendix, "Tools for measuring and managing intellectual capital" (p 222-246) to this subject.

Edvinsson and Malone suggest this calculation:

Human capital + structural capital = intellectual capital.

> *"1. Human capital. The combined knowledge, skill, innovativeness, and ability of the company's individual employees to meet the task at hand. It also includes the company's values, culture, and philosophy. Human capital cannot be owned by the company.*
>
> *2. Structural capital. The hardware, software, databases, organizational structure, patents, trademarks, and everything else of organizational capability that supports those employee's productivity - in a word, everything left at the office when the employees go home. Structural capital also includes customer capital, the relationships developed with key customers. Unlike human capital, structural capital can be owned and thereby traded." (p. 11)*

When knowledge can be expressed in capital, KM will be regarded as an important means to generate profit. From here on it becomes possible that time and effort to care about knowledge will be part of the project budgets. KM will then be an integrated part of the business process.

During the writing this thesis the general management of CG Nederland announced that a substantial amount of money will be dedicated to the research and proposals for KM. So for this company support from the top does not seem to be a problem for the coming years.

Recommendations for the near future

6. Use intelligent agents to search the Internet (but also CapCom and Galaxy) for new knowledge and discussion groups; use them also to distribute this pro-actively by the knowledge manager to the right people.

7. Cherish front runners.

These recommendations mainly regard new and innovative knowledge. Getting new knowledge was not seen as a problem, but it would not hurt to pay attention to better (and more structured) acquisition and distribution. Competitors will do the same.
These recommendations also prevent that the strengths and opportunities of today will become threats in the future.

To cherish front runners can be understood in many ways. One can think of involving these persons more often in rotating teams and in intervision sessions. They should also award extra time for their efforts.

They can also be chosen as persons in the socialisation of knowledge (recommendation 3). Good HRM will be important to manage these processes.

General recommendations for CG's KM activities

Various strategies for KM have emerged in the divisions. If they are results of answers to specific situations, there is no reason to abandon them and replace for a "CG-solution". I believe that KM can offer general methods to analyse a KM situation in a KIO or other organisations; it can offer a choice of solutions; although each situation has its own strengths, weaknesses, and the like, and therefore it calls for specific solutions. This is also true for (large) divisions within one organisation. Even within one division departments may have their own KM solutions, as we have seen at RAPID+ (2.2.4).
Concluding, there is no best KM practice, but there are best solutions to specific problems. However, one strategy for KM has a stronger impact through the entire company. Therefore I recommend that one strategy should be formulated in terms of goals for the entire company, which is in tune with CG' s credo:

> *"knowledge is power"* is replaced by *"synergy increases power"*.

In addition, it is advised to share throughout the company the technology of the development of knowledge-base tools:

8. Create a CG tool-kit (self-developed or licensed existing tools) for KM problems.

This tool-kit can obtain, for example,

* tools for performing KM audits (like questionnaires and knowledge charts)

* best practices in KM from the various divisions

* structures of the knowledge repositories

* retrieval systems and thesauri for easy access to the repositories

* intelligent agents for browsing the Inter/intranet.

Through this tool-kit the knowledge managers of the divisions can share their expertise. Also this tool-kit can be used by consultants to advise their clients about KM.

3.4 EVALUATION

Van der Spek and Spijkervet (1997, p 26) mention success factors and drawbacks for KM. Since these factors which have been collected during several years of experience in this field and have proved their mettle, I use them as reference and recommendations for the situation at FI.
(I have entered my comments, when applicable, between brackets.)

Success factors

1. KM-strategy should be in line with the organisational ambitions.

(Organisational ambitions at FI aim at innovation and high quality of products and services. The first is secured in the Centres of Excellence; the fact that they are flexible, easily formed and with people who are close to the market, makes them a good instrument for developing new knowledge. The second, high quality, can be supported by effective use of available knowledge.)

2. Blue prints do not work; KM is a learning experiment.

(The recommendations for KM are introduced on the basis of an analysis of the particular situation at FI. They might lead to changes during implementation or later. This is an important aspect of the learning cycle.)

3. KM should deliver quick results to be accepted.

(Prototypes of the various knowledge repositories should be tested by the end-users; their feedback will improve systems and usually make the users eager to use them. A system that would not take long to complete is one with organisation structures and personnel of the main clients of FI.)

4. Dedicated staff to initiate KM-activities, but will their job last?

(The knowledge pump metaphor calls for a dedicated staff, and their jobs will last. Initiation of KM-activities is an ongoing process.)

5. Structural rewarding system to support KM-goals.

(This is considered.)

6. Strong support of management towards KM-initiatives.

(FI management as well as general management, supports KM.)

7. Knowledge should be considered in its socio-organisational context.

(Recommendations 2 and 3 emphasise this.)

> *8. Communication and collaboration is the basis for every KM activity.*

(Development of systems must be done together with users; change management is in tune with culture. Let knowledge socialise; see recommendation 3.)

> *9. KM should be a natural part of everyone's job and embedded in every process.*

(This is in tune with recommendation 2, 3 and 4.)

> *10. KM should be part of your self-assessment process, i.e., EFQM[9]-model for business excellence.*

(KM can be part of QM at FI.)

> *Drawbacks*
>
> *1. KM activities are regarded as costs and do not show direct benefits (if you are not looking in the right direction!!)*
>
> *2. Sharing, consolidation, distribution of knowledge is not considered work!*
>
> *3. Invested interests of disciplines (i.e., HRM, Quality dept., librarians, IT-staff,...) obstruct KM-initiatives*
>
> *4. Culture is an important factor but in many cases also used as an excuse to do nothing*
>
> *5. Many organisations lack indicators or even relevant data about performance.*

(These drawbacks speak for themselves. They should be used as warnings or advice when FI carries on with KM.)

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[9]European Foundation for Quality Management

3.5 CONCLUSION

The KM survey that I have conducted for FI went according the proposed plan.
I have used the review (or observation), conceptualisation, and reflection subcycles in order to gain insight into the situation, and to analyse the problems. I gave the following recommendations:

1. Develop knowledge repositories for saving and sharing the knowledge that is needed.
2. Stimulate people to use them.
3. Let knowledge socialise.
4. Perform a knowledge analysis on the business-process level.
5. Place knowledge capital on the balance, or at least in the annual report.
6. Use intelligent agents to search the Internet (but also CapCom and Galaxy) for new knowledge and discussion groups; use them also to distribute this pro-actively to the right people.
7. Cherish front runners.
8. Create a CG tool-kit (self-developed or licensed existing tools) for KM problems.

It is now up to the division to take action and implement solutions. So far several actions have already taken place. After a period of time the solutions need to be evaluated. From these evaluations more actions and adjustments will emerge. The evaluations will also reveal how much the division has improved its performance and thus how much it has become a LO.

4 CONCLUSIONS ABOUT THE KM METHOD

4.1 EVALUATION OF THE SURVEY

What has been learned so far?

The survey went according to the plan. The method has proven to be a good support for the KM audit at FI. The method consists of a well established learning cycle as a basis. Knowledge is viewed from various dimensions: KM points of view and organisational points of view. This is done by observation, interviews and questionnaires. To detect problems more precisely, knowledge charts that follow the business processes are used. During and after the survey the business support persons as well as myself did not feel that we had missed something that could have been of value for the outcome of the results. Fortunately, the use of a learning cycle makes it possible to evaluate the situation and to detect possible omissions. In a short period of time many aspects of KM are revealed in such a way that a SWOT analysis can easily be drawn up. Of course, proposing recommendations for improvement depends on the problems that have been found, on the priorities and feasibilities of the organisation. This requires knowledge of general KM techniques, insight in organisational situations, and solutions seen elsewhere.

But, since many, if not, all aspects of the KM situation are mapped, proposing solutions that work should be a straightforward process.

4.2 A METHOD FOR KM AT CG AND OTHER KIO'S

After the KM survey at FI, the commission was to develop a general method for KM that CG can apply for its own company and for its clients.

As there is no blueprint for KM, each situation calls for its own solution. Thus, a method that can reveal the situation in all its aspects would be the basis for good KM solutions. It would be a gross generalisation to take the method I have used for the investigation at FI as a general method for any KIO. Yet, this method so far seems to cover all knowledge aspects of a KIO. I would propose to use it as a prototype-method. It can be used in new surveys, augmented and refined. It can undergo a learning process of its own and turn into a well established method. The KM tools that will be developed for FI, such as the knowledge repositories on the Intranet, can be used as shells for other divisions and clients.

In recapitulation I offer a brief description of the method:

1. A learning cycle is the guide that investigates the situation, discovers the problems, works towards solutions, implements solutions and evaluates the results.

2. Knowledge has many aspects. With the use of checklists and charts that cover these aspects bottlenecks and good practices are discovered. The problems can be described so precisely that it will be easy to find solutions that really work.

3. The three aspects, technology, organisation, and culture are the contexts in which the survey takes place. The strengths and weaknesses of these aspects were also taken into account in the recommendations.

4. KM applies to the three levels of organisation. On the strategical level long-term global goals are formulated and the marginal conditions are set. At the tactical level the goals will be given shape and tools will be chosen. At the operational level actions will be carried out. Among these levels the recommendations will take place.

5. A choice of solutions is available and will be developed. Knowledge acquisition and modelling for filling the tools; management tools such as BPR, change management, HRM, to name a few.

4.3 A MANUAL

4.3.1 INTRODUCTION

This section provides a manual of the KM method that can be used for KIO's.

The method is pursued according to the learning cycle of review/observe, conceptualisation, reflection, and action (see Argyris 1978 and Van der Spek & De Hoog 1994). Before actually starting the cycle several conditions need to be fulfilled.

First, it is important to be certain that the management understands the benefits of good KM and approves of the procedures. Also the cooperation of the managers of the (sub-) divisions are needed.

Secondly, a project plan must be drawn. This plan contains the following items:

* a description of the organisation or parts thereof that will be surveyed

* a description of the problem, or other reasons for the survey

* people involved

* techniques, tools and facilities to be used

* time schedule

* project budget

Depending on the situation other relevant items can be mentioned, such as reporting, confidentialness, risk management, etc.

4.3.2 THE REVIEW/OBSERVE PHASE

In this stage it is advisable to start with announcing the research on KM through bulletin boards (real or virtual), newsletter and the like. People are invited to reflect on the necessity of KM and on the present situation. They might come up with helpful advices.

The work for this phase consists of

* read company material to understand the business processes

* interview managers; these are open interviews in which the ins and outs of the
   business processes in general are explained if necessary. What is their reaction? Do
   they already apply a sort of KM?

* interviews with people who are already involved in any kind of KM. What do they
   do? Do they have suggestions to improve things?

During these interviews the questions are also aimed at the 3 spheres of the CG approach and the 3 levels

of an organisation:

* Technology: what is available at the moment, such as the existence of an Intranet.

* Culture: although business culture is something that can be noticed during later interviews and by open one's eyes and ears, one can ask about cultural aspects such as open-mindness, quality driven, leadership, etc.

* Organisation: from the company's organigram and from an outline of the business the structure of the organisation should be clear. However, during interviews more details can be asked. Moreover, informal interviews can reveal how things really are, or how they should be.

* In the first interviews with managers one can ask what is thought about KM on strategic level, and what is done about KM on a tactic level. In interviews with (sub-) division managers one can ask about KM on the operational level.

In the observe/review state these spheres and levels are only examined in a superficial way: just to get an impression, to get a mental picture of the situation. One can take this impression into account during the later interviews to check striking points.

In this stage it should also be clear what the aim is for the upcoming KM survey. This in order to know - at the end - if improvement has taken place, and in what way.
Performance indicators may tell something about the improvement of certain processes, they usually say little to nothing about the causes and effects. They are too abstract to use for learning purposes. Therefore, I recommend to use the data on the knowledge charts as indicators for improvement (or lack thereof). For example, when in a particular year knowledge is re-used in 10 of the atomic processes and in the next year in 20 processes, one can speak of a 100% improvement of re-use. This is a nice result, however, more important is that also easily can be detected in which other processes re-use still can be applied. The data of these charts will draw one's attention to shortcomings at the present time and may show improvements in the future. I think that using these knowledge charts is, among other things, a rewarding working method that monitors the way to a learning organisation.

This part of the cycle, reading company's material, interviewing staff and sensing an impression of the company should result in the following deliverables:

* a description of the context of the organisation or division

* a description of its goals

* a description of its processes and products or services.

4.3.3 THE CONCEPTUAL PHASE

This part of the cycle builds on the previous phase: problems and challenges are revealed in more depth.

The methods that I have used for CG are interviews with questionnaires and brainstorm sessions with knowledge charts. They seem to reveal a rather clear picture of the situation and to ease the composing of a SWOT analysis.

4.3.3.1 The questionnaires

The questionnaires were designed by CIBIT for a survey among Dutch companies, not necessary KIO's. I have altered the questions slightly to accommodate the typical situation at CG, and also to the fact that I have questioned people with different kinds of functions. Basically, I have followed the pattern of the original forms. I suggest that for KIO's the following sets of questions are sufficient.
The interviewees are chosen based on their crucial functions (managers, heads of R & D centres) or typical functions on the production level (consultants, software specialists). Beforehand they are briefly told about KM so that they could think ahead. Each interview should take about an hour or less.
The interviewer asks the questions, when necessary explication is given. When not applicable, questions can be skipped. The advantage to go through the questions orally is that the interviewees often volunteer to give additional information and even suggestions for improvement.

The questions are grouped around the KM cycle of new knowledge, saving, distributing, and combining knowledge.
They are also focused on technology, culture and organisation (the 3 spheres of an organisation) and the 3 levels of the organisation: strategic, tactic, and operational.

1. General questions about the organisation or this particular (sub-)division.
- What is the core business, what are the markets, competitors, clients, products, distribution?
These questions for the organisation are already answered in the previous interviews or found in the organisation literature. However, it is a good introduction to ask people first what their role is in the business process, and what they think that the core business, market and the like, is.

2. Questions about strategy towards knowledge.
- Are there specific goals for the management of knowledge in this organisation or (sub-)division?
- Which are they?
- How are they registered? (strategic plan; training plan; quality plan; information plan; other)
- Who knows about these goals? (management; middle management; workfloor; other)

3. Questions about critical areas of knowledge.
The interviewer gives first an explanation: critical areas of knowledge are those areas of knowledge that are of significant importance of the well-being of the organisation, now and in the future.
The following questions are focused on the one or more most important products or services of the organisation or (sub-)division:
Mention for each of the activities of the process for this product the critical knowledge areas and the persons who possess this knowledge.
Divide these knowledge areas for each product in
a. Basic knowledge areas (the knowledge that is essential for the activities)
b. Core-knowledge areas (which distinguish this organisation from the competitors)

c. Promising knowledge areas (the innovative knowledge areas, the core areas of tomorrow). Mention the persons who possess these kinds of knowledge for each activity.

Depending on the aim of the KM research also questions about critical knowledge areas for management activities can be asked: strategic management; financial management; marketing management; HRM.

4. Questions about the management of knowledge. These questions are focused on the core product of the organisation or (sub-)division. When necessary the questions can also be answered for other products.

4.1 Development of new knowledge
- Where is new knowledge developed? (workfloor; R&D; by the management; other)
- Does your organisation or (sub-)division use external sources for obtaining new knowledge? (no; yes, from universities; innovation centres; organisation consultants; suppliers; customers; other)
- What are your experiences with the use of external sources?
- Do you think that there is sufficient room for the development and introduction of new knowledge and ideas?
- What are the important restrictions for the development of new knowledge? (time; money; motivation; culture)
- Can you give an example of a new idea that has led to a successful introduction of a new product, or to a substantial improvement of the quality of an existing product?
- What were the important factors for this success?
- Can you give an example of an idea that did not make it?
- What were the important factors for this failure?
- How is knowledge about the market, clients, and competitors developed? (marketing; by agents; visiting fairs; other)
- How is decided which ideas are further developed?
- Is sufficient knowledge about market, clients, and competitors developed?
- Is sufficient knowledge about the organisation itself developed? (departments of purchase; technology development; personnel; facilities; management; other)
- When things go wrong, is there a structural evaluation of the causes?
- Together with everyone involved?
- Are failures openly discussed in your organisation?

4.2 Questions about the distribution of knowledge.
- When new knowledge is developed in a certain part of the production process, is this knowledge distributed to other divisions that may need this knowledge (e.g., client services)?
- By what means is new knowledge distributed within the organisation? (in written form; orally and during informal contacts; presentations; inside training; other)
- Do you think that new knowledge is sufficiently distributed within your organisation?
- Does this happen fast enough?
- What are the limitations?
- Is knowledge that is gathered about market developments sufficiently transferred to other persons in the organisation?
- By what means are new employees introduced to their jobs? (participating in the production process after a brief introduction; participating in the production process under guidance of an experienced employee; company training; other)
- Do you think that knowledge is sufficiently transferred to new employees?
- Is the explicit distribution of new and existing knowledge to other people in the organisation: (a critical success factor for the continuity of the organisation; important; not so important)?

4.3 Questions about the saving of knowledge.

- By what means is knowledge registered in your organisation? (manuals; directories; memo's; schemes/diagrams/drawings; computer programs; models; other)
- Do you think that promising new knowledge and ideas are sufficiently registered?
- Do you think that core-knowledge is sufficiently registered?
- Do you think that knowledge that is registered now, will be available for others or for future use?
- Do employees sufficiently know where and in what form knowledge is registered?
- What are the most important limiting factors for an optimal saving and sharing of knowledge? (money; time; poor tools; motivation; culture; other)
- Is knowledge about the organisation also saved and shared for others in the organisation?
- Do you think that is desirable?
- Is knowledge about the market, clients, and competitors also registered and available for others or for future use?
-Is the saving and sharing of knowledge for others and for future use: (a critical success factor for the continuity of the organisation; important; not so important)?

4.4 Questions about the combining of knowledge.
- Do you think that the various fields of knowledge within your organisation are sufficiently put forward? (check the various parts of the business process)
- What are the significant limiting factors for the combining of fields of knowledge? (money; time; poor tools; motivation; culture, other)
- Is the combining of the best available knowledge: (a critical success factor for the continuity of the organisation; important; not so important)?

5 Questions about possible bottlenecks in KM.
These questions are in addition to already mentioned problems in the previous sections of the questionnaire.
- Can you mention costly mistakes that have been made because the necessary knowledge was not available?
- Can you tell the consequences thereof?
- Do only one or two persons in your organisation or (sub-)division possess critical knowledge?
- About what part of the business process?
- Check for each part of the business process if sufficiently qualified personnel is available. If not, tell the consequences.
- Check for each part of the business process if good relations between the clients and your organisation are obstructed by insufficient knowledge of your personnel?
- What knowledge is missing?
- Is known who possesses the right knowledge if problems occur?
- Is best available knowledge always used when problems occur?
- Is sufficient knowledge available about the market, client, and competitors? (present market position; present clients; potential markets; potential clients; competitors).

The answers to these questions give a broad impression of the KM situation. It gives also the context of the dimensions that can be captured less precisely, like culture, the organisational restrictions, and the like.

4.3.3.2 The knowledge charts

To pinpoint the omissions of KM more precisely, each part of the business process needs to be checked. To perform an analysis of the knowledge processes on the most basic level the knowledge charts should be used. (See for a formal description 1.6.4 and for examples the Appendix.) This work can best be done together with a domain expert for the particular parts of the business process. In the CG case I have worked together with the manager of business support for the entire business process. Because of the limited time available the knowledge charts were filled in on a higher level then is advisable. It shows on the examples: where we stated the problems we had to mention the activities on the most basic level of the process. Not all the questions need to be filled in when irrelevant. When the aim is to pinpoint all the possible moments where good KM should be applied, then, of course, as many as possible questions must be answered.

Depending on the persons involved one chart takes about 30 to 45 minutes to be filled in. Often one jumps back and forward to other charts; or revisions are made. A so called "brown paper session" can support this. A wall is wallpapered with (brown) paper; the activities of the business process are printed out and divided among the wall. With yellow "post-it" notes and various coloured markers the answers can be given. The post-it notes make corrections easier.

I suggest that the knowledge charts are used in this phase of the research to confirm the questionnaire. A more superficial way of answering will be sufficient. In the action phase when one is working on the solutions, all relevant questions need to be answered. The questionnaires regard the context and broader impression of KM (e.g., lack of qualified personnel). The knowledge charts reveal more exactly what is missing (e.g., a certain knowledge profile that is needed for a particular process.) In such way the answers on the knowledge charts can confirm the first impressions of the answers of the questionnaires.

As mentioned before (in 4.3.2) the outcome of the knowledge charts can also be used as performance indicators for the learning cycle.

4.3.3.3 The SWOT analysis

The material that has been gathered so far should give enough insights to draw up a list of strengths, weaknesses, opportunities, and threats. Following the structure of the questionnaire is the easiest way to perform this analysis, supported by the observations, the mental picture of the organisation, and the knowledge charts.
The items on the SWOT list are in terms of the basic aspects of KM:

> * The creation of new knowledge, consolidation, distribution and the combination of
>   knowledge (e.g., new knowledge is hard to obtain)

Of organisational levels:

> * Strategic, tactic, operational (e.g., topmanagement encourages KM)

Of the aspects:

> * Technology, culture and organisation (e.g., technology infrastructure is poor)

During brain storm sessions together with the (division) manager and other relevant persons the SWOT analysis should get its final form. That means that about everyone present agrees with the list. I would suggest to limit each heading to 7 (plus or minus 2) remarks. These numbers make planning of improvement more realistic and easier to overview.

The deliverables for this phase are:

* A description of the KM situation based on interviews and/or questionnaires

* Knowledge charts of the business processes (superficial or in more detail)

* The SWOT analysis.

4.3.4 THE REFLECTION PHASE

This phase is also based on brain-storm sessions with the people involved. The researcher draws up possible solutions based on the SWOT analysis and all technologies and organisational tools that are available. Similar situations described in the literature can be studied and taken into account. Existing KM or KT tools can be investigated. The aims and priorities for this organisation's KM should be confirmed.
The sessions consist of thinking aloud and writing down suggestions (brown paper session). They lead to a list of realistic and feasible solutions for KM improvement.

Deliverables:

* A list of recommendations.

4.3.5 THE ACTION PHASE

The organisation takes it over from here to implement the recommendations. However, several actions may use the help of a knowledge engineer, such as the building of knowledge bases.
The contents of this part of the cycle depend on the particular situation of the organisation and the list of recommendations for improvement. Also the time involved depends on the proposed steps, but I suggest to limit a period of 6 months to one year for an initial list of improvements. After that period a new review phase takes place to check what has been done so far and how suggested improvements have really improved KM. From here on new aims and goals can be set.

After the action phase a new review phase takes place. The deliverables would be:

* A description of the present KM situation

* New knowledge charts of the business processes

* A comparison with the former data

* New goals.

4.4 CONCLUDING REMARK

The statement that

> *You cannot manage knowledge because it is too vague, too extended, too distributed, too unknown....*

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can be replaced by

> *With an integrated method it is possible to have a good idea what knowledge is. Together with the right tools and management insight it is possible to manage knowledge well.*

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APPENDIX

Business process:

Knowledge process:

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1. DESCRIPTIVE ASPECTS

What sort of knowledge:
 Knowledge elements:
- structure
- how detailed
- knowledge modeling
- who, when, where needed

Actors:
- Profiles of knowledge workers (novice - experts)

What carriers/ sources:
- Needs documentation?

Deliverables:

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2. MANAGEMENT ASPECTS

Creating of new knowledge:

Documentation of new knowledge:

Available:
- Easy - not easy
- Tacit - explicit
- How?

Later use (re-use):

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3. QUALITY ASPECTS
Is the knowledge up-to-date:

What goes wrong, if knowledge is absent:

Learning aspects:

Performance:

Creation new knowledge:

4. PROBLEMS
Bottlenecks:

For what reasons are the management aspects not done?

5. POSSIBLE SOLUTIONS: