# KNOWLEDGE MANAGEMENT
## Developing a Policy

MASTER THESIS

Jacob Yttesen c971432

7th July 2003

# Abstract


This paper presents the facilitation of the development of a knowledge management policy in a Danish company. The analysis and studies of literature prior to the policymaking emphasized the importance of a result that was specifically designed to the company. Real-life cases are usually non-quantitative due to the complex environment, wherefore the problem solving process must be accommodated to the individual project. Due to the large number of stakeholders and aspects involved a holistics view was employed in the initial phase of the project.

The policy is the link between the strategic and operational level, and therefore all employees in the company will be affected by its content. Ownership of the policy encourage dedication, which is vital for the success. To win commitment an user orientated approach was applied focusing on the needs of the individual. The employees were involved in the process through a series of meeting and two held vision conferences. The first conference establish a general understanding of the need for a policy, and the second conference defined the content of the policy. Accomplishing this in a problematic situation required a combination of rational, critical and intuitive thinking by the facilitator.

The knowledge management policy developed, focus on four principle areas of importance, namely: networks, relevance, responsibility, and education and training. These areas are essential to the value adding knowledge for the company.

# Preface

This paper is the final product of the cooperation between Niro A/S and the author from the Technical University of Denmark (DTU). The work has been conducted in this spring and early summer of 2003, and is the master thesis and so far the final work of the author at DTU.

Many thanks to Niro A/S for their willingness and eagerness to collaborate in this project even though the objective was not fully established from the outset. Among the many employees who have contributed to the project, Jens Brinch-Nielsen and Steen Søndergaard Nissen should be accentuated for the advice, comments, ideas and many hours of participation.

In addition, the collaboration and exchange of ideas with fellow student, Stefan Reib, who has been working on a similar project, must be acknowledged.

Finally, but not the least, the supervisor, Victor Vidal, has invested many efforts and hours in helping the project group in the form of advise and guidance - Thank you.

Lyngby July 2003

Jacob Yttesen

# Contents

**1 Introduction** **6**
- 1.1 Problem Description . . . 7
- 1.2 Structure of Thesis . . . 7

**2 Methodological Discussions** **9**
- 2.1 Value Basis . . . 10
- 2.2 Approaches & Techniques . . . 11
  - 2.2.1 Creativity . . . 12
  - 2.2.2 Tools & Techniques . . . 14
  - 2.2.3 Problem Solving Approaches . . . 16
  - 2.2.4 Vision Conference . . . 19
- 2.3 The Project Process . . . 20
- 2.4 The Learning Process . . . 25

**3 Niro A/S** **27**
- 3.1 Niro A/S - overview . . . 27
- 3.2 Organization . . . 28
- 3.3 Focus - Chemical Division . . . 31
  - 3.3.1 Project Handling . . . 33
- 3.4 Summary . . . 36

**4 What is Knowledge?** **37**
- 4.1 Knowledge . . . 37
- 4.2 Duality . . . 41
  - 4.2.1 Connecting Participation and Reification . . . 43
  - 4.2.2 Levels of Knowledge . . . 44
- 4.3 Summary . . . 45

**5 Knowledge for Niro A/S** **46**

5.1 Project Handling . . . . . . . . . . 46

5.2 Knowledge Niro A/S . . . . . . . . . . 48

5.3 Summary . . . . . . . . . . 49

**6 Context of Knowledge** **51**

6.1 Transformation: The Spiral Proces . . . . . . . . . . 51

6.1.1 The Spiral Transformation . . . . . . . . . . 52

6.2 Metaphors of Organizations . . . . . . . . . . 55

6.3 Knowledge Ecology . . . . . . . . . . 57

6.4 Summary . . . . . . . . . . 59

**7 Ecosystem Niro A/S** **60**

7.1 The Ecosystems . . . . . . . . . . 60

7.2 Summary . . . . . . . . . . 65

**8 Principles in Supporting and Sharing** **66**

8.1 Communities of Practice . . . . . . . . . . 66

8.1.1 Defining Communities of Practice . . . . . . . . . . 66

8.1.2 Communities of Practice in Organizations . . . . . . . . . . 67

8.1.3 Developing and Nurturing Communities of Practice . . . . . . . . . . 69

8.2 Networks . . . . . . . . . . 70

8.2.1 Social Networks . . . . . . . . . . 71

8.2.2 Personal Network . . . . . . . . . . 72

8.2.3 IT Networks . . . . . . . . . . 73

8.2.4 Competence Systems . . . . . . . . . . 75

8.3 Training . . . . . . . . . . 76

8.3.1 A Model of the Learning Process . . . . . . . . . . 76

8.3.2 The Reflective Practitioner Reflection-in- and on-Action . . . . . . . . . . 77

8.3.3 The Professional Practicum and Reflection-in-Action . . . . . . . . . . 79

8.4 Summary . . . . . . . . . . 80

**9 Strategic Thinking** **82**

9.1 Strategy . . . . . . . . . . 83

9.1.1 From Strategic Planning to Strategic Thinking . . . . . . . . . . 84

9.1.2 Strategic Perspectives . . . . . . . . . . 85

9.2 Summary . . . . . . . . . . 88

**10 Strategic Work in Niro A/S** **89**
10.1 The Business Plans . . . . . . . . 89
10.2 Summary . . . . . . . . 94

**11 Policy Development** **95**
11.1 The Development of the Policy . . . . . . . . 95
11.2 Vision Conference 8th April . . . . . . . . 96
11.3 Framework for a Policy . . . . . . . . 98
11.4 Vision Conference 3rd June . . . . . . . . 100
11.5 Further Development of the Policy . . . . . . . . 102
11.6 Summary . . . . . . . . 103

**12 Knowledge Management Policy - Niro A/S** **105**
12.1 The Policy . . . . . . . . 105

**13 Evaluation & Discussion** **108**
13.1 Approach . . . . . . . . 109
13.2 Knowledge & Support . . . . . . . . 110
13.3 Strategy . . . . . . . . 111
13.4 Policy . . . . . . . . 112
13.5 Future work . . . . . . . . 112
13.5.1 Following the Policy . . . . . . . . 113
13.6 The Learning Process . . . . . . . . 114

**14 Conclusion** **116**

**A Deputy-Meeting Vision Conference** **124**
A.1 Invitation . . . . . . . . 124
A.2 Summary . . . . . . . . 125

**B 3rd June Vision Conference** **128**
B.1 Invitation . . . . . . . . 128
B.2 Summary . . . . . . . . 128

**C Preliminary Paper on Knowledge in Niro A/S** **137**

**D Prelimelary Project Description** **139**

**E The DTU Strategy** **141**

**F Discussion Paper - Knowledge Management Policy** **142**

# Chapter 1

# Introduction

During the past decades, the focus of management and planning theory for successful businesses has changed. Total Quality Management and Strategic Planning were in focus, but it has shifted towards Strategic Thinking and Knowledge Management. Careful planning and decision making are still important elements, but the significance of the human resources is becoming more vivid. Employees with specialized knowledge and experience will be the backbone of the companies in the future. The major task for managers is no longer controlling the production by introducing procedures, checklists and structure. Instead the objectives are to create a dynamic organization where the creative individual can be inspired by participation in teams and knowledge exchanging groups.
Getting a certain job done is not enough. It is a matter of establishing an environment where the employee can develop skills and gain knowledge for the future benefit of the company. Thus, knowledge has become even more valuable since it is a mean to maintain an advantage to the competitors, but even more important it is the basis for motivation of employees.

Having realized that knowledge is one of the key assets of management in the future, the author decided to concentrate on knowledge management as the general theme for this master thesis. The topic was the result of a couple of meetings with Niro A/S and the supervisor to ensure that it was in the interest of the company and could be approved for academic purposes. The initial thoughts and decisions are stated in the project plan (see appendix D), which was produced before the actual project began. Since then it has been decided that the end result should be a knowledge management policy.

Doing the project in cooperation with Niro A/S has been a positive experience for the author. The main part of the work has been concentrating on the Chemical Division, but representatives from all units have contributed.
Niro A/S requested from the beginning of the project the thesis to be written in English, in case it was going to be used internationally. Since the author is non-native English, the reader is asked to bear with the linguistic level, mistakes and difficulties in understanding caused by the Danish background.

During the project a series of employees have used the expression *Niro-Culture*, but nobody could explain exactly what the meaning was. At the same time all explanations were different although the contents were similar. For use in this project the author has collected some versions and will use the following definition:

**The Niro-Culture** is the English translation of the Danish word "Niro-Ånd" or "Niro spirit" in english. The concept is based on the personal networks and the tradition of "open doors" resulting in mutual respect between colleagues. Alongside this, everybody is expected to take responsibility for their actions.

## 1.1 Problem Description

At the beginning of the project the intention was to analyse the knowledge management in Niro A/S, but as the project progressed it became evident that a link, between the strategic goals and the operational initiatives, was needed. Based on studies of literature and Niro A/S it was decided to develop a policy to be the link. The objective is therefore phrased as:

"Develop a knowledge management policy for Niro A/S"

This includes a conceptualization of knowledge with respect to the company, and a consideration of the factors and aspect influencing knowledge management. Additionally, the position of the policy within the frame of strategy, tactics and operational work must be determined. The development of the policy will follow some general principles for policymaking, but the resulting policy is specifically adjusted to Niro A/S. Finally, the theories, approaches, and techniques applied will be evaluated.

The theoretical studies have been used to obtain alternatives and to expand the reflection room of the author. Hereafter, the efforts have been concentrated on establishing working definitions of the terms involved in knowledge management. This work has not been eased by the many vague and different definitions in the literature.

## 1.2 Structure of Thesis

The following outline should be seen as a reader's guide. Each chapter includes a short introduction to the topics which are going to be presented, and a summary in the end. If the reader is only interested in a overview of the work, the introductions and summaries are recommended in conjunction with the conclusion. Please note that the chapters: Methodological Discussions, Knowledge Management Policy - Niro A/S, and Evaluation & Discussion do not include a summary.

Chapter 2 is an introduction and evaluation of the approaches, methods and techniques applied. Furthermore, it describes the course of the project and the learning process of the parties involved.
Chapter 3 provides an overview of Niro A/S.
In Chapter 4 the term knowledge is investigated and a working definition is stated.
Chapter 5 combines the two previous chapters to summarize the knowledge of greatest value for Niro A/S.
Chapter 6 and 7 introduce metaphors as a way of viewing how knowledge is embedded communicated in organizations.
Chapter 8 descibe a series of principles for nursing knowledge environments.
Chapter 9 and 10 contain a discussion of the meaning of strategy and policymaking in general and in the context of Niro A/S.
Chapter 11 describes the actual policymaking process.

Chapter 12 contains the developed policy proposed by the author.
Chapter 13 is the discussion and evaluation of the project, and Chapter 14 summarizes the results in a conclusion.
Finally, the Appendix contain various document produced during the project.

# Chapter 2

# Methodological Discussions

Besides the theoretical studies of knowledge management and the supporting elements, this project has been a learning process itself. The process can yet again be divided into the internal project group process (the learning process of the author) and the student-company process, ending up with a recommended knowledge management policy for Niro A/S. These aspects will be described in the following.

The origin of the project was the interest of the facilitator in hard and soft operations research, as well as creativity and management. Meanwhile, the authors wanted to be involved in a practical project in collaboration with a company. Contact was made to Niro A/S because the company fulfilled the criteria of being a company relying heavily on engineering and having an appropriate size. However, it was essential that the company was having interest in the project and was prepared to invest the time required. This type of intervention is known as a *research-driven* intervention since the authors took the initiative to find a real-life case study [Vidal 2003a].
Following a couple of meetings with Niro A/S and the supervisor, *knowledge management* became the topic of the project, making it possible to work with a real-life non-quantifiable problem applying a wide range of competencies. The authors would indeed be benefiting from this, and Niro A/S would get a useful product by being evaluated by external persons. The collaboration with Niro A/S has been excellent, resulting in a *participative* intervention shortly after the initial contact was made [Vidal 2003a]. Both parties have found the topic interesting, developed as group and individuals, and been involved in the design of the policy.

The initial stages of the project were characterized by being a *mess*, which had to be analyzed. A mess or a problematic situation is characterized by taking place in a complex environment, and the situation is dynamic due to the interplay between the organization and the environment, several conflicting goals and lack of transparency [Vidal 2003a]. At Niro A/S the author had to analyze these aspect in order to find an appropriate approach.
In the case of Niro A/S many factors were involved, as it was not clear how to limit the extend of the project. There were many questions: "who would it be relevant to involve?", "how to involve them?", "who were the stake holders?", and "were there some internal *power* relationship?", etc. Furthermore it was clear that more research about Niro A/S and knowledge management was probably needed, requiring close collaboration with Niro A/S. The author was however confident that through research on Niro A/S, knowledge management, and related topics, it would be possible to transform the problem, and give it a more structured form.

Initially the aim and targets of the project were deliberately wide and with lose ends due to the *mess* as it appeared to the author. The objective of some early analysis was to get an overview of the current sharing of knowledge in Niro A/S. The results would be used as an indication of the significant topics to consider. The targets were to conduct these preliminary analysis, and the development of a plan of action to *kick start* the knowledge management process in the company. The lose ends also made it possible to adjust the objectives to the time and resources available.
After the preliminary analysis it was decided to develop a policy, instead of a plan of action. This would support the tactical planning before actually carrying out the operational work of the action plan.

The approach should be seen as a generic process with an initial starting point and visions about how to handle the project. Naturally, the author had several tools due to the engineering background, having spent nearly six years at DTU. The education is focusing on the engineering approach, being rational, analyzing the problems (not defining them) and solving them in a rational and creative way.[1] As the knowledge about Niro A/S and the studies on knowledge management progressed, the view on KM in Niro A/S expanded. It became obvious that there were a lot more aspects to be uncovered. Picturing the knowledge embedded in Niro A/S and explaining KM required a larger reflection room.
As a consequence of the complex context the extension of the project had to be limited. Therefore, the decision making has been based on thorough and superficial research depending on the intuition of the author. All topics have thus been considered as individual cases and their importance evaluated.[2] The focus has shifted as the project progressed but the value basis described below did not!

## 2.1 Value Basis

The author has been operating with a set of principles which have been fundamental to the approaches considered. The concept has been to focus on the opportunities instead of focusing on the restrictions.

During the project the author has attempted to involve as many employees as possible to create a larger amount of inputs to the project. This is believed to increase the commitment for future implementation of the policy, which is essential if a knowledge sharing culture is to be an integrated part of Niro A/S. This can be regarded as a *Bottom-Up* & *Top-Down* approach, involving all levels of the organization. The idea is to view the situation from different perspectives and believe that any person can be creative and have useful contributions. This is exactly the Bottom-Up concept where the final result is based on ideas evolving from a creative organization. Afterwards management will have to use the Top-Down concept when supporting the implementation of the policy and motivating the employees to follow the guidelines, they themselves have added to the policy.
It should be emphasized that from the beginning the author has had a holistic and flexible view, when dealing with KM in Niro A/S. This holistic view has added to the understanding of the problem when conceptualizing the *mess*.
Another principle of the value basis was, that opportunities should be exploited if they appeared to be beneficial for the project. This meant that, instead of focusing on a single method

[1] The different problem solving techniques are introduced in section 2.2.3.
[2] This approach will be discussed further in Chapter 13.

and forcing it's application onto the problem, different approaches and tools have been used. Such a pragmatic attitude toward problem solving is suitable for real-life cases, since there is no exact solution, and it is the outcome of the intuitive thinking of the author.

In short the approach of the project can be viewed as the synthesis of two or three *strategies for change*, namely, *critical thinking*, *intuitive thinking* and partly *rational thinking*. The strategies are related to the attitude toward changes in organizations, and they can be divided into six categories [Vidal 2003a]:

**Escaping:** Leaving a market or shutting down the activities within an area in order improve the economy of a business.

**Reacting:** Waiting and gathering more information before decision making. The organization adapts itself to the environment with the purpose of avoiding troubles and obstacles.

**Rational thinking:** Options for the decision making are established, and the best is used according to some preset standards.

**Critical thinking:** One seeks to understand the underlying causes for a problematic situation. The strategy assumes a system model for change, where the apparent problem is believed to just represent the top of the iceberg of deeper problems that have to be uncovered and solved. It is a holistic approach, breaking boundaries and enhancing inter disciplinarity.

**Intuitive thinking:** The unconscious and creative mind is used to envision a desired future. It might involve creative problem solving (see section 2.2.3).

**Transformational thinking:** Here intuitive thinking is combined with empowerment of the work groups in the organization and the spirit of self organization to contribute to the development of a community of practice.

As postulated the approach of this project has been a combination of *critical thinking*, *intuitive thinking* and *rational thinking*. The reason for this is the use of intuition, the pragmatic attitude and the holistic view of KM in Niro A/S. The rational aspect is embedded in the analysis made as well as the engineering background of the author.

## 2.2 Approaches & Techniques

The mess described above is caused by the complex system that arises when human beings are interacting, and the approach chosen to deal with the situation should of course consider this complicated aspect. The process illustrated in figure 2.3 is naturally based on several techniques and tools supporting the work of the groups involved. The following sections will describe the most important tools and techniques used. The focus will be on creativity, supporting tools and problem solving. Fundamentally they are all compatible with to the value basis, although they are not a complete list of alternatives.

### 2.2.1 Creativity

In this project, creativity is regarded in a "broader" perspective, than the work of artists and musicians. Similarly, it is not to be regarded as brainstorm. Creativity is a process of any individual or group creating new ideas which, when combined, in the right order might be the solution to a given problem. Similarly, it need not to be a physical product or a new invention. Any concept relying on physical production, service or communication can be creative. It can either be revolutionary or combining old knowledge in a new way. Basically, creativity is the creation of new ideas - thinking alternatively. Being creative is when an individual or a group changes it's perceptions of something, introducing a new concept [de Bono 1995]. The only criteria is that the ideas must be different from what has been done before whereas the complexity is irrelevant [Amabile 1997]. The exercise is to be creative, relevant to a specific problem presented. This process is the case in the daily life of many companies, where known technology or knowledge is being implemented in accordance with external factors. Being aware of the existence and impact of the process might, thus, be beneficial, as creativity is the initial step in innovation.

On the other hand, creativity can be used when dealing with more complex situations. Innovation is concentrated on bringing new (commercial) products to market. Creativity can be used for strategic thinking, problem solving and political issues. In todays business world the costumers demand individual products forcing the suppliers to be ready to change if they want to survive in the market. Companies must include the concepts of creativity in their change management. Organizations choosing a defensive change management strategy waiting to implement the changes until the surroundings are dictating it will not continue to exist. Management must be willing to change as a mean to fulfill a vision, avoiding the reactive strategy for change. By doing this, the organization will become dynamic and creativity is a vital factor in achieving these goals.

#### The Componential Theory of Creativity

The Componential Theory of Creativity include three components necessary for a creative process. In the following the content and influence of these components will be described. They are expertise, creative-thinking skill, and motivation as depicted in figure 2.1 [Amabile 1997].

#### Expertise

When initializing a creative process the expertise is essential, especially in technically advanced companies. The expertise could include the explicit knowledge (see section 4.1) and technical level within a certain field. However, expertise is not necessarily equivalent to academic education, but it does include experience. Creativity is sometimes seen as a product of innocence and ignorance, but it is based on coincident instead of deliberate actions ([de Bono 1995]). In an innovative environment reinvention of the wheel and unnecessary expenses could not be avoided, if creativity is not supported by expertise.

#### Creative thinking skills

Where the expertise included the explicit knowledge, the creative-thinking skill is part of the tacit knowledge (see section 4.1). Creative-thinking will often be value adding to the

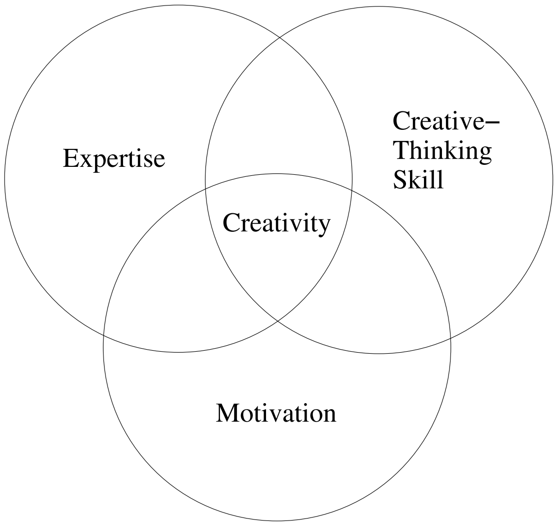


Figure 2.1: Elements of the Componential Theory of Creativity [Amabile 1997].

product because it goes beyond the standard technical solution which might be adequate and acceptable, but not necessarily extraordinary.

The ability of creative thinking is to some extent depending on the personality characteristics of the individual, but anybody can, when given the right support, take part in a creative process. Often it is a matter of learning and practice the right techniques which can result in a synergetic effect. Nevertheless, independent and self-disciplined individuals are often easier to involve in a creative process because they usually are more tolerant to ambiguity. Similarly, the perception of risk-taking and concern of social approval are important factors to consider for the facilitators of a creative process since it affects the activity of the participant [Amabile 1997]. However, even the most reserved individuals do often have very significant input to the process. The problem is not the personality, as long as the individual is able to think alternatively. The human mind is used to think in structured patterns. Waking up in the morning, eating breakfast, going to work and so on. At the same time of the day, the same things are done, the same way, every day, also in many organizations. Cutting these patterns, also called lateral thinking, is fundamental for creativity [de Bono 1995]. The facilitator must analyze these aspects to obtain the maximum benefit of the organization.
The way the individual is actually applying the creative-thinking skill may also be different. Some people are very systematic in their approach, breaking down the problem, testing and analyzing the results. Others prefer to consider a holistic view of the system, and the judgments and conclusions might be very different, but it is impossible to tell which method is the best. The task of management and the facilitator is often to combine these competences in the creative process, establishing the social environment based on freedom and trust.

### Motivation

The expertise and creative-thinking skill determine what a person is capable of doing, but the motivation determines what the person actually will do [Amabile 1997]. Management should ensure that the academic competences are available in the organization, but parallel to this the employees must be motivated to get involved. Motivation can be divided into two categories: extrinsic and intrinsic.
Extrinsic motivation is the motivation based on expected evaluation, surveillance, competition

with colleagues, dictates from superior, or the promise of rewards.
Intrinsic motivation is the motivation to work on something because it is interesting, involving, exciting, satisfying, or personally challenging [Amabile 1997].

If management is successful in motivating the employees, it is possible to reach a synergetic state. However, the timing of the different types of motivation is important, due to the human reaction. In general, intrinsic motivation always has a positive impact on the work being done. Extrinsic motivation on the other hand must be carefully applied because it might have a negative influence on creativity.
In situations where creativity is not needed, such as gathering of background information, extrinsic motivation can accelerate the process, because the human mind is basically greedy, according to fundamental assumptions in the science of economics. Additionally, if intrinsic motivation is high, extrinsic motivation might emphasize the process, but the manager must be very careful. Some group members might find such kinds of initiatives unnecessary resulting in a decreasing motivation. When considering motivation the manager must evaluate the effect according to the individuals involved.

Intrinsic motivation can be increased and demolished by different factors. Generally the working environment influences creativity, especially work group and supervisory support as well as challenging tasks. Surprisingly, resources and workload pressure play a less prominent role [Amabile 1997]. This might be due to the fact that people often feel satisfied when they complete a project where the resources have been short. The feeling of overcoming a massive task is more significant than the frustration caused by it. As long as there is a specific goal and a realistic amount of resources allocated, even the most difficult accomplishments become reality - probably by the use of creativity.
On the other hand political problems, "turf battles", destructive criticism, strict control and competition within the organization often undermine creativity [Amabile 1997]. If the employees are expecting to be evaluated, they might be focusing on how to produce a result that will get a good evaluation, instead of a useful result to the problem at hand. Similarly surveillance will distract the attention of the individual, as will competition when facing a win-lose situation [Stevens 1995]. Additionally, management must be aware of the effect of formal structures and procedures. These are necessary to some extent to standardize the working process, but can also be limiting the intrinsic motivation. In the end it will often be a compromise between the planner types, who prefer procedures, and the thinker types, who prefer a less structured process.

Finally criticism has an impact on motivation. As mentioned destructive criticism is detrimental to creativity. Judgment is an example of that, since it will force people back to a routine position [de Bono 1995]. However, when presented the right way criticism can actually have a positive influence on the process. People will include the criticism in the creative process, if it is specific, constructive and presented in a friendly manner.

### 2.2.2 Tools & Techniques

During the project different tools have been used to generate and evaluate ideas. Some of them are supporting the creative process, whereas others are based on project management resulting in a more rational and structured process. This combination of creative and rational thinking has been, as mentioned earlier, influencing the decision making. Similarly, the use of tools have been adjusted to the individual situation. Internally in the project group, mind mapping has been used extensively facilitated by the group members themselves. This was possible because of the prior knowledge of the technique and the social network within the group. Additionally, mind mapping is suitable for small groups. The field work at Niro A/S has mainly been meetings with small groups of two or three people, but two vision conferences were held to combine views from a larger spectrum.

### Brainstorming & Mindmap

Being part of a brainstorm is not equivalent to being creative, but it can be part of a creative process. The concept is to generate a large number of ideas without commenting or considering the value until the session is completed. To avoid the participants to consider social approval during the session, no criticism is permitted, and hitchhiking and combination of ideas are encouraged. The technique is simple, and it should be mentioned that it was designed for use in the advertising industry, where novelty can be a value [de Bono 1995]. The results are as such valueless. For a group to be creative it must continue using the results of the brainstorm in order to combine the ideas. When linked together the outcome of the idea generation might be the solution to the actual problem at hand. The concept of brainstorming is powerful in the advertising industry, because these people are usually open for lateral thinking. If the technique is to be used in other areas, the facilitator should focus on inspiring the participants. This can be done by asking the group to think in pictures, metaphors and links to nature. There is no final solution, and the facilitator should be creative when motivating the group.

Mind mapping is similar to brainstorming, but it is more structured in the it expands the ideas, making it more suitable for complex situations. A mind map physically links related ideas by lines on the figure drawn. The concept is to write the topic considered in a circle in the center of the paper. From the edge of the circle a line is drawn and a keyword is written on it. The participants will continuously add new ideas, or if hitchhiking and combining earlier ideas these lines will be connected to the related idea. The result is the topic in the center and branches sticking out. The basic rules are similar to those of the brainstorm avoiding criticism, discussions and judgments.

The advantage of the mind map is the visual aspect and the explanation that might accompany each idea. This explanation is not a discussion of the idea but the meaning is shared with the group in one or two sentences. The visual drawing of the map makes it possible for the participants to combine ideas from different branches, leading to new creative ideas. The individual participant will be confronted with completely different ideas from the others while thinking in his or hers own patterns. This encourage lateral thinking and creative thinking.
Using a mind map is a skill that can be trained, like anything else. It is possible to develop different styles of figures, colors and symbols to represent for example decision making and external factors.

### Divergent and Convergent Thinking

It has been shown that a creative process preferably can begin with divergent thinking with the purpose of producing as many ideas as possible and to widen up the horizon of the mind of the participants. After the divergent thinking process a convergent thinking process is useful in order to select the few most promising ideas and to develop them [Vidal 2003b].

**Rules for divergent thinking** :

- Imaging, reframing and see issues from different perspectives.
- Defer judgment, criticism or negativity kills the divergent process, be open to new experiences.
- Quantity breeds quality, to get good ideas a lot of ideas are needed.
- Hichiking is permitted, in this way a synergic effect can be achieved.
- Combine and modify ideas, in this way you can create many ideas.
- Think in pictures, to create future scenarios you can even essay to stimulate potential solutions.
- Stretch for ideas, imaging ideas beyond normal limits.
- Do not hesitate to break paradigms, avoid destructive criticism and add value to the challenged concept.

**Rules for convergent thinking** :

- Be systematic, find structure and patterns in the set of produced ideas.
- Develop ways to evaluate ideas, assess qualitative and quantitative measures of ideas.
- Use intuition, this is the way how most important decisions are taken.
- Avoid idea-killer views, try the impossible, do not be afraid to clash a wall; it is not for sure that it will hold.
- Avoid quickly ruling out an area of consideration, take your time or better sleep on it.
- Satisfy, do not expend to much time in looking for the optimal solution of an ill structured multi-criteria problem.
- Use heuristics, use common sense and experience based rules.
- Do not avoid but assess risk, does not mean being blind to risks, for serious consequences be sure to have a contingency plan.

The concept of divergent and convergent thinking is illustrated in figure 2.2, below. The phases of the vision conference described in section 2.2.4 follow this pattern for the creative process.

The facilitator applying and encouraging divergent and convergent thinking must be aware of the different personalities of the group members. As mentioned above some people are more easily involved in the diverging phase, whereas others tend to converge quickly, select a solution and conclude on that. Others again will be more passive depending on the attitude toward changes. These aspects add to the complexity of facilitation.

### 2.2.3 Problem Solving Approaches

During the facilitation of the process described in section 2.3, the author has been using approaches specifying the general principles and a step-wise process for problem solving. The most utilized approaches applied in the process are: the rational, the creative, and the critical

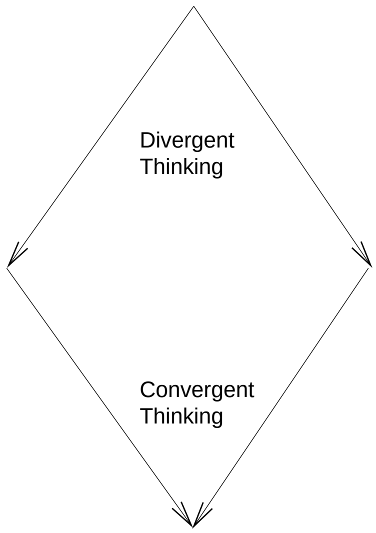


Figure 2.2: Divergent and convergent thinking.

[Vidal 2003a]. The rational approach is generally used when working within a set of boundaries of a system, and the decisions made can be described as intelligent, based on facts. Creative problem solving is aiming at breaking the boundaries of the current system to explore new opportunities and ideas. The critical approach is radical, empowering the members of the system, but at the same time it does not exclude the other approaches.
For each approach the facilitator can chose between different methods, each adding a certain dimension to the process. Methods usually give specific guidelines to the problem solving process. Techniques are rather simple and practical tools aiding the facilitator. The choice of methods and techniques should be specifically designed for each individual group facilitated. Is the group of interest engineers, lawyers, economists, craftsmen, construction workers or a combination, they presumably need to be facilitated in different ways.

### Rational Problem Solving

The essence of the rational approach is problem definition, structuring, decomposition, solution alternatives, resource planning and implementation. Logic and systematic thinking are characteristic aspects of all these phases, quantifying each part of the problem.

Although these elements do not seem to encourage motivation as described in section 2.2.1, the approach might sometimes be useful to apply. The facilitator will be an expert using this method and in the context it is used. The user or owner of the problem will not participate directly in the problem solving process, but often they provide the objective facts [Vidal 2003a]. When regarded as hard methods the results generally are mathematical models supporting the decision making of the owner. The advantage of the quantitative operation research is that the optimization results in an exact solution given a set of constraints. The solution dictates the decisions to be made, but this is also the weakness of the approach. On the other hand, the solution is as such objective, and the people affected then have to relate to it. The risk is that some people will not accept the results because they do not feel ownership. Meanwhile, the subjectivity of the model is hidden in the constraints actually making it possible for the problem solver to manipulate the model. The objective facts included in the modeling of constraints are gathered from the people with the knowledge and experience, and hereby they do indirectly have influence on the result. At the same time the results are also structured and to some extent easy to understand for third party.

The rational approach can also be regarded as a soft method, still with the same essence as above. Having defined and decomposed the problem, the means for reaching the goals are chosen. If the goal is a vision for the future, policies and projects will define the structure of solution alternatives. Rationality and decision making are thus a inseparable couple in this problem solving approach. Both the hard and the soft methods anticipate a holistic view of the problematic situation, being pragmatic towards the different solution alternatives. This positive behavior is also recognizable in the proactive attitude to change. When dealing with a mess it might sometime be necessary to be rational and finish of a less significant area with an objective decision. The rational approach provides this opportunity in a structured way.

### Creative Problem Solving

This approach to problem solving is closely related to creativity as described in section 2.2.1, where the lateral thinking is necessary and boundaries have to be broken. The aim is not to be anarchistic, breaking routines for the sake of breaking them, but still there should be a pro-active attitude to change. Alternatives are to be set up and the most promising ideas will set the future direction. A general model of the creative problem solving process is as follows [Vidal 2003a]:

**Mess finding:** An initial mess finding phase where the areas of concern are identified and regarded from a holistic viewpoint. The most general and significant problems should be chosen for further analysis.

**Fact finding:** The process continues to the fact finding phase where information about the topics are collected. The objective facts are usually easy to gather, but it is often the subjective inputs that are the most important. The facilitator is therefore facing a difficult situation because internal competition might obstruct the work.

**Problem finding:** Having gained knowledge about the problematic situation, the different possibilities are to be considered. In this phase it is important that the problem is regarded from alternative angles, and the causes for the problem are identified.

**Idea finding:** Create ideas, options and alternative solutions. Consider the approach, methods and tools needed in each case.

**Solution finding:** Evaluate if the ideas from the previous phase is fulfilling your criteria, and what is the consequences and impact of the ideas. What is the perception of the ideas? Choose the most promising solution.

**Acceptance finding:** Consider the actions needed to implement the chosen solution. Gain acceptance for the plan by motivating the involved parties, and develop a plan for the implementation.

During each phase the facilitator must encourage creativity in order to get the alternative ideas, that are crucial to the approach. Hereby, structures, procedures and assumptions are challenged, and the forces of lateral thinking are becoming significant. Creative problem solving relies on the divergent and convergent thinking, and the facilitator can use any method or technique aiding this.

#### Critical Problem Solving

The critical approach is a combination of the rational and the creative approach. The approach emphasizes the social intervention of the participative process when both the owner and the facilitator are proactive toward changes. The critical facilitator is focusing on the support of the group and the individual members. The idea of critical systems thinking is that problem solving should be accessible not only to the well-trained decision-makers but also to the majority of individuals [Ulrich 2003].

During the project the author was applying the rational and creative approaches while empowering the participarts. It was not until later that the author became aware of the critical problem solving approach. The critical systems thinking can thus be regarded as a facilitation technique similar to the value basis of the author.

### 2.2.4 Vision Conference

The Vision Conference is a workshop designed for a large group of participants with the purpose of creating visions for the future about a specific theme. The conference is described in [Vidal 2003b].

The purpose of the Vision Conference is the following:

- To create the space and the opportunities for the participants to be creative, producing their visions for the future.
- To have the participants to learn to work creatively, collectively and purposely in a large group.

The design of the Vision Conference can be divided in to three stages: pre-conference planning, the actual conference and post conference evaluation. Adding to these stages should be the two very important issues: a definition of the conference task and the organization and management of the group participating.

#### Pre-conference Planning

Tthe initial stage, pre-conference planning, includes task definition, social organization and planning and is done by the facilitator or due to some prior research, naturally in corporation with the organization involved in the conference. This includes the collection of relevant information and dialogue with the organization about central topics and their possible outcome during the conference.
There is one fundamental question for the facilitator when organizing the conference, namely: What is the desired output of the workshop?
Therefore a tentative definition of the purpose of the conference, that can be understood by the participants, should be developed. Furthermore a program should be suggested that provides adequate direction and sufficient scope for the participants. This is done in order to let the participants assume control and responsibility for the conference, or just ownership.
The task should preferably be defined as themes that allow the participants to take responsibility, which can be difficult if the task is too tightly defined.
Another aspect is social organization and planning. This includes some degree of planning

of whom to invite, how to conduct the conference, location, any games as starters for the participants to let them relax. Another matter of subject is how to position the participants, any specific rules that should be emphasized and time scheduling the phases described below. The planning should however not be too detailed as it should leave room for improvisation.
An invitational letter is finally sent to the participants, explaining, if needed, the purpose and task of the conference as well as if some prior questions have to be resolved in the minds of the participants.

### The Conference

The conference itself has two phases, a divergent phase and a convergent phase, described in Section 2.2.2. The phases follow an introduction where the facilitators, besides from introducing themselves, present the task of the conference. The structure of the phases is controlled by the facilitator depending on the individual conference. Some guidelines are:

**The divergent phase** could begin with subgroups producing as many ideas, projects, visions and objectives as possible. Hereafter, a plenary session continues the process.

**The convergent phase** is the phase where the participants, again in subgroups and partly in plenary sessions, will focus on the most promising ideas selected by the subgroups.

The phases will then end with a presentation of the work done through the day and an outline of what follows in the near future.

### Post conference

The facilitators should after the conference elaborate a report, which should be sent to all of the participants and the board of the organization in question. The report should contain all of the produced ideas, projects, visions and objectives from the two phases. Furthermore should the report too include an evaluation of the different processes and activities carried out at the conference. Ideally the Vision Conference should fuel a process that might evolve into action plans and implementations. For a more thorough description of the Vision Conference [Vidal 2003b] is advisable.

## 2.3 The Project Process

In section 2.2 it was stated that the approach of the project could be characterized by critical thinking, intuitive thinking and rational thinking. This characteristic can, however, be further detailed as the project has gone through several phases driven by some fundamental questions that arose as the project progressed.
The elements in the four phases involved a number of decisions and rationales for making these, as some were more obvious than others. All the phases involving methods and major decisions are described in figure 2.3, here a square represents a fact finding process, a diamond an idea and solution finding process and a circle pure solution finding process . Though the phases have been set in a way that indicates complete chronology, some of the phases took place simultaneously, but it will be explained in each of the following descriptions of the phases.

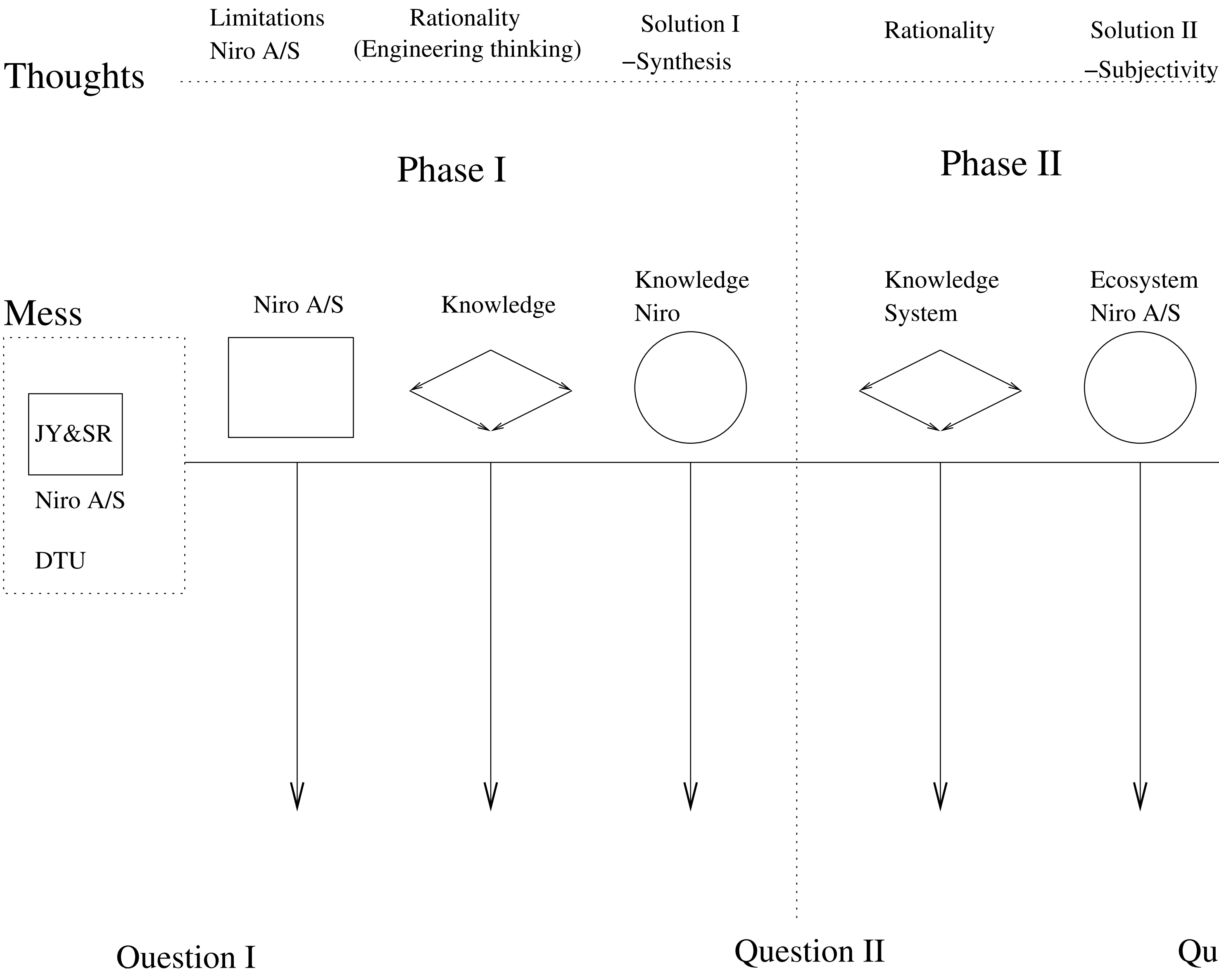


Figure 2.3: Method overview

The phases are much like the general model mentioned in section 2.2.3, though not all of the subprocess are present.

From the start of the project the situation was a Mess - very little knowledge about knowledge management and Niro A/S was obtained, however, some tools were available due to the engineering background. It was somewhat clear that some limitations had to be made. One of the first decisions was to limit it to only deal with Niro A/S in Denmark. Furthermore became the Chemical Division core of the project and investigations have mainly take place in the this division, though they were tried to be expanded to the rest of Niro A/S. Intuitively the decision was considered good as it meant that many meetings and interviews could be held quickly and it was not a problem to assemble several people at once.

In the beginning of the *mess* several meetings were held in Niro A/S, in particular with the Chemical Division. At these meetings it was decided to conduct a *fact finding* process about Niro A/S, as two basic questions had emerged:

> Question: What constitutes knowledge? and what is knowledge for Niro A/S?

### Phase I

It became evident that the management of knowledge in Niro A/S was a problematic situation, a mess [Vidal 2003a]. The initial phase of the project was a fact finding phase, focused on gathering information about Niro A/S such as organizational structure, products, and how work is carried out. Parallel to this, literature on knowledge and knowledge management was studied, emphasizing the complexity of the project. During the fact finding process at Niro A/S (see Chapter 3) a divergent process was taking place as theory about "knowledge" was investigated. Many definitions and explanations were found as literally thousands exist on the Internet and in the literature. Afterwards a convergent phase was initiated with rationality as the driving force. This was done in order to get some clear and workable definitions for the rest of the project. Considering knowledge as consisting of a tacit and a explicit dimension was the result of the process (see Chapter 4).
This definition was synthesized with the fact finding process about Niro A/S and an answer to the question, what knowledge was for Niro A/S (see Chapter 5), was found. This process is thus a solution finding process, defining the terms used.

Having "answered" the question another naturally arose from the following rationale: Since it is known what knowledge is for Niro A/S and an overview of Niro A/S has been obtained, it should be possible to describe how knowledge interacts and is embedded in the organization (Niro A/S). The following questions became the opening questions for phase II:

> How is knowledge embedded in Niro A/S? and how does it interact in Niro A/S?

### Phase II

In this phase the situation was, a bit confusing and several descriptions of knowledge conversion and organizations were studied. In particular the *spiral model* due to Nonaka & Takeuchi (See Chapter 6), as it was cited in many articles related to knowledge management. The divergent phase continued and a metaphor for describing a knowledge system (organization) was discovered: Knowledge Ecology (KE) due to [George Pór 2001]. This ignited a search for

other metaphors, the ones described by [Morgan 1986] were studied, as they showed that the KE essentially was a mix of them . The divergent phase of the process ended by selecting the KE model, as a way to describe how knowledge is embedded in Niro A/S. In connection with the the Spiral model the interaction was too seen. The rationale for selecting the KE model was that it was a comprehensible model that could be explained to Niro A/S.
As a result a KE model for Niro A/S was developed, Ecology Niro A/S, by applying the concept of KE to the already existing findings. [3]. Again the solution finding process was a synthesis and it was furthermore evaluated at Niro A/S and a special variant was found in the form of the "shell" (See Chapter 7.).
Simultaneously the next phase had already begun and was accelerated as Phase II neared its end. This phase did not end with a question since the KE Niro A/S was accepted as a solution, and the project shifted to phase III.

Simultaneously with the opening of phase II, other questions were asked, with the same rationale as with the questions to phase II, namely:

> If it is known how knowledge is embedded in Niro A/S and how it interacts, then how can it be support? and can it be converted ?

These questions mark the opening for phase III, which was conducted simultaneously with phase II

### Phase III

In order to describe how knowledge environments are supported, several key factors and principles were identified based on study of literature and meetings in Niro A/S. A Vision Conference confirmed that the hypothesis also were shared by several people in Niro A/S (See Chapter 11). The factors and principles, were among others, networks, responsibility, relevance and training and education. They were identified as the divergent phase of the support process, which took place (see figure 2.3). The divergent phase ended by identifying these key factors as well as several suggested solutions in the literature were considered. The decisions taken were not only made due to subjectivity, but also due to some rationality as another question arose:

> How to conduct support of the knowledge environments?

This question spawned the next divergent phase, Strategy, as several types of strategy making, policymaking and operational planning was considered. In the meantime a vision conference was held at Niro A/S, and after its completion the divergent phase was relatively quickly conducted, as it was decided, together with Niro A/S, that a KM policy was the right thing to develop for Niro A/S. This focus on developing a policy abruptly ended both the divergent phase and the convergent and should probably be seen as an opportunity that was exploited. The decision also meant that another subprocess of fact finding as the business plans for Niro A/S were studied. They had already been studied in Phase I, but now they had become significant for the project.

Prior to the project Niro A/S had worked out a Strategic Business Plan for each Strategic Business Unit (SBU, i.e. division, see Chapter 3 and Chapter 10) in collaboration with a

[3]See Chapter 7

consulting company (see Chapter 9). This had resulted in a definition of a mission, a vision and the strategic direction of each unit. Due to the time available, it has not been possible to conduct the analysis of the business plans to validate the statements. Instead the author has accepted the content based on well known analysis like SWOT, BCG and 7S.
These results and questions arisen during the theoretical studies have been discussed during a series of meetings with employees from all units in Niro A/S. Additionally two vision conferences have been conducted as described in Chapter 11. Nevertheless, the end result of this fact finding subprocess was the decision that the policy was the right thing to develop regarding KM in Niro A/S. This triggered the next phase, Phase IV, where the key question was:

> What should the content of a KM policy in Niro A/S be and how should it be constructed?

### Phase IV

In this phase some research took place in order to find a frame for a KM policy, and the divergent phase ended by the choice of adapting a framework from the Australian health department in New South Wales, though some modifications were made according to the intuition of the author and experience from policymaking at the DTU. The frame used was thus the result from the convergent phase.
The content of the policy was confirmed and adjusted through another vision conference (see Chapter 11) held at Niro A/S with more participants compared to the previous one. The content was then finally determined at a meeting in Niro hereafter the policy proposal was the end result of Phase IV or the solution found in the solution finding process in this subprocess.

### Epilogue

After the development of the policy several thoughts about how to implement it were considered, though none in detail. One suggested idea for supporting the implementation of the policy was described but again not in detail (See Chapter 13. Consequently the Epilogue is not only and acceptance finding process, but should also be seen as an evaluation of the decision making. Furthermore, a discussion of the future work is conducted here, more or less as a divergent phase for inspiration.

The above phases are as mentioned before placed in accordance with the outlay of this thesis, the phases contain the following chapters:

- Phase I
  - Niro A/S
  - What is Knowledge
  - Knowledge for Niro A/S
- Phase II
  - Context of Knowledge
  - Ecosystem Niro A/S

- Phase III
  - Principles in sharing and Supporting
  - Strategic Thinking
  - Strategic Work in Niro A/S
- Phase IV
  - Policy Development
  - Knowledge Management Policy - Niro A/S
- Epilogue
  - Evaluation & Discussion
  - Conclusion

## 2.4 The Learning Process

The author has too matured during the project, by being part of a complex environment. The reflections on the topic have been influence by the theory studied, the collaboration with the employees in Niro A/S and the discussions with the supervisor. However, the creative problem solving within the project group has contributed significantly to the understanding of the topics considered. The author has regularly had creative sessions using the mind map technique. Thus, each phase of the project have consisted of a convergent and a divergent phase where the authors have considered a certain theme, created new ideas, chosen the most promising ideas and combined them to fit into the context of Niro A/S. The process is illustrated in figure 2.4 below, and all the aspects are discussed later in this report.

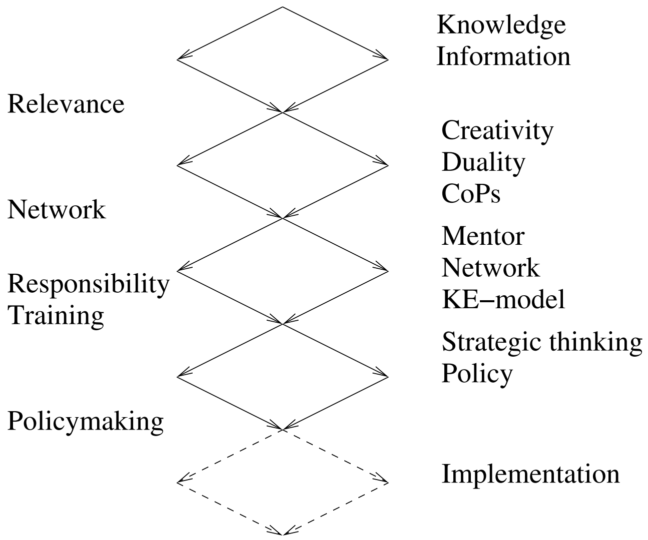


Figure 2.4: The learning process.

The figure 2.4 is not a complete picture of the learning process in the project but it underscores the creative process where a theme emphasizes the need for an expansion of the reflection room.

Meanwhile, the figure highlights a few fundamental elements essential for each theme. Some of these are mentioned on the left hand side of the model.

The dynamic approach illustrated in the figure was deliberately chosen by the authors at the beginning of the project to facilitate the work of the groups involved. The time between the meetings in Niro A/S is also important because the participants have time to reflect on the topics discussed. However, the creative processes often generate more ideas than can be analyzed, and it is therefore necessary to pick and choose among the alternatives. Rejected topics are not considered, but sometimes they have returned in later stage of the project. If they are considered important then, they will of course become part of the project. This was what happened, when the business plans were studied again in phase III as descibed in the previous section

The approach applied differs from the general academic projects within the soft operation research area. Usually a specific method is chosen and a theoretical study is conducted on a real-life case. In this project methods and tools have been used interchangeable and the direction of the project have therefore been dictated by the decision making of the project group.

# Chapter 3

# Niro A/S

In the following sections follow a general overview of Niro A/S,the services and products it produces, its organization and a description of how Niro A/S carries out its work. As most of the investigations in Niro A/S has taken place in the Chemical Division, the description is influenced by that. Though the Chemical Division is a rather good representative for the work made in Niro A/S, the focusing on this division will be discussed in Chapter 13.

**Process - Method**

As said in the previous chapter, the description of Niro A/S followed the initial stages of the project, the so called mess situation where one of the questions asked were "... what is knowledge for Niro A/S?". An investigation or fact finding process on Niro A/S was needed, and it is presented here. The focus of the investigation has been on gather information about Niro A/S, such as organizational structure, products, and how the typical work is carried out. The content of this chapter is based, besides from the investigations mentioned in the previous Chapter 2 , on information provided by Niro A/S and its official web site: WWW.niro.dk

## 3.1 Niro A/S - overview

Now we will describe the organization of Niro A/S as well as its main business area.
**Organization and ownership**
Niro A/S is owned by GEA, a global group of companies specializing in process and thermal engineering activities. GEA is part of the mg technologies group, one of Germany's large industrial enterprises with approximately. 35.000 employees. Niro is a leader in industrial drying technology and a member of GEA Process Engineering Division, P-division, which is represented in more than 50 countries and retains a total of about 3,000 employees. 375 of these work at Niro A/S in Denmark.

**Main business**
Niro A/S specializes in the design and supply of spray dryers, fluid bed dryers, freeze dryers, membrane filtration, extraction, heating and cooling plants for processing liquid, particulate and solid materials. We have particular expertise within environmental engineering where our core technology is used in air pollution control and waste management.

**Delivery Program**
Niro specializes in the development, design and engineering of process equipment and plants for product manufacture in liquid, powder and granular form.

Spray dryers and coolers, fluid bed systems, freeze concentration and freeze drying, evaporation, homogenization, membrane filtration systems, granulation and cooling units are included in the company's supply. The delivery program is marketed world-wide through a network of subsidiaries and representatives.

## 3.2 Organization

Niro A/S is organized into four divisions within the P-division. The P-division, contains the four main self supporting project divisions, Food & Diary, Chemical, Pharma and finally there is the the After Sales division. The P-division has furthermore embedded a number of units which support the other divisions

- Logistics
- Component Engineering
- Process control
- Finance & Administration
- Division Controlling
- H & R
- Informations Systems
- Marketing
- Test & Development.

The divisions are organized as shown in figure 3.1.

A description of each of the divisions follows here.

**Chemical Division**

The Chemical Division provides modern spray and fluid bed drying facilities which has gained a prominent position throughout the world's chemical industries.

The growing importance of technology for producing powders and granular materials is unmistakable.

Both in bulk and specialist chemical production, Niro spray and fluid bed plants have the ability to handle any plant capacity requirement, irrespective of whether the product contains aqueous or organic volatiles, is toxic, or abrasive.

Niro has delivered thousands of drying plants to the chemical industry handling hundreds of different products in spray dryers, fluid bed dryers, spray fluidized dryers, flash dryers and spray dryer absorbers.

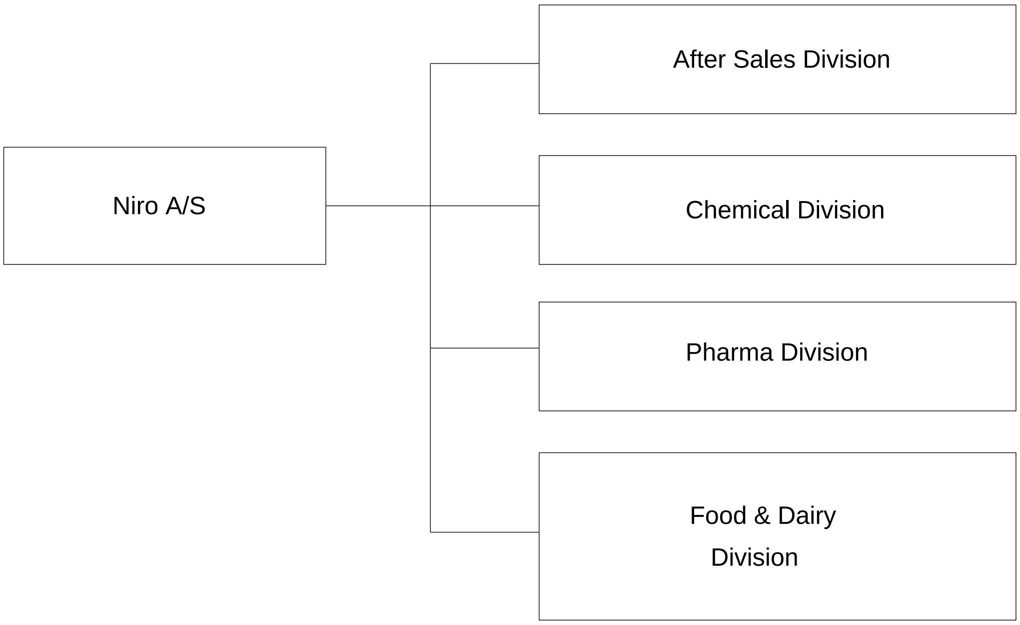


Figure 3.1: Overview of Niro A/S

**Segments served:**

- Agrochemicals.
- Air Pollution Control.
- Ceramics, Fine Ceramics, Hard Metal.
- Detergents.
- Dyestuff & Pigments.
- Fine Chemicals.
- Organic Chemicals.
- Polymer Drying.
- Spray-Cooled Products.
- Tannin.
- Wastewater.

**Pharma Division**

For half a century, Niro has supplied drying plants for powders and particulates to the pharmaceutical industry.

Small capacity dryers designed for specialist potent powders and industrial size plants for continuous operations under aseptic and high hygienic standards.

Product applications include analgesics, antibiotics, enzymes, proteins, vaccines, vitamins and yeasts.

Other equipment and plants supplied to the pharmaceutical industry include fluid bed tablet coaters, granulators and dryers, and microwave dryers.

**Segments served:**

- Biotech.
- Primary Pharma (Active Pharmaceutical Ingredients).
- Secondary Pharma (Powders for inhalation, micro encapsulation, etc.).

**Food & Dairy Division**

Serving the Food and Dairy industries has been and is the major factor the business activities of the Food and Dairy Division (FoDa). The Food and Dairy Division supplies equipment for processing a wide variety of products. This is being done in the form of individual plants such as evaporators, Spray dryers, Fluid bed dryers, Extraction plants or Freeze dryers or as combinations of the above, alternatively as complete process-lines on a turnkey basis.

Product applications have been within the segments of milk and whey products, carbohydrates, beverages, ingredients & flavors, protein foods, and fruit pulp and juices. Sanitary production conditions are offered.

**Segments served:**

- Blood and Gelatine (Animal).
- Carbohydrates, Sugar and Maltodextrin.
- Coffee, Tea & Cocoa.
- Health and Herbal.
- Juice, Fruit, Tomatoes and Vegetables.
- Milk Products.
- Spray-Cooled Products.
- Starch, Pectin, Functional Food and Food Conglutination.
- Vitamins.
- Whey Products.

### After Sales Division

The After Sales Division provides worldwide support for high technology Niro equipment. This also includes Atlas freeze-drying equipment. The After Sales Division serves customers by emphasizing quality design and manufacture, and through the employment of highly qualified customer service personnel. The After Sales Division guarantees that using Original Niro Spare Parts and components will ensure perfect compatibility, reliability and optimal operation of equipment and assures plant longevity.

**Service and Maintenance:**
The After Sales Division offers customers a broad range of services to secure optimal running of their plants. Highly qualified atomizer specialists and engineers carry out both field and in-house repair and maintenance services including upgrades of Rotary Atomizers - the specialized workshop in Copenhagen offers the latest technology within the atomizer wheel safety program. The repair of atomizers and atomizer wheels is followed by a certified test run in our custom fitted test facilities.

It is Niro policy to minimize any risk associated with operation of the high speed rotating atomizer wheels, and therefore atomizer wheel main components, repaired in the workshop, will be tested for surface cracks or other signs of stress, corrosion or fatigue before delivery takes place. The US ASTM Standard E 165-80 as well as the German DIN 54152 Standard will be followed.

**Training and Education:**
The After Sales Division offers training and education to give on site personnel the opportunity to service and maintain their atomizer equipment. This training can be carried out at the customers facility in Copenhagen or on site at the customer's plant.

Furthermore the After Sales Division has a service called *Delivery security and emergency calls:* Spare parts service assures that customers get all parts they need to secure the continuous operation of their equipment. Most parts are in stock and can be shipped the same day if required, including standard atomizer wheels, bearings, shaft assemblies and associated components. This service too includes holidays.

**Service program:**
Customers have automatic access to a range of services that are vital for both projecting new plants and achieving optimum performance of existing production facilities.

- Testing & Evaluation.
- Rental Plants.
- Project Financing.
- Installation and Plant Commissioning.
- Patent Department.
- After Sales Division.
- Process Control Department.

## 3.3 Focus - Chemical Division

In this section we know focus on the Chemical Division and describe it in further detail. The work presented is based primarily on interviews and meetings in the division and on the business plan for the Chemical Division (see Chapter 9 for details).

#### Distribution of Employees

The Chemical Division has in general a lot of engineers and many of them have worked in the division for many years. This can be seen from 3.1.

| Education | Number |
|---|---|
| B.sc. eng. - Mechanical | 8 |
| M.sc. eng. - Mechanical | 8 |
| M.sc. eng. - Chemical | 9 |
| Others | 13 |
| Experience (years) | Number |
| > 30 | 7 |
| 20-30 | 7 |
| 10-20 | 12 |
| 0-10 | 12 |

Table 3.1: Distribution of education and experience in the Chemical Division 2002

In general the employees in Niro A/S have a long career in the company, respect for each other, responsibility and commitment is embedded in the employees. Most employees posses a large amount of specific knowledge about their engineering work, sharing of this knowledge is done without any considerations. It appears, in general that the cooperation with the other divisions and departments follows the same principles of helpfulness

The amount of knowledge *stored* in the heads of the employees in the Chemical Division undoubtfully make up the main resource of knowledge for the division. In the employees are embedded the expertise and experience to contract and conduct large scale projects for the Chemical Division. The *loss* of experienced employees is therefore always a loss of expertise and experience, such losses are of course not limited to the Chemical Division alone, the other parts of Niro A/S are exposed to similar threats.
If look at the distribution of the employees and their level of experience in the Chemical division in figure 3.1, it appears that quite a few employees within a period of approximately five years will leave the company. On the other side there is reason to believe, that although some people will leave, there is still a large group of people who have stayed in the company for more than 20 years and they most likely could replace the *losses*. Whether this is case too in the other parts of Niro A/S or not, has not been investigated in details. Though the Pharma Division have a larger proportion of new employees and the average length of employment in Niro A/S is smaller. The main reason for this is the expansion that has taken place in the Pharma division the last five years.
It thus appears that with a little planning of the time when people leave the division, there should be no significant problems ahead due to loss of employees.
This conclusion only comes true if all the employees have the same positions with the same

responsibility and roughly the same importance for the division. This expanded analysis requires first a description of the typical work made in the handling of a project, see section 3.3.1 and chapter 13 for a further discussion of this matter.

**New Employees**

As mentioned in the previous section, having the right employees in Niro A/S is vital for its ability to exist. Consequently recruiting and training new employees are important tasks for Niro A/S.
In order to train new employees in the four main divisions Niro A/S have several steps a new employee will go through. An mentor is found, usually the group manager, and coupled with the new employee. He or she from the beginning is involved in the actual projects and anticipates in the different meetings and phases of a typically project in order to gain as much as possible of the knowledge, experience and competencies embedded in Niro A/S. Though the new employee attends the many meetings, only "minor" independent projects are given to he or she to be solved on their own. The complexity of the projects given are then gradually increased.

### 3.3.1 Project Handling

There exist a number of procedures for handling projects, right from the first contact from the customer to the Sales engineer to the evaluation of the finished plants by the commissioning engineer. The procedures have been developed over a long period of time and are well tested. However there appears to be a few problems in catching up with learned lessons and to pas them on to other departments of Niro A/S, if they have been involved in a project.

One of Niro A/S's main core competencies [1], is their *project handling*. This includes their contact with the customers, typically through a sales engineer, the approval and engagement of the Process technologist, in the Process engineering , and finally the basic engineering or project handling carried out by the Project engineers in th project teams in *engineering*. To this handling should be added After Sales and Test & Development.

The role of the process engineers in a typical project is to act as consultants and advisors for the sales engineers. Through testing (Test & Development), experience and negotiation with the customer, a project is first approved and verified by the process technologist and a offer is given to the customer. If the customer accepts this offer, the project is then, together with a project manager transferred into a technical specification, which is approved and verified by the process engineers as well as the involved persons from engineering. Their advise gives rise to guidelines concerning verification and approval of the technical demands as well of the economical ones.

The project is now handled by the Project engineering and the process technologist ensure that the specifications and the level quality are kept.

In average the process technologist handles about 20 ongoing projects at different level[2], to this figure should be added the several requests for advise and verification from the sales engineers, see figure 3.2. Sudden *loss* of a process technologists is thus if not a catastrophe then

[1] See chapter 10
[2] According to interviews with Process technologists .

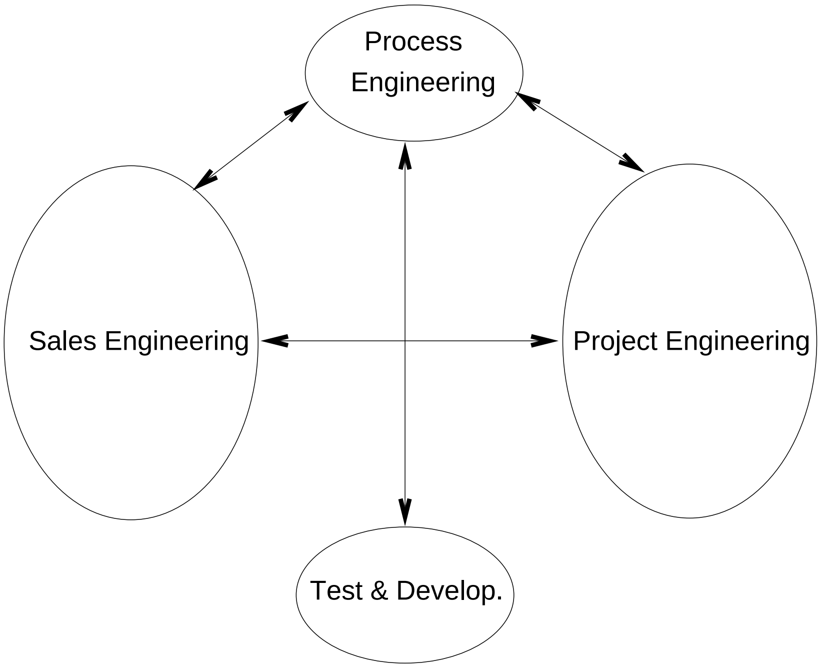


Figure 3.2: Typical project handling

a great loss.
Recruiting process technologists is not always an easy task, according to one process technologist, there are many people, who do not wish to be a process technologist due to a lot of work and responsibility. It is naturally a problem since in such a relatively small company that handles many complex projects, that requires the skills of the process technologists, it is absolutely crucial that new process technologists are recruited continually.

The project handling can be summarized in the following bullets.

**Process Engineering** for Niro

- 3-4 core technologies or process handling competencies
  - Process technologists many years of experience.
  - Large contact with the Test & development department

  Common network, shares knowledge, utilizes core tech. competencies with colleague Process technologists, *Process community*, in the other divisions in order to enable new development projects.

**Project Engineering** for Niro

- 3 subgroups, internal competencies, fluid bed, air pollution control (APC) and spray drying.
  - 3-4 experienced group managers.
    - Internal network/pool of engineers, 12 project managers, with good contact to Component and Process Control department and minimum 10 years of experience.

**Sales Engineering** for Niro

- 9 experienced sales engineers
  - Extensive knowledge about the 3 core tech. competencies due to experience from either the project handling or from the Test & Development department. They work in close contact with the process engineers.
  - Extensive knowledge about market segments, players on the market and the customers themselves. Have large personal customer networks.

Which can be represented in the following figure 3.3

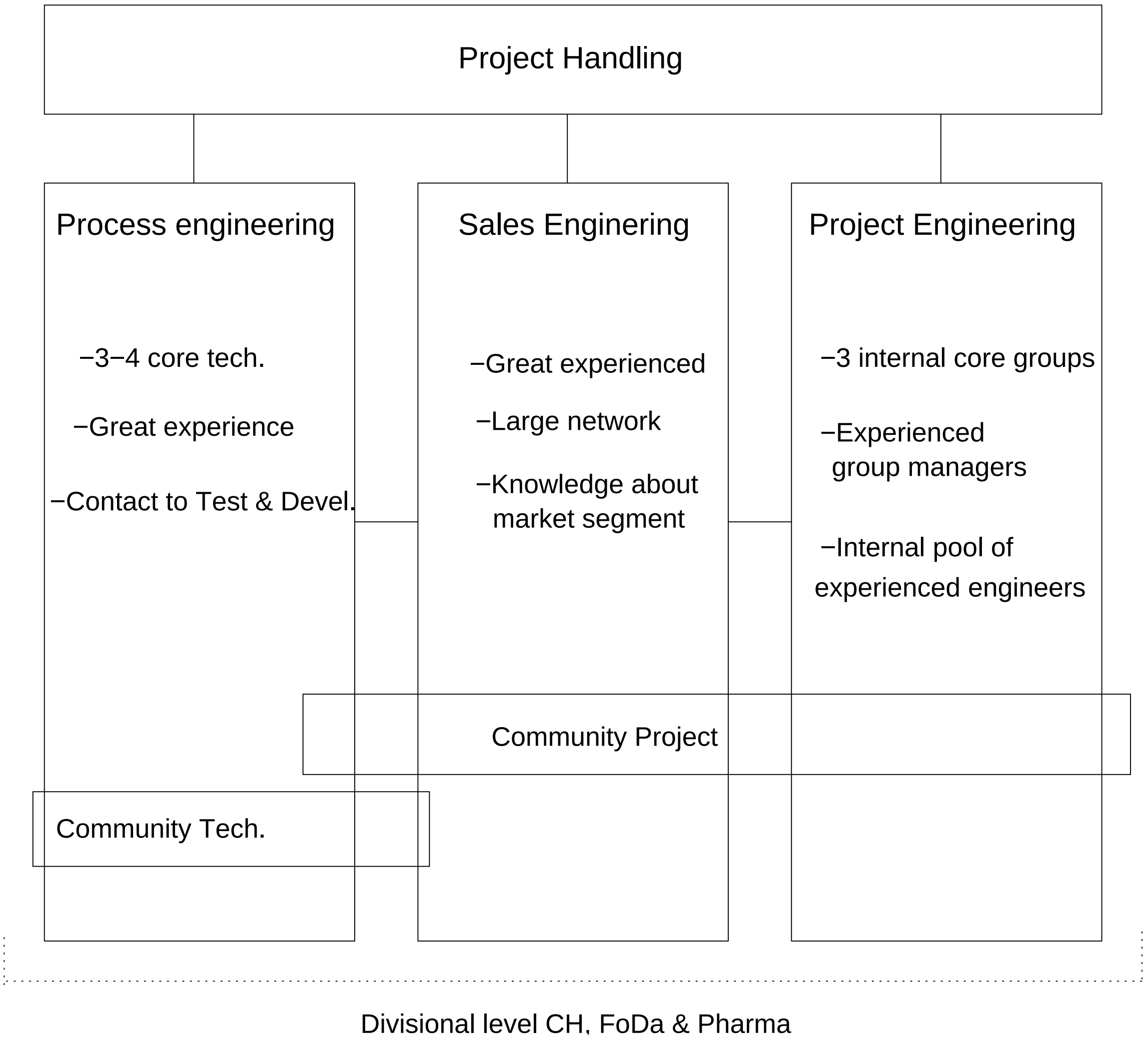


Figure 3.3: Project handling

**Communities**

Besides from the *Process community* there exist several other horizontal communities (in the Process handling see figure 3.3), a community consisting of experts with special knowledge and interest in the handling of explosion danger in chambers with high pressure exists. However most communities are informal and are driven by professional interest and in particular by the professional need, they tend to be a mixture of personal relations or networks (see Section 8.2) and task forces. From the experience of the past there is one key observation, namely, that the communities that are driven by either professional interest or by a need in the daily handling of projects, are the ones that have *survived*. Communities which have primarily been driven by other means have vanished.

The establishment of new horizontal communities should not be refused, but people will apparently not join them or use them unless they can benefit directly in their daily work. It appears, that communities, new or existing, should not focus only on nursing the personal contacts as most people already know each other.
The maintenance of such communities (is discussed further in chapter 8 and, and see [Wenger 1998]) should therefore take into account, that they need to have a specific goal, a task or a set of exercises should be employed and the people must from the beginning be aware of the usefulness of their commitment.

## 3.4 Summary

It thus appears that there a few main interesting conclusions to be drawn from the above description of Niro A/S:

- Process technologists are vital links in the project handling, due to great experience and knowledge about most projects.
- The risk of loss of knowledge, due to loss of employees, is always present though not an unsolvable problem for the Chemical Division. However, the departure of a process technologist have to be planned.
- Keeping an experienced and flexible staff is important, especially maintaining the ability for the division to conduct large scale projects including being able to define the task for the customer and consequently select the appropriate technology while servicing the customer.
- The personal relations between the customers and the sales engineers are valuable and takes years to build up.
- Recruiting and training new employees is equally important regarding the above bullet.

Whether the above headlines should be solved by increased use of IT tools, training, documentation etc. will be investigated in the following chapters.
We have now ended the fact finding process about Niro A/S, a lot things have not been mentioned and what is left out is due to the authors considerations of relevance. We can now turn our attention to the next question asked, namely what constitutes knowledge - what is it? Answering this question is needed in order to be able to define what knowledge really is for Niro A/S. We first have to look at the different aspects involved in the term "knowledge". This is done in the next chapter 4.

# Chapter 4

# What is Knowledge?

What is knowledge? Is it possible to decompose it in to any subparts without loosing some of its meaning? We will in the following chapter outline some of the descriptions and definitions of knowledge by first decompose it into two fundamental terms, *tacit* knowledge and *explicit* knowledge. Thereafter we will combine the two terms with context of the knowledge possessed by the individual, the group, the organization and several organizations. Finally we will introduce the concept of duality of knowledge. This concept marks the end of the search conducted in order to find a clear and workable definition of knowledge, and the concept was more or less abandoned in order to decrease the number of terms involved.
This chapter will lead to Chapter 5 that will answer the question: *What is knowledge for Niro A/S?*

## 4.1 Knowledge

In philosophy, the theory of knowledge is called epistemology and deals with such questions as how much knowledge comes from experience or from innate reasoning ability; whether knowledge needs to be believed or can simply be used; and how knowledge changes as new ideas about the same set of facts arise.

An initial way of describing knowledge is done by [Conklin 1996] who uses the terms *formal* and *informal* knowledge. He describes formal knowledge as that which is found in books, manuals and documents, and which can be easily shared in training courses. Informal knowledge is described as the knowledge that is applied in the process of creating formal knowledge.

Another differentiation is made by [Kogut & Zander 1992], who differentiates between *information* and *know-how*, while [Brown & Duguid] make a distinction between *know-how* and *know-what*:

> "The organizational knowledge that constitutes "core-competency" is more than "know-what" explicit knowledge which may be shared by several. A core competency requires the more elusive "know-how" - the particular ability to put know-what into practice." ( [Brown & Duguid]: p.91)

Instead of viewing knowledge in black and white, as a dichotomy[1], it could also be viewed as a *continuum*. In [Leonard & Sensiper 1998] knowledge is described as a continuum or as they state a *spectrum*:

> "Knowledge exists on a spectrum. At one extreme, it is almost completely tacit, that is semi conscious and unconscious knowledge held in peoples "heads and bodies". At the other end of the spectrum, knowledge is almost completely explicit or codified, structured and accessible to people other than the individuals originating it. Most knowledge of course exists between the extremes. Explicit elements are objective, rational and created in the "then and there", while the tacit elements are subjective experiential and created in the 'here and now'". (See [Leonard & Sensiper 1998])

Although many terms are used to describe knowledge, perhaps the most contentious is the distinction that is made between *tacit* and *explicit* knowledge. Taking a simple "dictionary definition" (see [Webster]), tacit knowledge is that which is understood without being openly expressed; it is unvoiced or unspoken. An example might be the knowledge that a native speaker has of a language. Explicit knowledge on the other hand is that which can be expressed clearly and fully in formal language, and leaves nothing implied. An example might be knowledge that can be formally expressed and transmitted to other people through i.e. manuals, specifications, regulations, rules or procedures.

There are however some inconsistencies if we use the above distinction.
Using this distinction highlights some of the inconsistencies in the previous statements. For example, [Brown & Duguid] state that know-what is explicit knowledge. However, know-how can also have an explicit component. For example, procedures are a codified form of know-how that guide people in how to perform a task. These inconsistencies, due to the distinction between tacit and explicit knowledge, have according to [Hildreth & Kimble 2002] created a problematic situation that continues to dog much of the literature on KM.

Probably the most often cited, when describing tacit knowledge, is [Polanyi 1967].Polanyi proposed a concept of knowledge based on three main theses:

- First, true discovery cannot be accounted for by a set of articulated rules or algorithms
- Second, knowledge is public but is also to a large extent personal (i.e. it is socially constructed)
- Third, the knowledge that underlies explicit knowledge is more fundamental; all knowledge is either tacit or rooted in tacit knowledge.

For Polanyi, tacit or implicit knowledge is knowledge that is known but cannot be *told*. It is the kind of knowledge that cannot be articulated in formal language because it has become *internalized* in the unconscious mind. It represents a level of understanding that cannot be externalized because it is "inaccessible to consciousness" put simply "we know more than we can tell."( [Polanyi 1967])

A more recent distinction between tacit and explicit knowledge is made by Nonaka [Nonaka 1991]. According to Nonaka, explicit knowledge is knowledge that is easily expressed, captured, stored

[1] The dictionary definition of "dichotomy" is a division into two parts when they are sharply distinguished or opposed [Webster]

and reused. It can be transmitted as data and is found in databases, books, manuals and messages. In contrast, according to Nonaka tacit knowledge is:

> "...highly personal. It is hard to formalize and therefore difficult to communicate to others ...tacit knowledge is deeply rooted in action and in an individual's commitment to a specific context ...tacit knowledge consists partly of technical skills [and partly] of mental models, beliefs and perspectives so ingrained that we take them for granted and cannot easily articulate them." ( [Nonaka 1991], 98)

For Nonaka [Nonaka 1991] tacit and explicit knowledge are not separate but mutually complementary entities. They interact with each other in the creative activities of human beings. Nonaka calls the interaction of these two forms of knowledge the knowledge conversion process, and it will be explained further in the chapter 6.

Another interesting distinction is the one between Knowledge, data and information by [Bertelsen 1996]. He defines information as i.e. his phone number, the viscosity of water and mathematical formulas. In other words information is more than just dates, which is just numbers or text without any context or meaning. Information can be used and deciphered in i.e. books about IT systems, which are information.

Knowledge is according to [Bertelsen 1996] simply information that has been captured and deciphered in the human mind. If it is transmitted by a person to another person verbally or nonverbally, it is transformed into information, which the other person will have to capture and decipher into knowledge, a translation has taken place and the knowledge existing in the minds of the two person might not be the same due to this translation.
Furthermore knowledge can differ whether it is stored in one person or in a group or in an organization. In information technology, knowledge is, to an enterprise or an individual, the possession of information or the ability to quickly locate it. This is essentially what Samuel Johnson[2], said when he wrote that:

> "Knowledge is of two kinds: we know a subject ourselves, or we know where we can find information upon it." [Boswell & Endicott 1964]

More terms and descriptions are found in the literature and countless books have been written about the topic and probably they will continue to be written. However, we chose to use the definition or description made by Nonaka [Nonaka 1991], though we will see it more like a pair of coordinates, meaning that some examples of knowledge may contain a certain amount of tacit knowledge and another amount of implicit knowledge.

The figure 4.1 shows in a rather naive way our view of knowledge consisting of a tacit dimension and an explicit dimension. But specifying the quantity of each of coordinates, X and Y, is probably not an easy task, if it at all makes sense to so.
In [Hildreth & Kimble 1999] Hildreth and Kimble adopt the terms soft and hard knowledge as working terms to describe the different kinds of knowledge that were being explored in the KM field.

The terms were, according to Hildreth and Kimble, not intended to add to the existing plethora of terms to describe knowledge, rather they were intended as *pantechnicon* [3] terms to bundle together a range of views to facilitate easier discussion.[Hildreth & Kimble 2002]

[2](1709-1784), compiler of the first comprehensive English dictionary

[3]Pantechnicon comes from two Greek roots: "pan" meaning "all" and "technikos" meaning "belonging to the arts" or just "all the arts". The word is nowadays means large warehouse that stores furniture.

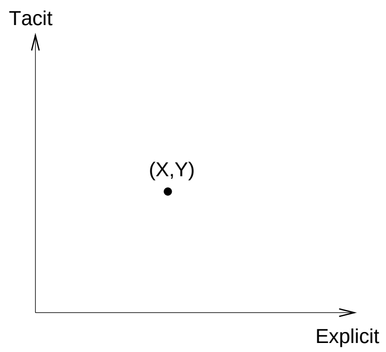


Figure 4.1: Visualization of knowledge as consisting of coordinats.

They referred to *hard* knowledge as being "codifiable" and observed that the management of hard knowledge is now well established with many tools and techniques available to support this form of KM. *Soft* knowledge in turn was describes as that which is less quantifiable and cannot be so easily captured and stored. [Winograd & Flores(1986)] described such knowledge as "lost in the unfathomable depths of obviousness". Examples of such knowledge might include tacit knowledge, internalized experience, skills, internalized and cultural knowledge embedded in practice. Hildreth and Kimble also recognized the importance of the social aspect of soft knowledge as per the constructionist approach championed by von Krogh [von Krogh 1998].

The constructionist perspective regards knowledge as an act of social construction. Von Krogh states:

> To the constructionist, some knowledge is explicit but some is also tacit, highly personal, not easily expressed and therefore not easy to share with others. Tacit knowledge involves physical skills such as putting the movements together in a high-precision luxury watch as well as perception skills such as interpreting a complex seismic readout of an oil reservoir. ( [von Krogh 1998]: 134)

[von Krogh 1998] constructionist view is based on his earlier work comparing the representational (cognitivist) view of knowledge with a particular type of constructionist view: autopoiesis[4].

Underlying the arguments of von Krogh [von Krogh 1998] regarding the use of autopoiesis theory is the idea that knowledge is socially constructed. The differences between the traditional and autopoietic perspectives can be summarized in the table by [Vicari 1996]:

One of Polanyi's [Polanyi 1967] three main theses was that knowledge is socially constructed, in accordance to von Krogh. In making a tacit/explicit distinction (as typified by Nonaka [Nonaka 1991]), the KM approach follows a cognitive approach and simply tries to make the soft knowledge hard.
If soft knowledge poses the main challenge to KM, then in order to manage soft knowledge more successfully we should move away from a representationalist view of knowledge towards

[4] The formal definition of autopoiesis is: "'An autopoietic system is organized (defined as a unity) as a network of processes of production (transformation and destruction) of components that produces the components that: (1) through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them; and (2) constitute it (the machine) as a concrete unity in the space in which they exist by specifying the topological domain of its realization as such a network." [Varela 1979] (p.13).

| Autopoietic View | Representational View |
|---|---|
| Knowledge is creational and based on distinction making in observation | Knowledge is representation of a pre-given reality |
| Knowledge is history dependent and thus is context sensitive | Knowledge is unchanging , universal and objective |
| Knowledge is not directly transferable | Knowledge is directly transferable |

Table 4.1: Autopoietic vs. traditional view of knowledge.

a more constructionist view. To move towards the management of soft knowledge we need to understand the processes that govern its construction and how nurture it in an organization.

## 4.2 Duality

A broader perspective of knowledge was proposed i.e. by Wenger in [Wenger 1998], it was the concept of viewing knowledge as a duality consisting of two ingredients, namely soft and hard. The two ingredients do not exclude each other and they contain all of the aspects and facets of tacit and explicit knowledge; as the softer aspects of knowledge are those that cannot be externalized and the harder aspects are those that can be articulated, captured and stored.
Seeing knowledge as a duality also means that one has to see knowledge as an entity that contains both softer parts as well as harder parts, not unlike the rather naive representation of knowledge as pair of coordinates.

*What is Duality really?* The term *Duality* in this context is as said before made up of a softer ingredient and a harder one - in the literature they are given the formal names: *participation* and *reification*[5]. An explanation of the two elements follows here.

- **Participation:** Experience -Meaning -negotiations The definition by Webster's encyclopedia is the following:

  > "To take or take a part or share with others (in some activity, enterprise, etc.)"

  One is taking part in some relationship with other people, at work, at home or somewhere else and is comprised of action and connection. In [Wenger 1998] Wenger use the term *participation* to describe the social experience of living in the world in terms off membership in social communities and active involvement in social enterprise. It is thus *personal* and *social*.

  Participation is a dynamic and active process that involves peoples thoughts, emotions, beliefs, actions, social relations and feelings. Wenger further explains the term participation by stating that i consists of a number of elements, which we will list some of them ([Wenger 1998],p. 63);

  - Living in the world We shape the world, but it shapes us to, we live in a social and a physical world where our actions shape one of them if not both [6]. One example of our impact on the social and physical world is when a couple decide to have

[5]See i.e. [Wenger 1998].
[6]See [Cook & Brown]

children. A new born child is un doubtfully a change to the physical world we live in, but for parents have too changed the social environment or world they live in. Their friends and family no longer see them as a *couple*, in their minds they have become *parents*, with all the responsibilities it inherits.

- Acting is a central element of participation, we act in several communities in more less dominant ways. Most people would say, that they do not *act* in the political system (in Denmark ), but they *do*. By voting at the elections or articulating our beliefs or frustrations at home to the family, we act. Our actions might not have great implications for the politicians, but we still act.
- Membership We belong to many communities or feel we belong to them. Our working place is community where we have a *membership* which shape our behavior and self sense, but it too shapes other peoples way of seeing us. Belonging to the management at a factory means the ordinary workers see you in one *perspective*, you are manager, your employees view you differently from your colleagues in the management, who see you in another perspective - you are part of their community and you view them as colleagues while the ordinary workers are your employees.
- Mutuality Mutuality is a key aspect of engagement. Wenger explains that practice exists because people engage in actions, the meanings of which they have to negotiate with each other. Therefore, he states that practice is not to be found in books or tools (although it may involve many kinds of artifacts). Practice is to be found in a community "and the relations of mutual engagement by which they can do whatever they do" [Wenger 1998] (p73).

• **Reification:** Participation and Reification are inextricably linked. Wenger uses the concept of reification as:

> "very generally to refer to the process of giving form to our experience by producing objects that congeal this experience into "thingness"... With the term reification I mean to cover a wide range of processes that include making, designing, representing, naming, encoding and describing, as well as perceiving, interpreting, using, reusing, decoding and recasting." [Wenger 1998] p58-59

He explains that any *Community of Practice* (See section 8.1) will produce artifacts, tools, stories, procedures and terms which *reify* something of its practice. The artifacts reified have knowledge embedded in them, however the duality shows that it is the harder aspects which have been reified. Wenger emphasises that these two constituent processes are separable analytically but are a duality. One cannot replace the other. Participation is undefined without reification and vice versa. They are not a dichotomy, they are a complementary pair in that they differ in how they affect the negotiation of meaning: in participation mutuality is essential as members of a community recognize themselves in each other. In reification, however, our meanings are projected on to the world and attain an independent existence.
In regard to reification one can thus refer to both a process and its product, though it does not necessarily originate in a design, though there are some characteristics( [Wenger 1998]: 63):

- Forms Reification can have many forms it could be the fire signaling system of the Chinese on the Great wall of China, the Great wall itself and mathematical axioms and theorems. They are usually all part of a greater context of significance, which is realized in the human practices [Wenger 1998].

- Point of focus can be achieved through reification, one example is the Danish constitution which sets the scene in which Danish citizens can live and thus act. By documentation, it is possible for communities to "remember" what what has been decided in the past and in which direction work should be spent.
- Documents are used extensively in documenting process and routines in most companies, we reify when we write down what we have experienced and what we have decided to do or what should be done by ourselves or by others. Writing down mathematical formulas axioms is a form of reification though it appears to be common sense.
- Instruments There are many possible instruments in reification. Writing things down on paper is one, electronic databases is another one, which can be used to store documentation. instruments are thus crucial for reification and are involved in nearly all forms of reification.

### 4.2.1 Connecting Participation and Reification

Again their is the representation of the connection between the two elements of knowledge, reification and participation, namely by reusing the previous representation in the Euclidean $R^2_+$ space instead of seeing it as a continuous spectrum like in figure 4.1. Actions can involve a high degree of documentation and little interaction, but it is never just pure reification. on the other hand peoples actions or interaction always involves some reification though it might not be much, thus the two terms "go hand in hand" as represented in figure 4.2.2.

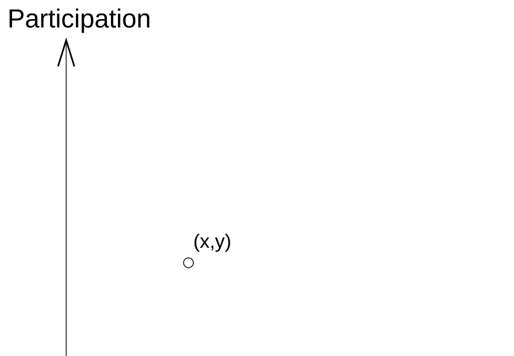


Figure 4.2: The visualization of reification and participation as a pair of coordinates.

The notion of Reification and participation is very useful as it emphasizes that one can not isolate knowledge from the context or the people that develop and use it. However, through the rest of this paper the more simple notion of tacit and explicit knowledge will be maintained, though the benefits of using duality is acknowledged.
The decision was therefore, not to abandon duality, but to use it as a way to understand some of the processes taking place e.g. in connection with CoPs in Section 8.1. The basic notion of knowledge as consisting tacit and explicit knowledge is therefore chosen as *the* distinction to use. The choice is made from a pure rationality point of view in order to decrease the

complexity. Naturally this decision will affect the rest of the project, which will be discussed in Chapter 13

### 4.2.2 Levels of Knowledge

Though being used à priori we have still not paid attention to the fact that the amount of knowledge embedded in the individual differs from that of the group. The amount embedded in the group probably too differs from that of the entire organization. There are many aspects in this discussions and it will not be described in details, though a simple example will illustrate some of the aspects.

The individual in a company has a certain amounts of tacit knowledge that he or she uses in the daily work. If he or she is part of a group that together performs some tasks. Collectively they poses an amount of tacit and explicit knowledge that probably is greater than any of the individual members, this is illustrated in figure 4.2.2.

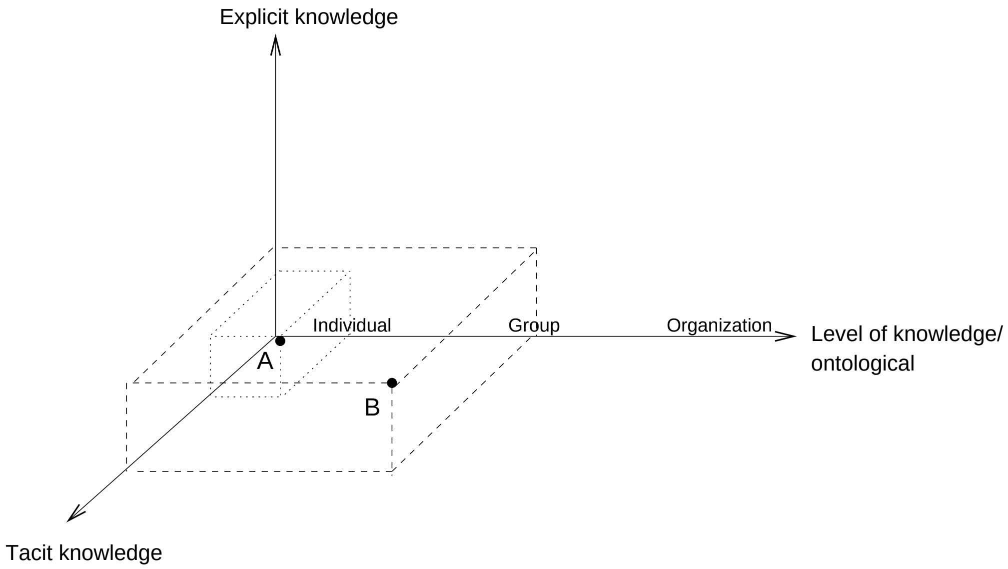


Figure 4.3: Knowledge in the individual-group-organization.

In the figure there has deliberately not used any scaling, as it in most cases not would make any sense to do so. It would depend on the size of the group, the tasks being performed and level of *participation* in the group. Furthermore it would be difficult to describe the synergic effects of working together as a team that might occur. If a function should be used to describe such effects it would undoubtfully be nonlinear and discontinuous. The figure should more be seen as an example of well known principle of that added together the group performs better than the sum of the individual performances. For a more thoroughly discussion of the factors and aspects involved in *measuring* the collective knowledge versus the individual, including the psychological one, see [Nonaka & Takaeuchi 1995].
These topics will be looked at later on, though for now we will in the next chapter see if we can describe what knowledge is for Niro A/S.

## 4.3 Summary

We have in this chapter looked at the term knowledge, several ways of seeing knowledge has been studied. In the end we have chosen to use the distinction of knowledge as tacit or explicit, though the concept of duality of knowledge by [Wenger 1998] is acknowledged, in particular the more general terminology of participation and reification is useful.

The hard part is managing the tacit knowledge and many attempts have been seen. The notion of tacit and explicit knowledge has been established. All kinds of knowledge is seen as a pair of coordinates, a tacit one and a explicit one. The difference of the knowledge embedded in the individual, the group and the organization has been briefle looked at. This dimension in conjunction with tacit and explicit knowledge has too been added and some of the aspect involved in this three dimensional view has been outlined.

# Chapter 5

# Knowledge for Niro A/S

In the previous chapter we have looked at knowledge, the division of it into tacit and explicit knowledge and the extension into *reification* and *Participation*. The basic division into tacit and explicit knowledge was used and will be used in the context of Niro A/S. There are two main components in a definition of knowledge for Niro A/S, they are *project handling* and *experience*, and have several underlying aspects. As seen in this chapter the two components are interconnected and have many of the same topics in common which will be described in the following.
This chapter will lead to the following chapter 6 where the context of knowledge will be described.
It should be emphasized that the chapter is based on the investigations within the Chemical Division and the conducted VC conferences, see 11.

As said in Section 2.3 the process of describing what knowledge is for Niro A/S was a synthesis of the two previous processes and the driving force rationality through a number of questions:

> What are the main processes that Niro A/S makes money on?

The answer was relatively clear: The conduct of projects for customers is *the* main source for profit, thus *project handling* is the main source. The next natural questions were:

> What are the key elements in project handling?

And

> Are these key elements of such value, that they can be identified as knowledge for Niro A/S?

All these questions are the rationales for findings in the following sections.

## 5.1 Project Handling

The main set tasks which Niro performs in order to earn any money is by conducting projects for customers. Naturally the core business is project handling as described in chapter 3 and in chapter 9, though After Sales too contribute. The technical competencies in project handling can be centered around 3-4 core technical competencies, according to the Test & development department, this does not mean that Niro A/S only rely on these 3-4 core competencies. It means that these 3-4 core competence are more or less unique to Niro A/S, other technical competence areas are assembled into a number of areas where people are attached. These areas include Valves , electric components, materials, etc.

The basis of the project handling can be summarized in the following bullets from Chapter 3.

**Process Engineering**

- 3-4 core technologies or process handling competencies
  - Process technologists many years of experience.
  - Large contact with the Test and development department

**Project Engineering**

- 3 subgroups, internal competencies, fluid bed, air pollution control (APC) and spray drying.
  - 3-4 experienced group managers.
    - Internal network/pool of engineers, 12 project managers, with good contact to Component engineering and Process control ice department and minimum 10 years of experience.

**Sales Engineering**

- 9 experienced sales engineers
  - Extensive knowledge about the 3-4 core tech. competencies
  - Extensive knowledge about market segments, players on the market and the customers themselves.

These bullets embodies the Chemical divisions ability to conduct optimized large scale projects and are the key elements in project handling. This in leads us to study these elements in further detail.
In this project handling the Process technologists, as mentioned in Chapter 3, play a key role as the people who handles a lot of projects simultaneously and thus gain a lot of technical and personal experience.
If we focus our attention on figure 5.1 which is similar to figure 3.2, though it has been emphasized that the customer naturally contacts Niro A/S through the sale department of the division.

Project engineering takes responsibility for the project, at a "hand-over meeting" between the Sales engineers, Process technologist the group manager from project engineering. Afterwards a technical specification is made and a "technical specification" meeting takes place in order to settle the entire project that ends by the commissioning at the customer, and internally at

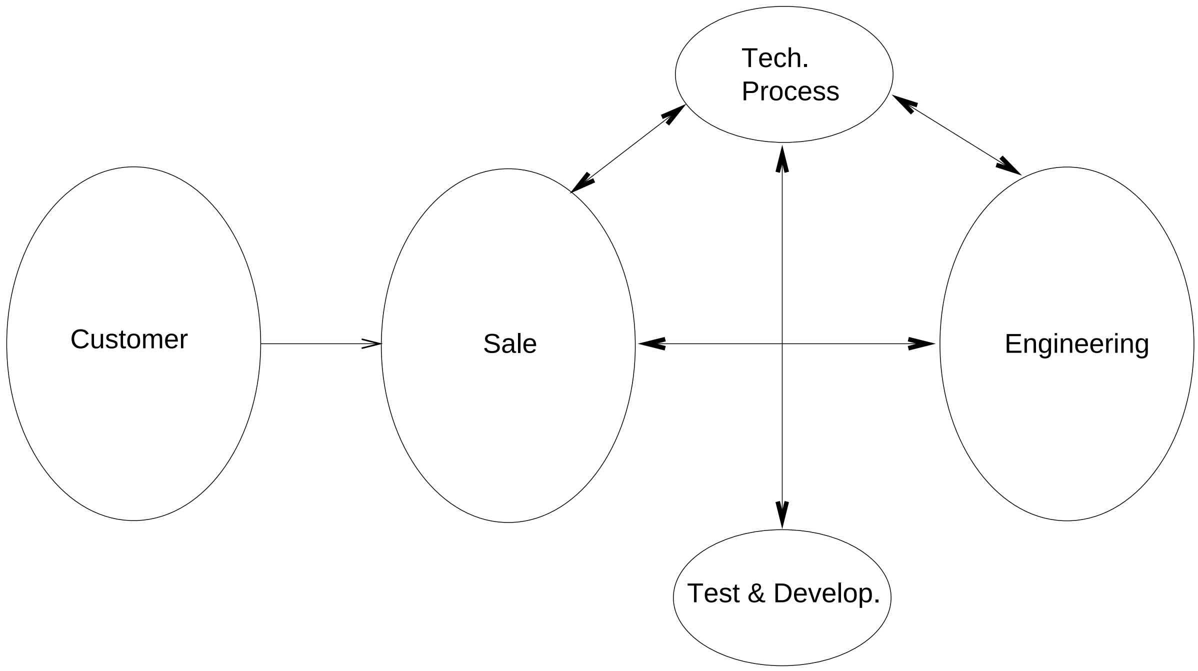


Figure 5.1: Typical project handling

Niro A/S where the commissioning engineer evaluates the project with the involved engineers in the division.
Project engineering has a number of procedures that will be followed after the "hand over meeting". The procedures act as a framework and specifies for e.g. how to conduct the project, how to limit the extend of the project etc.
The engineering people use the procedures as the framework that ensures the standard, but within that framework, despite its appearance of being strict, the engineers attached to the project are as such free, and expected, to use their technical skills, experience and creativity to conduct the project and deliver the plant to the customer as promised in the technical specification. The project engineering naturally use and are part of the competence areas of excellence.
The Sales Department relies on personal experience, technical skills as well as personal ones. Together with primarily the Process technologists they define the needs for the customer and consequently design the proper plant. This ability is of great value and contribute beyond any doubt to Niro A/S's reputation as the market leader in delivering drying technology plants all over the world. The personal experience is highly tacit and embedded into the individual sales engineer and include a global network of contacts within or outside Niro A/S. The technical skills are a mix of explicit knowledge and tacit experience in dealing with the attached technologies.

## 5.2 Knowledge Niro A/S

One of key issues in the above description is technical excellence, technical creativity, *personal* experience and not the least the ability to define the needs of the customer and the appropriate plant.
In all of the above statements the backbone is the technical and personal experience embed-

ded in the employees. They include the people in the Process handling department, Project engineering, Sales department and the supporting units.

The knowledge of greatest importance for Niro A/S is consequently the personal and technical (including the 3-4 core technical competencies) experience or competencies embedded in the employees in the above mentioned units, as they make up the core of what Niro A/S known for, namely high quality plants. This experience is *highly* tacit though explicit knowledge, to some degree, is present, due to the technical nature of the projects.

The above paragraph thus answers the questions of which key elements that are *the* knowledge of greatest importance for Niro A/S. As seen a slight distinction has been made as we say knowledge of greatest importance, this is done, since besides from the experience embedded in the people centered around project handling; it is clear they in turn rely on the skills of the people in the support units (i.e. marketing) and of course of the top management. This is not to say that their work is inferior to that of the people involved in project handling. But what really makes a difference and maintains Niro A/S's position as marked leader, is primarily embedded in the units centered around project handling.

One of the reasons for this excellence in conducting projects is that the employees, centered around the project handling, have been in the company for a relative long time. The average person in Chemical Division have been in the company for more than 10 years (see table 3.1). The employees are part of a global Niro network and constantly in contact with the people in the local offices as well many of the people involved in project handling are visiting and ensuring that the plants are setup and run properly and thus gain valuable experience about the plants delivered. This means that not only the process handling people have a great knowledge about the plants but many of the people from project engineering obtain intimate knowledge about the products plants they design and thus can benefit from this in future projects.
The way the a project is handled, means the people involved in it will work relatively close together and thus get a detailed understanding of the project and the complex details. This close corporation ensures that a lot of the tacit knowledge involved in *conducting* the project is being shared and transferred within the group. *Newcomers* are introduced the embedded knowledge within the group through their close work within the group. This aspect will be emphasized in Chapter 8.

Maintaining and keeping this core knowledge for Niro A/S, is not an easy task. The primary objective should be to support and nurse the already existing environment or culture centered around the project handling, the responsibility and care among the employees as well as habits of having "open doors" and willingness to help each other are key issues and will be the focus in the following chapters. The intranet and other IT aids would in this context be important tools for support. Again this will extensively be discussed in the following chapters.

## 5.3 Summary

The knowledge of greatest importance for Niro A/S is the personal and technical experience or competencies embedded in the employees in the units centered around project handling. They include primarily, process engineering, sales engineering and project engineering, as they make up the core of what Niro A/S known for, namely high quality plants. Maintaining, supporting and keeping this knowledge is absolutely crucial for Niro A/S.

The expertise of other units is important too and should be kept and maintained as well. Furthermore it should be emphasized that this expertise, experience or just *knowledge* is *highly* tacit though explicit knowledge, to some degree, is present, due to the technical nature of the projects.

# Chapter 6

# Context of Knowledge

In this chapter we will investigate the way knowledge is exchanged and converted in an organization. We will look at several models for imaging organizations in connection with knowledge. Morgans theories of how organisation and management are based on implicit metaphor, will be used to view some of the models. The one we have settled on using in the case of Niro A/S is the so called *Knowledge Ecology* model (KE), with some adaptations in the case of Niro A/S, which we in the following Chapter 7 will use on Niro A/S. Other models could have been used to project on Niro A/S but the KE model was chosen as fitted well.

We recall that the main question driving this process was

> If we know how knowledge is embedded in Niro A/S and how it interacts, then how can we support and convert it?

A lot of litterature about knowledge management in respect to support and conversion of tacit knowledge to explicit knowledge has been looked through, much of it will not be used in order to limit the process, there are however a few things that can be generalized by the author: Though interesting, much of the litterature (in particularly the elder) focus on how to *capture* the tacit knowledge embedded in the employees into the organization. The solution to this is seen in the convertion of tacit knowledge to explicit knowledge. In the last few years the focus has shifted towards acknowledging that much of the tacit knowledge is useless when stored! Instead the tacit knowledge embedded in the employees should be supported or nursed like a gardener nurses his garden.

However, we will start loking at the conversion of tacit knowledge to explicit knowledge and for that purpose we study *the spiral proces* by Nonaka [Nonaka 1991]. The model shows one way of seing conversion of knowledge and embodies many of the aspects of the KM litterature, the elder and newer one, and is thus a relatively good representative for the search done.

## 6.1 Transformation: The Spiral Proces

One of the single most cited source in reports, articles and in interviews is Nonaka & Takeuchi, "The Knowledge-Creating Company" this texts have significantly influenced many of the practitioner views encountered during this state of the art study of knowledge management. Nonaka

& Takeuchi focus on knowledge sharing and knowledge transfer [Nonaka & Takaeuchi 1995].

Organisations are not tools for information processing The model developed by Nonaka is influenced by Japanese techniques of *knowledge-creation* [Nonaka 1991]. According to Nonaka Managers from Japan's most successful companies recognise that creating knowledge is not simply a matter of processing objective information through and into the organisation. Rather, knowledge creation depends on tapping into the tacit and often highly subjective insights, intuitions and ideals of employees. The key to this process is personal commitment and the employees sense of identity with respect to the enterprise and its mission. A *holistic* approach is essential according to Nonaka - a company is not a machine, but a living organism, where ideals create ideas, which fuel innovation. It is a way of behaving, in which everyone is a knowledge worker, that is to say, an entrepreneur.

Before describing the model by Nonaka & Takeuchi in detail it should be emphasized that the work of Nonaka was conducted during the 1980s when Western management ideas very much embraced the success stories of Japanese manufacturing industry. Today, the belief in the Japanese system has somewhat shifted. The life time employment that was once considered to be a strength (and which many of the basic principles of Nonaka indirect build on) is now more of a Japanese corporate curse. Young employees are starting to rebel against a system that demands absolute loyalty to the company as well as a deadening work pace. How this will develop in the future is unclear, but it does seem, that Japan's younger generation lacks the sacrifice mentality of its parents and the will to work hard a lifetime for *one* company without substantial reward. If the findings of Nonaka & Takeuchi are dependant on this hard working mentality, it can be difficult to copy their spiral model to other societies, where hard work and commitment to *one* company throughout ones life are not valued as much.

### 6.1.1 The Spiral Transformation

The transformation of knowledge is base on two basic assumptions. Firstly, the *ontological*: An organisation can not create knowledge without individuals. The organisation supports creative individuals or provides contexts for them to create knowledge in. The individual can be part of a *Group*, which is part of the *organisation*, which in turn can be seen as part of *inter organisations*.
In the case of Niro A/S the idividual project engineer is part of a project group, which is part of the Chemical Division this could be the organization, but as the division has no more than 38 employees , the division is considered a larger group containing the project group and the individual engineer. The division is part of Niro A/S, which can be considered the *organization*. Niro A/S is part of the group GEA consisting of several organizations, GEA thus acts as the *umbrella* covereing the inter organizational network.

The other basic assumption is the epistemological is the division of knowledge into tacit and explicit knowledge, see chapter 4

Nonaka's theory of Organisational Knowledge Creation [Nonaka 1991] is basically a framework for driving successful innovation process, that are based on the mobilisation and conversion of tacit knowledge through knowledge conversion, where tacit and explicit knowledge interact and interchange into each other in the creative activities of human beings. Knowledge is created through social interaction of the two types of knowledge according to Nonaka & Takeuchi [Nonaka & Takaeuchi 1995].

Organisational knowledge creation can be visualised as a spiral process. The base for this is the evolving interaction between tacit and explicit knowledge as mentionned before.

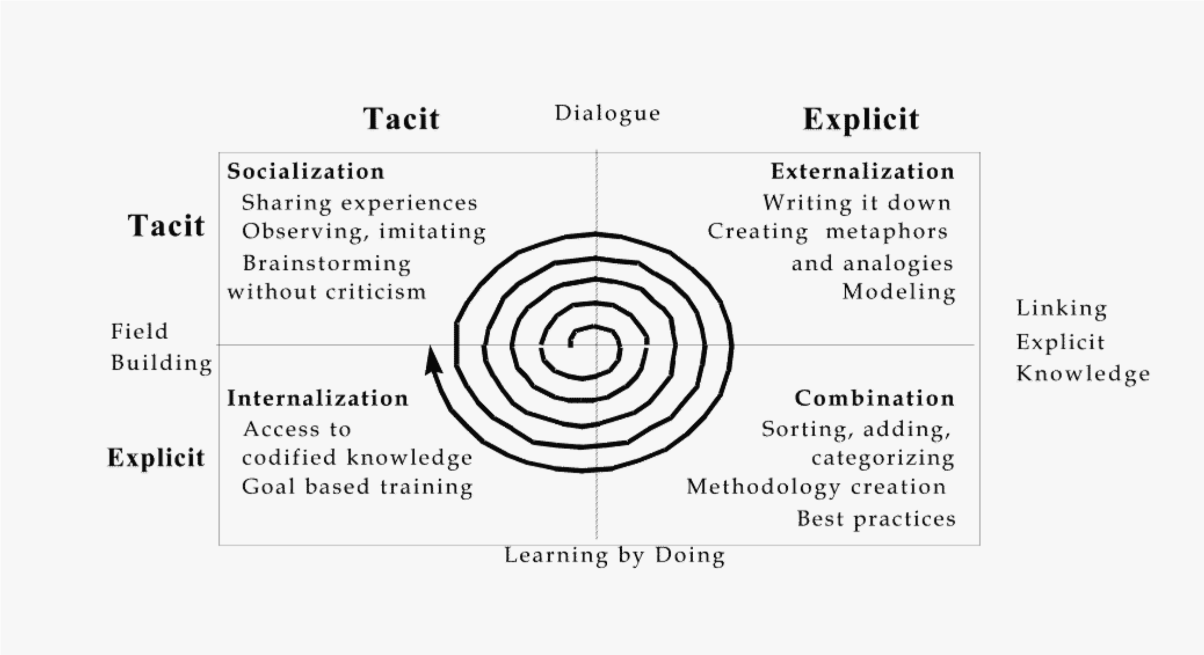


Figure 6.1: The conversion of knowledge through spiral proces by Nonaka and Takeuchi

The four stages or sub process are characterized by:

1. Socialisation mode, shared mental models, building field of interaction or just the transfer of tacit knowledge between individuals through observation, imitation and practice. A common process between e.i. mentor an student see chapter 8.

2. Externalisation mode, conceptual knowledge, meaningful dialogue, collective reflection. Thus externalization is triggered by dialogue or collective reflection and relies on analogy or metaphor to translate tacit knowledge into documents and procedures.

3. Combination mode, systemic knowledge, linking explicit knowledge. Combination thus consequently reconfigures bodies of explicit knowledge through sorting, adding, combining and categorising processes and spreads it throughout an organisation.

4. Internalisation mode, operational knowledge, learning by doing. Internalisation translates explicit knowledge into individual tacit knowledge.

Eventually, through a phenomenon that Nonaka calls the "knowledge spiral", knowledge creation and sharing become part of the culture of an organisation as described in the above scheme.

As an example in the context of Niro A/S one could see the in the case socialisation between the individual engineers in their daily work, conversation the inexperienced engineer listens and imitates the more experienced one. In group meetings the entire project group meets, summarizes results and lessons to be learnt, these are frequently written down and stored

- Externalization. The learnt lessons might be shared or distributed to other department in paper or on the intranet after being readjusted - Combination. Finally learnt lessons might give rise i.e. a policy for the entire organization i.e. a policy for safety management in Niro A/S. The policy is distributed internally from the organization to the departements, groups and finally read and followed in the daily work by the individual engineer.

When thus managed,organisational knowledge creation is moving up to expanding communities of interaction, that crosses sectional, departmental, divisional and organisational boundaries. As mentioned erlier in this report, one has to be aware of the differences between the Western and Japanese culture. Japanese culture is more at home with working from a tacit knowledge domain, while Western culture is more comfortable handling explicit knowledge. It is a long discussion with many aspects and facets that is beyond the scope of this paper, and will not be investigated further. Furthermore the knowledge conversion will be used in the context of Communities of Practice in chapter 8.

Finally we can connect spiral proces by Nonaka with the rather naive coordinasystem in figure 4.2.2 where the individual in a company has a certain amounts of tacit knowledge that he or she uses uses in the daily work. If he or she is part of a group that together performs some tasks. Collectively they poses an amount of tacit and explicit knowledge that probably is greater than any of the individual members. The spiral process of the knowledge conversion would then become a curve in this coordinatesystem.

### Aversions to Nonaka

The spiral process appears to attractive but it has some flaws , according to [Hildreth & Kimble 2002] this view of the knowledge conversion process and the spiral of knowledge are problematical. If we accept Polanyi's view of tacit (implicit) knowledge as being inexpressible, it cannot be converted into explicit knowledge because it can never be externalised and written down in an explicit form.

Nonaka (1991) emphasises that the sharing of tacit knowledge takes place through joint activities and requires physical proximity. He also states that in order for others to understand it tacit knowledge must first be externalised. Some authors (e.g. [Teece 1998]) feel that this is not a problem and are of the opinion that tacit knowledge is merely difficult to articulate, while others (e.g. [Huang 1997]) feel that although difficult to articulate tacit knowledge can be "captured". Others (e.g. [Buckingham Shum 1998]) will claim that such knowledge cannot be captured and codified without becoming invalid. However, if we accept Polanyi's definition, tacit knowledge is impossible to articulate. For example, [Goguen 1997] states:

> "People may know how to do something without being able to articulate how they do it. In the social sciences, this is called the say-do problem. Some examples are riding bicycles, tying shoe laces, speaking languages, negotiating contracts, reconciling personal differences, evaluating employees and using a word processor." [Goguen 1997].

Nonaka's [Nonaka 1991] example is in fact an example of tacit knowledge being impossible to articulate - a master craftsman with years of experience cannot articulate the principles behind what he knows and can only teach someone by taking them through a period of apprenticeship. In Nonaka's spiral of knowledge, tacit knowledge is "shared" through interpersonal interaction. However, the tacit knowledge is not articulated and shared; the learner actually develops their own tacit knowledge by becoming immersed in the practice itself, under the guidance of a mentor and whilst situated in a particular environment.

The flaw in Nonaka's spiral of knowledge is in the tacit-explicit stage. If tacit knowledge is inarticulable, this stage simply cannot work - yet the primary KM approach to managing "less-structured" knowledge is to try to make tacit knowledge explicit. Even taking view of knowledge as a continuum, [Leonard & Sensiper 1998], does not help here as despite terming it a continuum they still place certain types of knowledge at the ends of the spectrum and portray them as being either tacit or explicit.

The debate about what form less-structured knowledge takes has thrown up a whole range of terms to describe different types of knowledge. However, most of these view knowledge in terms of opposites. As we do not wish continue to new terms and how to convert them - a choice is needed. The spiral model, in particularly its rationale, by Nonaka & Takeuchi, will be *accepted* as a model that demonstrates how important personal traning, imitation and coaching is for e.g. a new employee in Niro A/S[1]. Through this kind of learning the tactit knowledge can be transferred between individuals in a working environment, though still being tacit. It appears that converting tacit knowledge into explicit is not possible for all kinds of tacit knowledge. The stages in Nonakas & Takeushi's model are not wrong but i does not "work" for all kinds of knowledge, and according to [Hildreth & Kimble 2002] it needs to be extended with the view of knowledge as a duality. This will not take place in this context and instead we look at another aspect of KM, namely how to view and describe organizations where knowledge conversions take place. we will look of how metaphors can be used to understand and highlight how do and do not work organisations work, naturally in the context of knowledge management.

## 6.2 Metaphors of Organizations

Gareth Morgan has described various images of organizations [Morgan 1986]. His intent was to expand our thinking on the possibilities for how organizations are and should be and sensitize us to the views of others.

The central thesis of the book [Morgan 1986] is that all theories of organisation and management are based on implicit metaphor, and that metaphors play a paradoxical role: they are vital to understanding and highlighting certain aspects of organisations, while at the same time they restrict understanding by backgrounding or ignoring others.

In all aspects of life... we define, according [Morgan 1986], to our reality in terms of metaphors and then proceed to act on the basis of the metaphors. We draw inferences, set goals, make commitments, and execute plans, all on the basis of how we in part structure our experience, consciously and unconsciously, by means of metaphor.

Take for example the very common metaphor that an organisation is like a machine. We think in terms of "inputs and outputs", maximising "production" and making "efficiency the driving force". When things are going well we say the organisation is "running like clockwork", a "well-oiled engine" or an "assembly line". When they are not, then communication has "broken down" and "things need fixing" because there is "a spanner in the works". In response we want to get to the "nuts and bolts" of the operation and intervene at the point of maximum "leverage". We conduct "time and motion" studies, regard people as "cogs in a wheel", and

[1] See Chapter 8 for a more elaborate discussion.

attempt to quantify and measure everything. We establish human "resources" departments, allocate "manpower" and recruit to "fill a slot". And all because the organisation loves "re-engineering". Gareth Morgan says, "One of the most basic problems of modern management is that the mechanical way of thinking is so ingrained in our everyday conception of organisations that it is often difficult to organise in any other way" [Morgan 1986]. To open up our thinking he seeks to do three things:

1. To show that many conventional ideas about organisation and management are based on a small number of taken-for-granted images and metaphors.

2. To explore a number of alternative metaphors to create new ways of thinking about organisation.

3. To show how metaphor can be used to analyse and diagnose problems and to improve the management and design of organisations.

Morgan illustrates his ideas by exploring eight archetypical metaphors of organisation: Machines, Organisms, Brains, Cultures, Political Systems, Psychic Prisons, Flux and Transformation, Instruments of Domination .

#### Archetypical Metaphors for Organisations

**Machines** Efficiency, waste, maintenance, order, clockwork, cogs in a wheel, programmes, inputs and outputs, standardisation, production, measurement and control, design

**Organisms** Living systems, environmental conditions, adaptation, life cycles, recycling, needs, homeostasis, evolution, survival of the fittest, health, illness

**Brains** Learning, parallel information processing, distributed control, mindsets, intelligence, feedback, requisite variety, knowledge, networks

**Cultures** Society, values, beliefs, laws, ideology, rituals, diversity, traditions, history, service, shared vision and mission, understanding, qualities, families

**Political Systems** Interests and rights, power, hidden agendas and back room deals, authority, alliances, party-line, censorship, gatekeepers, leaders, conflict management

**Psychic Prisons** Conscious & unconscious processes, repression & regression, ego, denial, projection, coping & defence mechanisms, pain & pleasure principle, dysfunction, workaholis

**Flux and Transformation** Constant change, dynamic equilibrium, flow, self-organisation, systemic wisdom, attractors, chaos, complexity, butterfly effect, emergent properties, dialectics, paradox

**Instruments of Domination** Alienation, repression, imposing values, compliance, charisma, maintenance of power, force, exploitation, divide and rule, discrimination, corporate interest

[Morgan 1986]

According to [James Lawley 2001] is Morgan at pains to avoid asserting the supremacy of any given metaphor or theoretical perspective, though it is clear that he prefers a relativistic, self-organising approach to management[2]. To manage multiple decentralised teams and projects, for example, he offers the metaphor of a spider plant.
Methaphors can thus be utilized in order better explain a given situation in an organization, but also to better understand or comprehend what is happening in an organization.
The *Brain* metaphor has been further developed by and mixed with the Organisms and Flux and Transformation metaphors in the Knowledge Ecology model (KE), by [George Pór 1997]. The rationale for selecting or on converging on the KE model is a purely intuitive decision as it was felt that it was a comprehensible one that could be used as wel as explained to Niro A/S.

## 6.3 Knowledge Ecology

"Knowledge ecology" is an interdisciplinary field of management theory and practice, focused on the relational and social aspects of knowledge creation and utilization. Its primary study and domain of action is the design and support of self-organizing knowledge ecosystems, providing the infrastructure in which information, ideas, and inspiration can travel freely to cross-fertilize and feed on each other.
An easy way to think about knowledge ecology is according to [George Pór 2001] that it is the marriage of:

- Information science.
- Social science.
- Management science.
- Natural science.
- The creative arts.

Knowledge ecology focuses on discovering better social and technical conditions for knowledge creation and utilization. It operates on the understanding that natural "learning organizations," like a rainforest or the human brain, are the best models we have for designing systems that create, sustain, and foster organizational learning and evolution.[3]

KE is as important in the wider society as it is in business and government organizations. Its contribution starts with the emphasis on the fact that issues such as achieving quality in education and dealing with environmental preservation cannot be resolved simply by calling in policy-makers or experts. Systemic problems call for the input of a wide variety of people with diverse views and expertise, working together. They call for the active involvement of those people who are most closely connected to, and have a stake in the issues; the people with experience and an ongoing commitment and sense of responsibility to the matters at hand.

[2] See [James Lawley 2001]
[3] See [George Pór 2001].

The focus of KE as a management discipline is the fact that when ideas matter we require organizational cultures in which people are able to share knowledge and are rewarded for doing so. It provides today's 'knowledge organizations' (where ideas are both the capital of business and the work that people do) with a new framework, principles and set of practices to replace the ideas about management that came out of the factory system of a century ago.

**Knowledge Ecology for the Era of Discontinuous Change**

Some of the key premises underlying the notion of knowledge ecology may be extrapolated based upon the observations of the natural ecosystems. One would observe the contrast offered by these characteristics of knowledge ecology in comparison with the traditional knowledge management systems described earlier.

- Knowledge ecology primarily focuses on social networks of individuals (see Chapter 8) in contrast to the overly technological emphasis of traditional knowledge management systems on computers and information technology networks.
- In a knowledge ecology environment impacted by sudden and pervasive change, mode of survival is adaptation [or more accurately,'anticipation of surprise'] instead of optimization.
- Knowledge ecology is made up of knowledge nodes and knowledge exchanges or knowledge flows. In the knowledge ecology the basis for cooperation and survival is differentiation and similarity between the knowledge nodes. Highly differentiated knowledge nodes can collaborate to accomplish specific actions and may dissolve thereafter. However, collaboration between such nodes would require that they be able to 'relate' to one another under an overarching mission or theme.
- Within a knowledge ecology, focus on people does not only imply understanding of knowledge exchanges and relationships based on such exchanges. It also implies understanding of how such knowledge influences action or potential for action based on such exchanges.
- Just as natural ecologies thrive based on species diversity, knowledge ecology thrives on diversity of knowledge. Such diversity rests on cooperative competition: the various knowledge nodes collaborate as well as compete based on their differentiating characteristics.
- Knowledge ecology treats knowledge creation as a dynamic evolutionary process in which knowledge gets created and recreated in various contexts and at various points of time.

We thus choose to see the KE as a natural ecosystem or enviroment, like the gulf of Prince William in Alaska where a natural equilibrium has been established between the members of the ecology it will as not change itself by its own will, since it has found the natural equilibrium. However it does not mean that it can not be changed, if a supertanker, say Exxon Valdèz enters the gulf and spills 50.000 tons of oil on the shores, we have forced a change on the enviroment, many of the members of the ecosystem will vanish or their numbers will dimish. In the end another natural equilibrium will be found. The ecosystem will react on changes forced upon it. It means that if we nurse the system like a gardener nurses his garden we are making a difference we are changing the enviroment. The same accounts for the gulf

of Prince William: by manually removing large parts of the oil we are actually nursing the ecosystem.
Nursing the ecosystem in order to let it *grow* in one way or the other is crucial and the outcome can be genereous a simple example is the way a farmer *nurses* his fiels by adding nutrients and removes bugs by adding pesticides. Without such nursing the outcome would be modest but by adding this nursing his outcome increases greatly. By nursing an organization like a KE it should thus be possible to increase the outcome - knowledge creation, at least that is what the theory says.

The traditional view of knowledge management primarily focuses on information, whereas the knowledge ecology adds the context, synergy and trust necessary for translating such information into actionable knowledge. Nursing is in KE essential though it will use the information and the tools to proces it, just like the gardener!
KE is also usefull not only for nursing but also to see the broader apsects in a complex situation, to understand the process taking place in the organization and try develop methods in order to nurse or impacts the organization.
We have now settled on using the KE as *the* metaphor or "product" of this divergent process, when describing Niro A/S in terms of KM as a knowledge ecosystem. This naturally leads to the extension of actually doing that, which will be done in the following chapter.

## 6.4 Summary

We have now studied the spiral model for tranformation of knowledge made by Nonaka & Takeuchi. The four stage model was interesting as a way of understanding how the nature of knowledge can shift between tacit and explicit knowledge in particularly the stages socialization and externalization were studied.
The choice of settling on the spiral model and not extending it was choice made only to limit the project, because there are indeed some flaws or simplifications in the spiral model one has pay attention to.
A number of metaphors that can be used to describe an organization were furthermore studied. Finally a special metaphor called Knowledge Ecology, was looked at, as it is usefull for getting a hollistic overview of an organization. The KE also acts as a way of seing knowledge managemment as nursing of knowledge ecosystems. However, many other views could have been used and the decision was a made exclusively due to the intuitive mind of the author.

# Chapter 7

# Ecosystem Niro A/S

Using concepts of Knowledge Ecology (KE) is usefully applied to Niro A/S as a way of creating an image of the interaction between the different units. The interactions are complex and widespread, and the directions and speed changes rapidly. Therefore, seing the exhcange and transformation of knowledge as an ecosystem gives a holistic view. As a result a KE model for Niro A/S was developed, Ecology Niro A/S, by applying the concept of KE, from the previous chapter.
The "solution" found is a synthesis and was evaluated in Niro A/S, which resulted in a variant called the "shell" ecosystem Niro A/S with the Chemical Division as an example in the center[1]. The intenions when "creating" the ecosystems was viewing Niro A/S as a garden or a rain forest[2], that can be nursed and suported. The first description concerns Niro A/S, the next focus on the Chemical Division with the other divisions around it, and finally, the sales engineers are portrait as the contact to the surroundings in the "shell" variant.

## 7.1 The Ecosystems

Figure 7.1 describes the major surfaces of contact or collaboration (thick lines) between the divisions and the supporting units. However, the figure has focused on showing the contact between P-division, Marketing, Test and the the other divisions.

As seen the Process enginering units of each divisions has been seperated from the rest of the division and connected with dotted lines to the other Process units. This is done in order to show the relationship betwwen the units across the boundaries of the divisions.
Furthermore the After Sale division is acting with all of the divisions although it is in contact with the P-division. Finally the connection between the divisions, Pharma, Chemical and FoDa has been made with dotted lines, as the contact between the individual projects is limited. One exception is the monthly meetings between the deputies of the divisions and the supporting units, but again the meetings are held with a strict agenda, and people are as such not obliged to participate in the meetings, thus the meetings should be seen as personal contact meetings. Another interdivisional contact is between the management of P-division or Niro A/S and the managers of the strategic business units. This contact is official and part of the thick line from the division to the P-division as the meetings should be considered to be held in the context

[1]See figure 7.3
[2]Not unlike the described by George Pór on www.knowledgeecology.com

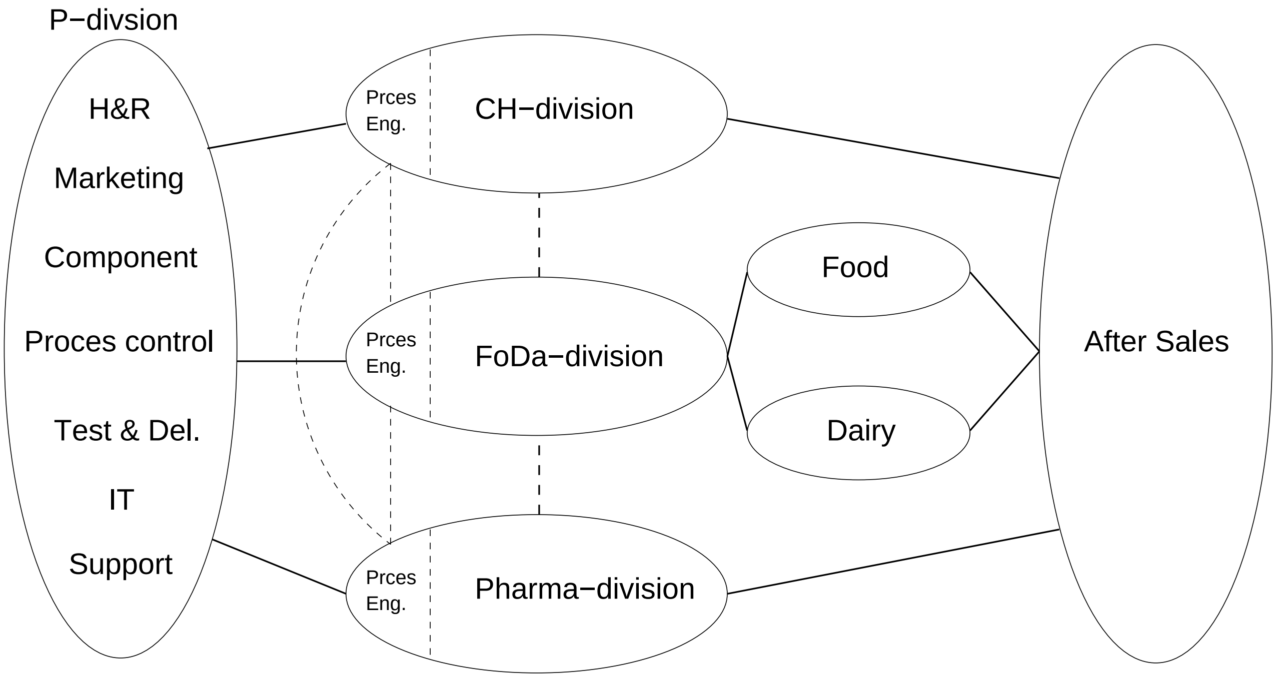


Figure 7.1: Niro A/S Ecology - inter divisional level

of the P-division.
The different parts of Niro are connected to various parts of GEA Niro. This means that Ecosystem Niro A/S is part of the GEA ecosystem and part of market for spray and fluid bed dryers which again can be seen as a ecosystem.

At the divisional level the personal networks become apparent. Figure 7.2 shows the surfaces of contact within the Chemical Division.

The units in the Chemical Division have been conected to the units they coorporate with. However the many support units in the P-division have not been specifically drawn as they are connected in many ways. It should be noted, that the connection to the Pharma Division is limited and the one to FoDa, as mentionned before, is limited to personal contacts. The Test & Development is part of the P-Division and through it the Proces Tech. engineers in all the divisions are connected to each other.
We can thus see that personal contact is the basis for the main contact between the Pharma, FoDa and Chemical divisions.

As described in section 6.3 one way of dealing with knowledge creation and knowledge distribution and sharing in the organization is by seing as KE and the way to deal with the above is to nurse the KE with the aim of increasing the knowledge creation and ease the distribution, the sharing *and* to increase the absorption of the distributed and shared knowledge. However, by using the KE context it is also clear that one should nurse the KE in the right way, by this we mean that not only should the above aim be achieved, but the danger of overkill by distribuing and sharing all the available knowledge will lead to overkill and stress the KE.
It is nevertheless too interesting to see that the KE emphasizes the limited contact between the Pharma, FoDa and Chemical divisions and to improve or nurce this contact could possible be beneficial for the KE, and it should therefore be taken in to account when developing plans for impacting the KE.
The policy developed in chapter 11 should be seen in the context of this metaphor Knowledge

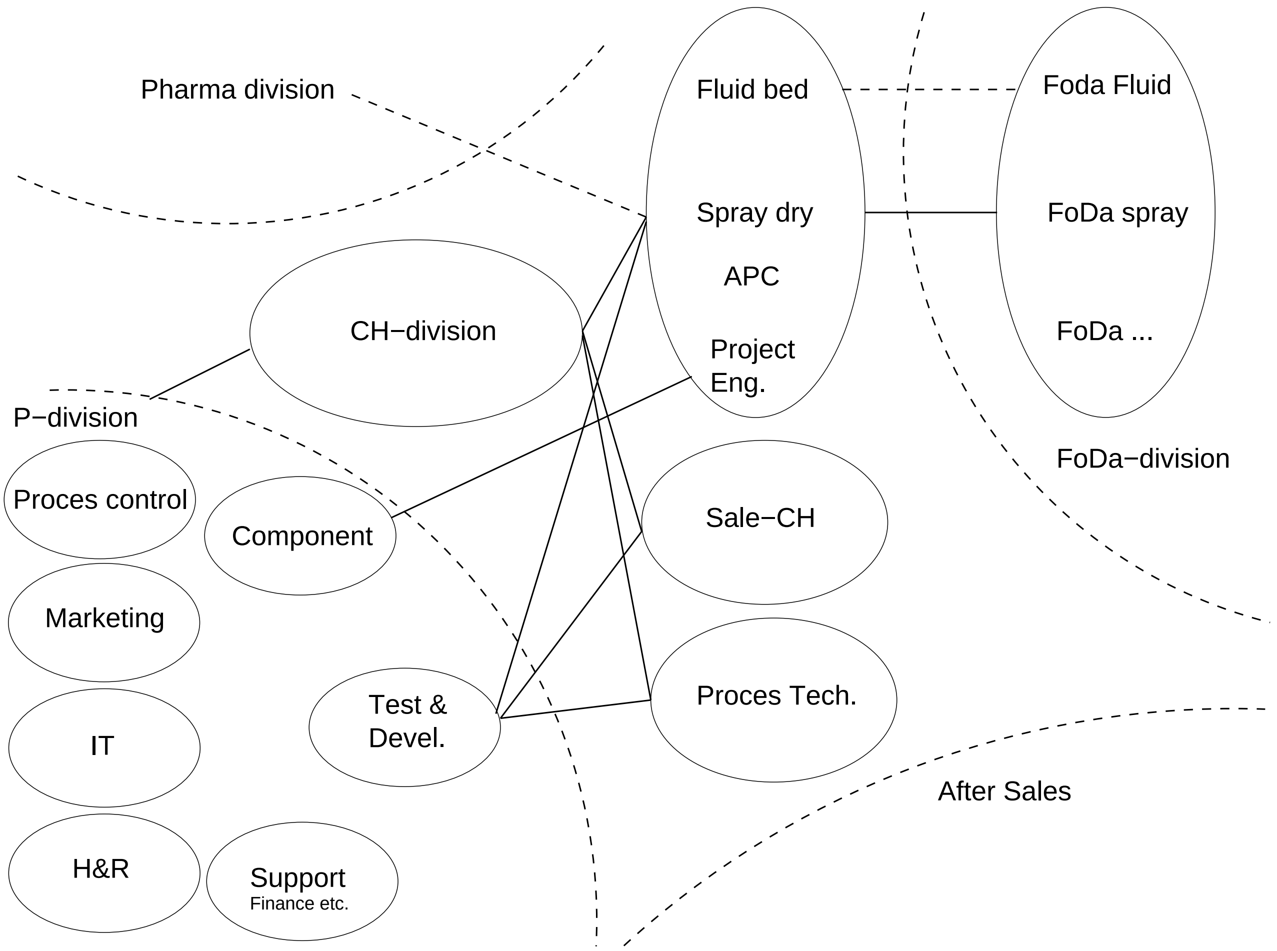


Figure 7.2: Niro CH ecology - remark the Test & development is part of P-division

Ecology and the improvement of the contact between the divisions.

Finally we now describe a special relation between the ecosystem Niro A/S and to its surrounding ecosystems, which we could call the *Powder World*, which includes competitors, customers, etc.. The relation is characterized by the sales engineers having a role close to a gate keeper. The relations to the surrounding ecosystems are vital as the work undertaken in Niro A/S is due to projects in the "Powder World". Events taking place in the "Powder World" can greatly impact the living conditions in ecosystem Niro A/S, dramatic and sudden fall in the use of e.g. powder milk would impact at least the FoDa division and consequently all Niro A/S.
This situation is not much unlike the situation in Alaska close 15 years ago in the gulf of Prince William as most of the spilled oil actually in the following years was removed by the endless supplies of fresh water pouring into the gulf from the Pacific ocean.

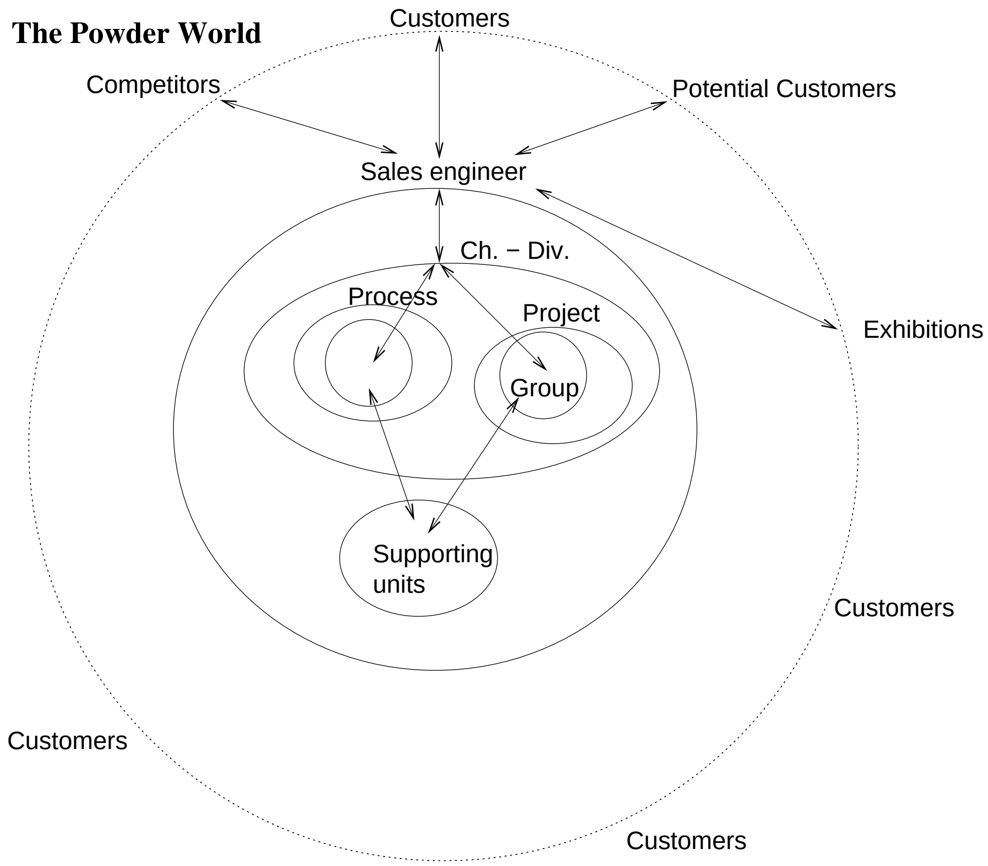


Figure 7.3: Niro CH ecology - Sales engineering view in a "shell" ecosystem Niro A/S with the Chemical Division as the center.

The rationale for figure 7.3 is to show how e.g. the Sales engineers can influence the amount of information from the customers to the various departments of Niro A/S. In this case only the departments in the Chemical Division are shown though it is true for the other divisions. The main point here is that the Sales engineers act somewhat like gatekeepers in regard to the customers, at least in the initial stages of a project. New ideas gathered at e.g. exhibitions are too up too the the individual Sales engineer to decide whether or not to pass it on to the rest of Niro A/S (if he or she is the only one gathering the ideas). The Sales engineer thus needs to know whether the information he finds is relevant and usefull for other departments

of Niro A/S. It could also be the case that he gains knowledge from competitors which could be usefull for one of the supporting units.
It goes to some extend the other way round, since the project group within e.g. the Project engineering sometimes gain new knowledge relevant for the Sales engineer which in turn could be usefull to show potential customers etc.
As the figure shows the contact from this ecosystem to its neighboring ecosystems e.g. the Customers in many cases goes through the Sales engineers, who consequently can play a vital role if one plan to increase the flow of knowledge from the customers and e.g. the Chemical Division and visa versa.

In the Chemical Division the project handling is framed in such a way that the Sales engineering is supported and have great contact to e.g. project engineering (see section 5.1). To mention one specific measure is the evaluation meeting between, the Sales engineer, the process technologist and project enginering including the commissioning engineer, which e.g. ensures that the sales engineer gains insight to the lessons learned from the part of the project he has not been involved in. The situation is not unlike the stage in the spiral model called *externalisation* as the group at the meeting share their experinces and the lessons learned and decide what should be written down for future projects on the basis of the report made by the commisioning engineer.
As it can seen the contact role of the sales engineers is dependent on the personal network they have built up to the "powder world" as well as to "inside" Niro A/S, a lot of tacit knowledge im the form of personal experiences are present. Though procedures like the evaluation meeting have been established they should be seen as support for the personal relations or networks.

Figure 7.3 is only showing the example of the contact of the Sales engineer. Often the contact is represented by the project engineers obtained through commissioning of plants. These relations should also be plotted in the figure to get a more precise overview of the relation between the ecosystems.
One thing that strikes the observer is, that is the contact with the supporting units at Niro A/S is not that clear, meaning that relevant knowledge for the Component unit found by the sales engineer at an exhibition is not necessarily sent to Component by the sales engineer unless he recognizes the importance and through his personal contacts sends it to Components. We have that the interdivisional communication, as mentioned before, depends heavily on the personal relations.

After having seen examples on thee different ecosystems in Niro A/S, on the basis of the finding and decision made in Chapter 6, we turn to the question: How can we support the ecosystems or knowledge environment?
As we have seen Niro A/S relies heavily on personal relations, the personal networks are well developed, furthermore the staff have many years of experience and a lot of tacit knowledge is embedded. The synthesis and description made in this chapter thus leads to investigations of what constitutes such personal network, how to support them, how to keep the tacit knowledge in Niro A/S as wel as how to train new employees. These will be the opening comments for the next Chapter 8.

## 7.2 Summary

In this chapter we have seen three examples on different ecosystems in Niro A/S, on the basis of the finding and decision made in Chapter 6. The first showed an overall view of the Niro A/S ecosystem, with relations between the divisions and supporting units. The second focussed on the Chemical Division compared to the rest of Niro A/S and showed that there are personal relations and some official contacts to and between the other division, but they are *not* impressive orgiven a high priority. The last ecosystem showed that the Sales engineers have great contact to the surrounding ecosystem, "Powder World", which defines the living conditions of Niro A/S. It is furthermore in many cases up to the sales engineers, in the "field", to decide what knowledge to pass on to many of the departments of Niro A/S.

What characterizes the ecosystems, described, are that they rely heavily on personal relations, the personal networks are well developed, furthermore the staff have many years of experience and a lot of tacit knowledge is embedded. Much of the distribution of knowledge in the ecosystems is similar to the ones taking place in the Socialization, externalisation stages and between them, of the Spiral model by Nonaka & Takeuchi. Supporting and aiding this communication is of key importance for Niro A/S.

# Chapter 8

# Principles in Supporting and Sharing

In this chapter we will investigate the concept of *networks*, personal ones as well as digital ones in connection with Communities of Practice (CoPs), introduced by Wenger [Wenger 1998]. As we progress through this chapter we will relate the terms investigated to Niro A/S. Training of new employees and passing on personal experience will be seen in the design of principles for a "mentor program". Donald Schön [Schön 1983] will be used in terms of his "practice in practicum" and "reflection in action", "reflection on actions " and "reflections on reflections in action". Furthermore will some of the theory by Dreyfus & Dreyfuss be used.
In general the studies made in the processes conducted in this chapter, build on several discussions with Niro A/S as well as a vision conference in Niro A/S[1].

The studied theories will in the end be used to emphasize some of the already found conclusions about the reliance on personal relations and social networks in Niro A/S. These theories will all be used to setup some guiding principles, in order to answer the question of how to support the knowledge environments in Niro A/S. But as a start follows here a *short* explanation of *Communities of Practise* (CoPs).

## 8.1 Communities of Practice

CoPs where introduced by Wenger and his main work, regarding CoPs, is collected in his book [Wenger 1998], which is the basis for this section. Communities of practice are not a new kind of organizational unit; rather, they are a different cut on the organization's structure - one that emphasizes the learning that people have done together rather than the unit they report to, the project they are working on, or the people they know. Communities of practice differ from other kinds of groups found in organizations in the way they define their enterprise, exist over time, and set their boundaries.

### 8.1.1 Defining Communities of Practice

Communities of practice are everywhere. We all belong to a number of them at work, at school, at home, in our hobbies. Some have a name, some do not. We are core members of some and we belong to others more peripherally. One may be a member of a band, or one may just

[1] See Chapter 11

come to rehearsals to hang around with the group. One may lead a group of consultants who specialize in telecommunication strategies, Or one may just have joined a community and are still trying to find place in it. Whatever form our participation takes, most of us are familiar with the experience of belonging to a community of practice.

Members of a community are informally bound by what they do together from engaging in lunchtime discussions to solving difficult problems - and by what they have learned through their *mutual engagement* in these activities.[2] A community of practice is thus different from a community of interest or a geographical community, neither of which implies a shared practice. A community of practice defines itself, according to Wenger, along three dimensions:

- *What it is about* - its joint enterprise as understood and continually renegotiated by its members
- *How it functions* - mutual engagement that bind members together into a social entity
- *What capability it has produced* - the shared repertoire of communal resources (routines, sensibilities, artifacts, vocabulary, styles, etc.) that members have developed over time. [Wenger 1998]

In terms of Niro A/S, a good example of a community of practice are the project engineers involved in "solving" projects, in many cases they travel to destinations in e.g. Asia to commission plants. They experience the same difficulties when commissioning, they have eaten in the same cafeterias and talk to each other. Furthermore, they know if one of them calls them at the Copenhagen office from e.g. China and asks for help, how he feels out there in China, as they together have many shared experiences. Another "feature" in these communities of practice in the project engineering is the common "language" meaning the use of the same technical terms etc.

We can thus say that communities of practice develop around things that matter to people. As a result, their practices reflect the members' own understanding of what is important. Obviously, outside constraints or directives can influence this understanding, but even then, members develop practices that are their own response to these external influences. Even when a community's actions conform to an external mandate, it is the community "not the mandate" that produces the practice. In this sense, communities of practice are fundamentally self-organizing systems.

### 8.1.2 Communities of Practice in Organizations

Communities of practice exist in any organization. Since membership is based on participation rather than on official status, these communities are not bound by organizational *affiliations*; they can span institutional structures and hierarchies. They can be found in:

- Within businesses: Communities of practice arise as people address recurring sets of problems together. So project engineers within the Chemical Division (all are situated on the same office floor) form communities of practice to deal with the constant flow of information they need to process. By participating in such a communal memory, they can do the job without having to remember everything themselves.

[2] See [Wenger 1998]: 73.

- Across business units: Important knowledge is often distributed in different business units. People who work in cross-functional teams, thus form communities of practice to keep in touch with their peers in various parts of the company and maintain their expertise. When communities of practice cut across business units, they can develop strategic perspectives that transcend the fragmentation of product lines. For instance, a community of practice may propose a plan for equipment purchase that no one business unit could have come up with on its own.

- Across company boundaries: In some cases, communities of practice become useful by crossing organizational boundaries. For instance, in fast-moving industries, engineers who work for suppliers and buyers may form a community of practice to keep up with constant technological changes.

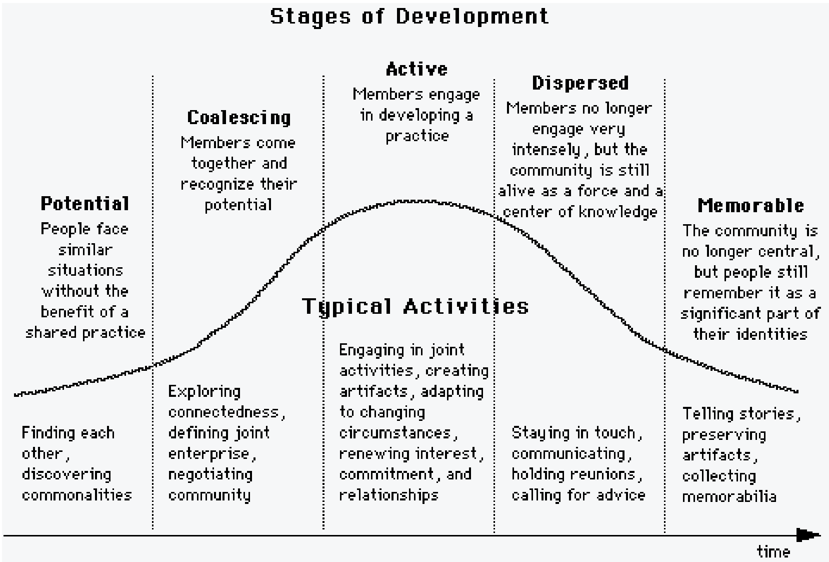


Figure 8.1: CoPs development stages, by Wenger

Figure 8.1 show the stages CoPs will go through, according to Wenger. In Niro A/S, where there are many employees who have worked for many years, the last stage can be seen among some employees. Several years ago they worked together in another company that was eventually bought and absorbed by Niro A/S. They still share the memories from the time when they worked together, but their community is fading. The project engineering as used before as an example clearly belongs to the *active* stage in figure 8.1 as they are still engaging in joint activities.
An example of a CoPs in Niro A/S that span across the boundaries of the division (across business units) is a community which in figure 3.3 is referred to as Community Tech.. This CoPs includes the process technologists who all have started in Niro A/S in the same department, namely Test & Development and from there they have been "recruited" to the position of process technologists in the divisions. They meet weekly and discuss various topics related to their daily work.

People belong to communities of practice at the same time as they belong to other organizational structures, the employees absorbed by Niro A/S are an example of this. In their business units, people shape the organization. In their teams, they take care of projects. In their networks, they form relationships. And in their communities of practice, they develop the knowledge that lets them do these other tasks. This informal fabric of communities and shared practices makes the official organization effective and, indeed, possible according to [Wenger 1998].

**Importance of Communities to Organizations**

Communities of practice are important to the functioning of any organization, but they become crucial to those that recognize knowledge as a *key* asset. From this perspective, an effective organization comprises a constellation of interconnected communities of practice, each dealing with specific aspects of the company's competency - from the peculiarities of a long-standing client, to manufacturing safety, to esoteric technical inventions. Knowledge is created, shared, organized, revised, and passed on within and among these communities. In a deep sense, it is by these communities that knowledge is "owned" in practice.
This view is much like the knowledge ecology view, as a ecology sees the *communities* or units as interconnected. The communities in a KE too have common practices, shared repetoires etc. The KE builds on the principles of the CoPs (see e.g. [George Pór 2001]), but focuses more on the interconnections and the mutual dependence on each other.

### 8.1.3 Developing and Nurturing Communities of Practice

Just because communities of practice arise naturally does not mean that organizations can not do anything to influence their development. Most communities of practice exist whether or not the organization recognizes them. Many are best left alone - some might actually wither under the institutional spotlight. And some may actually need to be carefully seeded and nurtured. But a good number will benefit from some attention, as long as this attention does not smother their self-organizing drive.

Whether these communities arise spontaneously or come together through seeding and nurturing, their development ultimately depends on internal leadership. Certainly, in order to legitimize the community as a place for sharing and creating knowledge, recognized experts need to be involved in some way, even if they do not do much of the work. But internal leadership is more diverse and distributed. It can take many forms:

- The inspirational leadership provided by thought leaders and recognized experts
- The day-to-day leadership provided by those who organize activities
- The classificatory leadership provided by those who collect and organize information in order to document practices
- The interpersonal leadership provided by those who weave the community's social fabric
- The boundary leadership provided by those who connect the community to other communities
- The institutional leadership provided by those who maintain links with other organizational constituencies, in particular the official hierarchy
- The cutting-edge leadership provided by those who shepherd "out-of-the-box" initiatives.

These roles may be formal or informal, and may be concentrated in a core group or more widely distributed. But in all cases, leadership must have intrinsic legitimacy in the community. To be effective, therefore, managers and others must work with communities of practice from the inside rather than merely attempt to design them or manipulate them from the outside. Nurturing communities of practice in organizations includes according to [Wenger 1998]:

- Legitimizing participation
- Negotiating their strategic context
- Being attuned to real practices
- Fine-tuning the organization.
- Providing support

As Niro A/S has many *communities* these bullets fit well, though they should be seen as guiding lines for nursing the knowledge environments - knowledge ecology Niro A/S. It is clear if we look at the communities like project engineering that it should be legitimate to participate, their strategic context should negotiated, *real* practices should be attuned and they should *fine tune* the organization. All of these can in the case of the Chemical Division be *checked*. The provision of support for such CoPs is again available but it is not official as they are an integral part of the daily work and the management of the division will provide the necessary support - But no official measures or policies exist in Niro A/S only the personal leadership provides and defines the support.
It could thus be interesting to see what could be used as a general nurturing for all of Niro A/S and how support should be done. Our investigation of CoPs tells us that the CoPs in Niro A/S already existing are integral part of the company or KE Niro A/S - they connect it. The nurturing should include the above five principles, but what the exact content of support should be like is not clear. For now we will notice the importance of the *nurturing* of the different communities in Niro A/S and move on to see what constitutes the many communities, namely *personal* and *social* networks.

## 8.2 Networks

The world is composed of networks, both computer networks and social networks. When computer networks connect people and organizations, they are the infrastructure of social networks. Just as a computer network is a set of machines connected by a set of cables , a social network is a set of people (or organizations or other social entities) connected by a set of socially meaningful relationships. Although this may be obvious to many computer scientists, the implications of living in a networked world are non-obvious.

The development and use of the Internet and telecommunication networks is creating new social structures in the cyberspace as well as in most companies. One concept often used to focus these new social structures and personal relationships emerging in cyberspace, is Virtual Communities. A virtual community is often regarded as a new form of community only existing in Cyberspace and solely founded upon the technological infrastructure provided by information technology. [Wellman 1999] Virtual communities are however not the emphasis of this section, instead we will start with some general descriptions of networks.

### 8.2.1 Social Networks

As such social networks or as we have used personal networks, are described extensively in the literature and we will only highlight some aspects and instead refer to some of the scholars. Individuals create interpersonal bonds with others within their social network, however these bonds are in some unspecified way causally connected with the actions of these persons with the social institutions of their society[3]. It is these interwoven patterns and matrices that can facilitate the success or failure of societies and organizations that depend on these networks [4]. Hence the creation and facilitation of these networks are pertinent to the analysis of community development, whether virtual or trans national. Vertovec [Vertovec 2001] highlighted the benefits of using social networks, by explaining how interpersonal relations cut across boundaries such as neighborhood, workplace, kinship or class and could be abstracted on an individual basis.

We will use a definition of social networks as the one given by [Campbell & Marsden] which offers a definition of a social network, as a more detailed discussion of the involved aspects exceeds this context:

> A social network is a set of actors and the relations that hold them together. Actors can be individual people, or they can be aggregate units, such as departments, organizations, or families. The key is that the actors exchange resources which then connect them in a social network. Resources may include data, information, goods and services, social support, or financial support. Each kind of resource exchange is considered a social network relation, and individuals who maintain the relation are said to maintain a tie. The strength of their tie may range from weak to strong depending on the number and types of resources they exchange, the frequency of exchanges, and the intimacy of the exchanges between them.

In Niro A/S our Ecosystem thus can be seen as a social network with the department, communities and employees as the actors. Some of the relations in this context are official, e.g. the arrangement of divisions within Niro A/S, and others not official, for example the relations between the process technologists across the division boundaries. Used as a general term, knowledge is a resource *exchanged* in this ecosystem or social network, using the definition by [Campbell & Marsden].

#### Analyzing Social Networks

Social sciences analyze the respective social networks of people or groups in order to describe relations between people. As these are only a "theoretical constructs," they have to be reconstructed before their formal characteristics can be measured. This is typically done, according to [Waloszek 2002], on the basis of interview data: people are asked about their contacts, the frequency or closeness of the contacts, the use of media, and so on. This data makes it possible to monitor and analyze the e-mails of users automatically and to create first versions of their networks.

There are two approaches to network analysis. In the socio-centric approach the network is investigated as a whole. It focuses on the pattern of connections in the entire network. In the

[3] See [Barnes 1954]

[4] See [Freeman 2000]

egocentric approach, the network is centered around one person and his or her links to other people.

There are two important characteristics of networks:[5]

1. Size: Number of nodes in a network; personal networks typically comprise ten to a few hundred nodes but may be much larger depending on the type of network (learning network, e-mail contacts, or co-workers)

2. Density: Relative amount of contacts (ties) in a network; can be expressed as the number of connections divided by the maximum possible number of connections for socio centric networks; the density can range from 0 to 1 or 0% to 100%; for egocentric networks, the density has to be calculated differently.

For a more in-depth analysis, the role and effect of ties of different strength should taken into account. The social network of Niro A/S has not been specifically mapped in accordance with the above two characteristics though some can be said: If we use units of the size of e.g. sales engineering in the Chemical Division as the minimum size of unit, there are approximately 25 - 30 nodes on the grand scale of Niro A/S. If go down to the individual employee in Niro A/S there are 400 people, and the networks become rather large. The density for the typical personal network (see below for the definition) for an employee is relatively large as many people have worked for many years in Niro A/S and have a lot of personal contact.

### 8.2.2 Personal Network

A personal network is a special type of a social network that is centered around one person, in other words, it is an egocentric network. The general and accepted definition of a personal network, according to [Waloszek 2002] is:

> A set of people that are preferably contacted by an individual person to get informal information or advice.

That is to say, a personal network is based on personal relationships. These may exist within a company or organization, or across organizational borders. Its main purpose is usually to share information and advice, not necessarily in the context of work. This definition is much more pragmatic than the definition of a social network. Personal networks are typically informal and unstructured and they include members with stronger and weaker ties.

In Niro A/S it is clear that the Chemical Division can be considered a social network with many personal relationships and consequently many personal networks. People have been in the company for quite some time and these relationship have developed over time. Another important ingredient in the development of social networks is shared experiences. The Chemical Division has an advantage compared to many other workplaces as the project work require that many of the employees have to travel to foreign countries far away. The employees remember these trips and share their experiences and thus strengthen the ties in the social network as well as improving their own personal networks.
The first thing most people would do when they are assigned to a new project in an unknown

[5] See [Waloszek 2002]

area in the field of the chemical Division is to contact people known to them and who can provide background information or give advice on how to solve problems in the field. This contact is eased greatly by the relatively strong social network existing in the Chemical Division, which is more or less equal to the CoPs described earlier.

In Niro A/S, the social networks in e.g. the Chemical Division are relatively strong and help people in their daily work. Supporting such networks are thus a priority and the study of their impact on the capability of conducting large scale projects resources show that they are vital. It can not be emphasized to much that these networks should be *nursed* and given resources to continue to flourish.
We now look at the different IT tools availably for supporting the existing social networks and to develop new networks. [Waloszek 2001]

### 8.2.3 IT Networks

All in all, the evidence above could indicate that companies should invest a lot in supporting personal networks with appropriate software and integrated media solutions. In the case of Niro A/S there already exist an electronic intranet based on a Lotus Notes database and infrastructure. The system developed by Lotus Notes (now part of IBM) is based on the ideas and finding from the early 90's and is widely accepted as well proven easy to use system as intranet for an organization.
What constitutes an IT network and what should be given resources in the context of knowledge management solutions? These questions are important, there are several issues to keep in mind, when finding KM supporting solutions in connection with IT networks.

Leaning on[North & Probst 2001] the implementation of Knowledge Management solutions orients itself to the following three strategic areas, see figure 8.2:

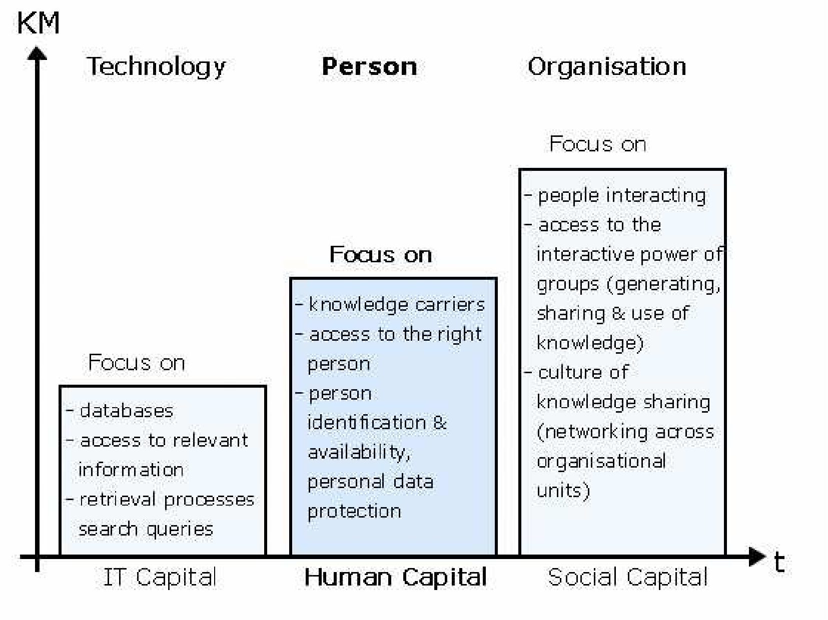


Figure 8.2: The Involvement of Knowledge Management in Business Processes

Next to the expansion of IT infrastructure, solutions are consciously differentiated between those that address the individual employee (human capital), and those that aim to support a collaborative mess work of interactive people (social capital).

The Lotus Notes system in Niro A/S does not pay much attention to the needs of the individual user. The focus is laid on the IT capital. A easy to use and update contact map is not provided and the one existing takes a lot of time to update.

After having seen those it would be nice to find some solutions. In general it is important to take seriously the power of the individuals in deciding and designing how to contribute to knowledge-sharing. Organizational conditions must be changed in such a way that people would like to share. These changing conditions do not always require different organizational structures, rewards systems, positions, etc. In fact, at Niro A/S it is observed that people do feel the need to learn and share knowledge with others in situations, where this would help them do their work better, more efficiently and with more satisfaction. This certainly applies to situations in which knowledge-sharing contributes to the daily operations of the organization.

People do want to share knowledge in Niro A/S, but there needs to be reasons to do so. Personal triggers to share knowledge are, for example, when it provides recognition from others, when it contributes to daily practices, or when it contributes to individual learning processes. The most important obstacle to managing knowledge is the management itself. The role of managers in the next generation of knowledge management will be much more on the periphery, providing opportunities for people to exchange knowledge. What first needs to be addressed is the question how to stimulate a need to share knowledge among a group of people. It is only when this need is satisfied, that physical or electronic spaces are used for knowledge sharing purposes.

Still remains the question of which elements should be emphasized in a intranet with a size like the one existing in Niro A/S. Interesting work regarding electronic KM systems has been made by [Stenmark 2002] where he highlights the importance of an electronic competence system in combination with personal databases.
In [Waloszek 2002], Waloszek list some of the existing tools or solutions for supporting personal networks:

- Personal Information Managers (PIM), address books, contact managers, task managers (to-do lists)
- E-mail managers (e.g. Microsoft Outlook), instant messaging (IM), chat
- Phone, fax communication hardware that has to be integrated into software systems
- Face-to-face contacts via video-conferencing systems.

Waloszek states, that some of these tools already combine several aspects, such as people, dates, and tasks, but most of these tools lack integration, are restricted to one (desktop) computer (or entail tedious synchronization), or require too much work on the part of the user in the shape of data entry, recording and maintenance.
Waloszek wants to implement a *contact map* with a special focus-and-context display technique. The solutions appear to be promising, though have not yet been fully integrated.

We will no go back to the work by Dick Stenmark by describe some of the features in his "competence system", though only briefly and instead refer to his thesis [Stenmark 2002].

### 8.2.4 Competence Systems

Existing competence systems are according to [Stenmark 2002] based on a rationalistic view of competence. While these competence systems might work in job-based organizations, Stenmark argue that in more dynamic settings, such as in knowledge-based organizations, the interest informed actions that capture the emergent competencies of tomorrow require different types of information technology support.

On the basis of how organizational members used the prototype, developed by Stenmark, to find information they were interested in, Stenmarks research team was able to inquire into how personal interest, embodied in information-seeking activities, could be a mean for identifying competence. Building on the relation between personal interest and competence, Stenmark discuss competence systems design and spell out explicit implications for managerial practice in knowledge-based organizations.

Designing the new intranet means, according to Stenmark, to take advantage of the tangible traces of everyday work activities left behind in form of published documents and server log entries. By exploiting the user's everyday actions in an unobtrusively manner, the intranet activities the user is already engaged in during an ordinary workday, can be turned into an organizational benefit. Designing the new intranet also means to take advantage of the fact that actions on an intranet are not isolated events but interrelated activities performed by members of the same organization. The activities that spontaneously occur on an intranet should be aggregated and exploited to reveal otherwise invisible patterns. An intranet application such as a search engine could therefore be able to detect if two users were interested in similar things, and use this insight to increase organizational awareness.

For today's organizational members to be able to create and share knowledge on a daily basis, the intranet should rest on an *information* perspective grounded in real user needs and based on actual user activities. From an*awareness* perspective, the intranet design should alert the users both of relevant information and of other knowledgeable users. The intranet should facilitate collaboration by applying a *communication* perspective that allows both ad hoc and well defined groups and communities of practice to engage in dialogue. For the individual user he or she a *personal* database is suggested by [Stenmark 2002] as one of the interesting solutions. In the case of Niro A/S an electronic backbone network of database like Lotus Notes is necessary in order to store the information availably in Niro A/S. However, the way to retrieve and select could be greatly improved with an intelligent search engine based on the above competence and interest driven competence system and it should be possible to integrate it with a self-updating competence map as proposed by [Stenmark 2002].
Another thing that can be said about Niro A/S is that people complain about the amount of mails and reports sent by e.g. email. Therefore, an interest driven competence system should also, if designed properly, emphasize the aspect *relevance* meaning that it should help people in sharing and distribution in a way that ensures that the relevant documents, reports , mails etc. are received by the right person.

With these remarks we will leave the study of supporting social networks, CoPs and personal networks by IT tools. We will now study another important aspect of networks, namely training of e.g. new employees who eventually shall participate in the already described networks.

## 8.3 Training

As seen, the project handling carried out in Niro A/S, which involved the knowledge of greatest value for Niro A/S, depends heavily on the communities of practice involved, e.g. project engineering. They in turn are interwoven with the social and personal networks existing in Niro A/S. One way of nurturing such networks is through continuously introducing new employees to them. As the average "age" of the population in the communities (like a herd) increase and eventually "fresh" blood is needed. According to analysis from the Human Resources department in Niro A/S the average period of employment will fall due to wishes of the younger generation of employees entering the market of employment. Training of new employees is therefore essential for a company like Niro A/S relying on its employees. Using our metaphor of knowledge ecology, the "fresh blood" simply be seen as the new seeds that in the first time will need a lot of care, but who eventually will replace the older population.
As new employees in many cases have just graduated from the university or college, they do not have much experience in working for a company like Niro A/S and personal training and coaching is definitely needed.

One way of seeing the learning process for a new employee is to see it as a process where the new employee or *novice* will have to go through several stages of learning in order to ultimately reach the expert stage. After a description of a learning model we will study some of the aspects of using a mentor to introduce the new employee to the communities and the social networks in Niro A/S, as well as to support the learning process.

### 8.3.1 A Model of the Learning Process

The model that was proposed by Dreyfus and Drefus in 1987 is about the learning process from novice to expert by Dreyfus & Dreyfus [Dreyfus & Dreyfus 1986]:

1. A novice who does not know anything of the subject he or she is approaching has to start with taking in the facts and rules of it. The application of them to the novice's practice or exercise of the field has to be automatic: the novice cannot decide on which rules to apply and learns them as context-free. Practice is thus limited to imitation, to exercise.

2. The beginner can start to learn the context of the rules, i.e. that there are different rules to apply in different cases. The practice becomes more varied and more adapted to individual cases, but it is still impossible to act autonomously in the field.

3. At the third stage, the competent person grasps all the relevant rules and facts of the field and is, for the first time, able to bring his/her own judgment to each case. This is the stage of learning that is often characterized by the term "problem solving": the conscious and often laborious decision-making process based on the vast repertoire of facts and rules available to the learner.

4. Contrary to most learning theories, this approach, however, does not stop here and does not consider competence to be the final goal of learning. The fourth stage is called *fluency* and is characterized by the progress of the learner from the step-by-step analysis and solving of the situation to the holistic perception of the gestalt of the situation. Just like the situation, its solution also starts to present itself as a holistic pattern or gestalt together with the problem.

5. This ability of gestalt perception is brought to perfection by the expert, the final stage in the learning process. An expert identifies him/herself with the complex real-life situation in which he/she is bound to act. The "art" of the expert consists not in solving problems, but in constructing them out of the amorphous complexity of life. This act of creating the problem already contains its solution.

The crossing between the stages are not sharp, they are continuous and according to [Dreyfus & Dreyfus 1986] the novice will have to go through all stages before reaching the expert level. Most theories of learning stop, according to [Dreyfus & Dreyfus 1986] at the level of competence, since reaching the stage of fluency as will require the use of intuition and a holistic view and not just rely on procedures and rules - some guidance is needed.
Traditional Artificial Intelligence research with its focus on the representation of facts and rules and on problem solving [Baumgartner & Payr 1995] has no small part in this narrowing of our perspective on learning. *Practitioners* and those who are concerned with their education, like Donald Schön (See [Schön 1983]) have never been satisfied with this view. Schön's concept of the "practitioner", for example (see below), shows close similarity to the "expert" characterized above, and his writings about the education of practitioners that have inspired so many educationalists offer an account not only of what it means to be a practitioner, but also of what it could mean to "teach" them.
For Niro A/S it is clear that getting new employees beyond the stage of competence is a necessity as the project handling needs dedicated employees who as experts can identify them self with the complex real-life situations the plants will have to be operate in. But how can they reach this level where they will e.g have to use intuition?
Here we will turn to Donald Schön and his studies of *practitioners* like engineers[6], and how to *learn* to learn being good practitioners.

### 8.3.2 The Reflective Practitioner Reflection-in- and on-Action

One of Donald Schön's great contribution was to bring *reflection* into the center of an understanding of what *professionals* do. Technical-rationality is a positivist epistemology of practice. It is "the dominant paradigm which has failed to resolve the dilemma of rigour versus relevance confronting professionals" [Schön 1983]. Donald Schön looks to an alternative epistemology of practice "in which the knowledge inherent in practice is be understood as artful doing". The notions of reflection-in-action, and reflection-on-action were central to Donald Schön's efforts in this area. The former is sometimes described as "thinking on our feet". It involves looking to our experiences, connecting with our feelings, and attending to our theories in use. It entails building new understandings to inform our actions in the situation that is unfolding.

> The practitioner allows himself to experience surprise, puzzlement, or confusion in a situation which he finds uncertain or unique. He reflects on the phenomenon before him, and on the prior understandings which have been implicit in his behavior. He carries out an experiment which serves to generate both a new understanding of the phenomenon and a change in the situation. ( [Schön 1983]: 68)

We test out our "theories" or, as John Dewey put it "leading ideas" [John Dewey 1933] and this allows to develop further responses and moves. Significantly, to do this we do not closely

[6] See [Schön 1983].

follow established ideas and techniques - textbook schemes. We have to think things through, for every case is unique. However, we can draw on what has gone before. In many respects, Donald Schön is using a distinction here that would have been familiar to Aristotle - between the technical (productive) and the practical.[Smith 2002]

We can link this process of thinking on our feet with reflection-on-action. Workers may write up recordings, talk things through with a supervisor and so on. The act of reflecting-on-action enables us to spend time exploring why we acted as we did, what was happening in a group and so on. In so doing we develop sets of questions and ideas about our activities and practice.

The notion of *repertoire* is a key aspect of this approach. Practitioners build up a collection of images, ideas, examples and actions that they can draw upon. Donald Schön, like John Dewey ([John Dewey 1933]: 123), saw this as central to reflective thought.

When a practitioner makes sense of a situation he perceives to be unique, he sees it as something already present in his repertoire. To see this site as that one is not to subsume the first under a familiar category or rule. It is, rather, to see the unfamiliar, unique situation as both similar to and different from the familiar one, without at first being able to say similar or different with respect to what. The familiar situation functions as a precedent, or a metaphor for the unfamiliar one.[7]

In this way we engage with a situation. We do not have a full understanding of things before we *act*, but, hopefully, we can avoid major problems while "testing". When looking at a situation we are influenced by, and use, what has gone before, what might come, our *repertoire*, and our *frame of reference*. We are able to draw upon certain routines. As we work we can bring fragments of memories into play and begin to build theories and responses that fit the new situation.

There have been three important areas of criticism with regard to this model). First, the distinction between reflection in and on action has been the subject of some debate[8]. Indeed Donald Schön may well have failed to clarify what is involved in the reflective process - and there is a problem, according to [Eraut 1994], around time - "when time is extremely short, decisions have to be rapid and the scope for reflection is extremely limited" ( [Eraut 1994]: 145). There have also been no psychological elaborations of the psychological realities of reflection in action ([Russell & Munby 1991]). However, when we take reflection in and on action together it does appear that Schön has hit upon something significant. Practitioners are able to describe how they "think on their feet", and how they make use of a repertoire of images, metaphors and theories. However, such processes cannot be repeated in full for everything we do. There is a clear relationship between reflection in and on action. People draw upon the processes, experiences and understandings generated through reflection on action. In turn, things can be left and returned to.
We have to take certain things as read. We have to fall back on routines in which previous thought and sentiment has been sedimented. It is here that the full importance of reflection-on-action becomes revealed. As we think and act, questions arise that cannot be answered in the present and we have to reflect on them later.

The second area of criticism is related to, whether his conceptualization of reflective practice really entails praxis. While there is a clear emphasis on action being informed, there is less focus on the commitments entailed. Donald Schön creates, arguably, "a descriptive concept, quite empty of content" ([Richardson 1990]: 14). While he does look at values and interpretative

[7]See [Schön 1983]: 138
[8]See [Usher et al. 1997].

systems, it is the idea of repertoire that comes to the fore. In other words what he tends to look at is the process of framing and the impact of frame-making on situations:

> As "inquirers" frame the problem of the situation, they determine the features to which they will attend, the order they will attempt to impose on the situation, the directions in which they will try to change it. In this process, they identify both the ends to be sought and the means to be employed. ( [Schön 1983]: 165)

The ability to draw upon a repertoire of metaphors and images that allow for different ways of framing a situation is clearly important to creative practice and is a crucial insight. We can easily respond in inappropriate ways in situations through the use of an ill-suited frame. However, what we also must hold in view is some sense of what might make for the good (frame)(see [Smith 2002, pp. 142-145]).

The third area of criticism - it could be argued that while Donald Schön is engaged in the generation of formal theory - "what we do not find in Schön is a reflection by him on his own textual practice in giving some kind of account of that he does of reflection-in-action and the reflective practicum…He does not interrogate his own method". ([Usher et al. 1997]: 149). A more sustained exploration of his methodology may well, according to [Smith 2002] have revealed some significant questions.

Though areas of criticism are present the notion of practitioners is highly relevant in the context of Niro A/S. This is seen in project handling, which involves a lot of work by the engineers characterized by reflection in and on action, which in turn distinguishes Niro A/S from competitors, as they are able to conduct the demanding large scale projects that require a lot by the involved engineers.
But how can one learn people to be practitioners? Schön gives an interesting answer.

### 8.3.3 The Professional Practicum and Reflection-in-Action

Schön notes that the practice of any profession involves the use of special *esoteric* knowledge in action. This knowledge is not merely verbal, but does, of course, have a verbal or discursive dimension. And though the professional can employ the knowledge in action, he or she generally cannot give a very full description of his or her practical knowledge. In Polanyi's terms, this is tacit knowledge learned in use. There are three ways of acquiring such knowledge, Schön states [Schön 1983]. The first, very unusual, way is via *self instruction*. The second is via apprenticeship learning online in real world contexts. But because this is both inefficient and can have serious negative real world effects, the standard site of learning is the practicum. The practicum is an *off-line* situation that approximates the world of practice. In this virtual world the novice learner undergoes a series of graduated problems under the close supervision of a master practitioner serving as a coach, the mentor. The novice learns the vocabularies of the professional practice in the course of learning its operational moves. In the more advanced problems the novice learns to confront the messy unanticipated problems that arise in professional practice. This is not merely knowledge in action, but reflection-in-action, in that new moves have to be tried out and assessed, and thus thought about and talked about.
The practicum as a training program aims at proficiency in this sort of reflection- in-action. It takes the form of reciprocal reflection in action the coach and novice engaged in conjoint problem solving talking and working through the problems side by side. In making the moves, talking about them and even talking about their talk about them (meta-reflection), the novice

and master negotiate the ladder of reflection. In these two ways, in its aims and methods, such experiences are reflective practice [Schön 1983].

Continuing this study of the practicum could be interesting, but there are many aspects, and for now we only use some of them in conjunction to Niro A/S. As seen the coach or mentor should *coach* the novice and present him or she with an adequate amount of challenges, the novice should be given "space" to operate within, as well as stimulation for his reflection process. But the novice should too challenge his own reflective process, his actions and his coach.
In the Chemical Division a mentor is appointed to help the new employee, or novice, through the his first time at Niro A/S. In cooperation they produce a plan for the learning stages to be completed quite similar to the stages in the learning model by Dreyfus & Dreyfus. The way of doing it in the Chemical Division is not far away from the principles outlined by Schön, though there are differences in particularly in the way the practicum is planned. It appears that some considerations should be paid to "learn" the novice to ask the "stupid" questions about his work, reflect-on-action. The mentor should be aware of it and encourage the novice to so.

One element still remains in the coaching, namely that the mentor should introduce the novice to the social networks, e.g. the project engineering. Members of the network should be aware of this and ease the introduction and act as co-coaches. It means that a great deal of *responsibility* is required by the members of the social networks or communities. This introduction takes place in the Chemical Division and people are in general more than willing to help the "newcomers".

We can now sum up some of the main "findings" of this study of learning. One way of seeing the leaning process for a new employee was to see it as a process where the novice goes through several stages of learning in order to ultimately reach the expert stage. The coaching is important and the appointed mentor *must* be aware of this when aiding the novice. He should in return, aided by the mentor, reflect and on and questiong his work and actions. This combined with the willingness of the rest of the community to aid, should ensure that the novice will be able to go through the stages outlined by Dreyfus & Dreyfus and become a genuine member of the social networks.
This description has naturally been idealized a lot but the principles are so important that they are later incorporated in the knowledge management policy developed [9].

## 8.4 Summary

In this chapter we have studied *networks*, personal ones as well as social ones in connection with Communities of Practice (CoPs) as introduced by Wenger [Wenger 1998]. in the case of Niro A/S, at least the Chemical Division, it was found that many of the social networks existing were similar to CoPs, due to the many years of employment in the Chemical Division. Networks are thus a key element of the organization and should be a key element in the knowledge management of Niro A/S.
Because of the many similarities no radical distinction between CoPs and Social networks, was made, though their importance are unquestionable. The personal networks naturally depend

[9] See Chapter 11

on the persons involved but again they do not differ much from the CoPs or social networks, due to the many years people have been employed.
The communities and networks form the backbone of the project handling that takes place in Niro A/S. Nursing of them is vital as they embed the knowledge of greatest value for Niro A/S. Wenger [Wenger 1998] listed five principles in nursing the communities:

- Legitimizing participation
- Negotiating their strategic context
- Being attuned to real practices
- Fine-tuning the organization.
- Providing support

They fit well for nursing and will act as principles for the further work, though it still remains to be studied how it can be provided. Some IT tools were considered and a promising "Competence system" due to [Stenmark 2002] was studied. There were some remarks to the system, among others that it could help the distribution and sharing of *relevant* knowledge.

As the various networks are vital for Niro A/S the introduction and training of new employees is a necessity that simply can not be overestimated. This training and introduction was too seen as a way to nurse the communities like ecosystems. Training of new employees and passing on personal experience was seen in the design of principles for a "mentor program". Donald Schön was used in terms of his "practice in practicum" in conjunction the learning model by Dreyfus & Dreyfuss.

It was found that coaching is important, appointed mentors *must* be aware of this when aiding the novices who in return should, reflect and question their own work and actions. This combined with the willingness of the rest of the community to aid, should ensure that the novices will be able to go through the stages outlined by Dreyfus & Dreyfus and become genuine members of the social network of e.g. project engineering. The "old" members of the social networks or communities should thus also be responsible for the integration of newcomers.

# Chapter 9

# Strategic Thinking

In this chapter the term *strategic thinking* will be considered. The main ideas are due to [Mintzberg], [Michael E. Porter] and [Harrison 2003], dividing the strategic thinking into the categories: Traditional, stake holder oriented and resource oriented and a combination of the others.
Initially some descriptions of strategy are considered alongside policymaking. The reason for studying the field of strategic management is the results of the previous chapters, stating that the communities in Niro A/S play a key role in project handling. The nursing should follow a set of principles:

- Legitimizing participation
- Negotiating their strategic context
- Being attuned to real practices
- Fine-tuning the organization.
- Providing support

and be incorporated in four general terms:

1. Networks
2. Training & education
3. Responsibility
4. Relevance

The question is how we can incorporate these principles and terms and at what level. Should it be at a strategic, tactical or operational level and are there some "special" lessons to be learned in regard to knowledge management. The use of only a limited number of authors within the field strategy development was a deliberate choice in order to limit the complexity of this process, this limitations will be discussed in Chapter 13.

## 9.1 Strategy

*What is strategy?*

Planning and strategy have a long history ( [Mintzberg 1998]. It has been described as having ten-yearly forecasts, revised every five years, by managing means and regarding foresight as an essential part of management. Strategy can occur at a number of levels. We have seen already that governments and multinational organizations can shape the future of whole economies and engage in strategic human resource planning at a macro level (see [Mintzberg 1998]).
The military way of seeing strategy is as the overall strategic level where overall strategic objectives are defined, which in turn call for a tactical planning process concerning how to achieve the objectives. This planning calls yet again for the operational activities. Strategy thus acts as the upper level generating the lower ones and a great deal of planning is needed.

Mintzberg observes that, ironically, planning achieved its greatest importance in two of the most divergent societies on earth: the command economies of the communist world and in corporate America. However, many observers have argued that the Japanese economy is the best illustration of integrated government and corporate strategic planning ([Whitehill 1990]: 256). Japan has targeted and supported successful industries but that success has not just been a matter of good fortune. "Winners" have been created by means of strategic thinking and careful planning at a joint national and organizational level.

Chaffee [Chaffee 1985] considers that (academically) strategy is viewed in three distinct but sometimes conflicting ways: linear strategy, adaptive strategy, and interpretive strategy. The linear model has been used by most researchers and focuses on planning and forecasting. The second model is described as adaptive and most closely associated with "strategic management". This model "tends to focus the manager's attention on means" and is largely concerned with "fit". The third, interpretative model, is a minority view that sees strategy as a metaphor and, therefore, it is not something which can be measured but is viewed in qualitative terms.

[Mintzberg 1998] identified 10 "schools" of strategy research which have developed since strategic management emerged as a field of study during the 1960s and are present today:

1. The Design School - strategy as a process of conception.
2. The Planning School - strategy as a formal process.
3. The Positioning School - strategy as an analytical process.
4. The Entrepreneurial School - strategy as a visionary process.
5. The Cognitive School - strategy as a mental process.
6. The Learning School - strategy as an emergent process.
7. The Power School - strategy as a process of negotiation.
8. The Cultural School - strategy as a collective process.
9. The Environmental School - strategy as a reactive process.
10. The Configuration School - strategy as a process of transformation

Furthermore, Porter makes another distinction, namely that between operational effectiveness and strategic positioning. Operational effectiveness means simply performing better the same activities your competitors perform. Practices like benchmarking, TQM [1], and lean manufacturing are all necessary and valuable routes to improving operational effectiveness. But while superior operational effectiveness can be a source of short-run competitive advantage, in the long run it is nowhere near sufficient. The "rapid diffusion of best practices" means that industries become more efficient without individual companies' becoming more profitable. Even more dangerously, benchmarking means that companies become more alike.

Instead, Porter [Michael E. Porter] suggests that companies need to position themselves differently from their competitors. They need to do so not, as Hamel and Prahalad [Hamel 1994] might have it, by discovering their *core competency* but rather by figuring out where the opportunities in the industry lie. "Operational effectiveness means you're running the same race faster," Porter says. "but strategy is choosing to run a different race because it's the one you've set yourself up to win." [Michael E. Porter]
The core competencies are an integral part of the strategic work done in Niro A/S,see Chapter 10, but for now Mintzberg has the view focused on strategic thinking.

### 9.1.1 From Strategic Planning to Strategic Thinking

Henry Mintzberg [Mintzberg] states, in an article appearing in the *Harvard Business Review* titled, "The Fall and Rise of Strategic Planning," that the label strategic planning should be dropped because strategic planning has impeded strategic thinking.

Mintzberg's argument is as follows: strategic planning is about analysis (i.e., breaking down a goal into steps, designing how the steps may be implemented, and estimating the anticipated consequences of each step). Strategic thinking is about synthesis, about using intuition and creativity to formulate an integrated perspective, a vision, of where the organization should be heading. The problem is that strategic planning proponents believe that analysis encompasses synthesis; that in the best practice, strategic planning, strategic thinking, and strategy making are synonymous. This belief, in turn, rests on the assumptions that prediction is possible and that the strategy-making process can be formalized.

Mintzberg argues, that predicting seasons of the year is simple, but predicting discontinuities, such as a technological innovation, is difficult, if not impossible. Moreover, Mintzberg maintains, formalizing a strategy implies a sequence from analysis through procedure to action. Certainly we do think in order to act; but also we sometimes act in order to think. We experiment; those experiments that work converge into patterns that become strategies. To Mintzberg, the essence of strategy making is the process of *learning as we act* (not far from Schön's notion of reflection in action). Formal systems can never internalize, comprehend, or synthesize hard information. Thus planning can not "learn." Mintzberg says, "Strategies can develop inadvertently, without the conscious intention of senior management, often through a process of learning... Learning inevitably plays a, if not the, crucial role in the development of novel strategies" [Mintzberg, pp. 111].

Mintzberg sees strategic planning as practiced, as strategic *programming* - articulating and elaborating strategies that already exist. When managers comprehend the difference between planning and strategic thinking, it is possible to return to what the strategy-making process

[1] Total Quality Management.

should be: "capturing what the manager learns from all sources (both the soft insights from his or her personal experiences and the experiences of others throughout the organization and the hard data from market research and the like) and then synthesizing that learning into a vision of the direction that the business should pursue [Mintzberg, pp. 107].

Mintzberg does not mean get rid of the planners. Instead, those with planning responsibilities should make their contribution around the strategy-making process rather than inside it. Planners should supply the data that strategic thinking requires, should act as catalysts who support strategy-making by aiding and encouraging managers to think strategically, and should help specify the implementation steps needed to carry out the strategic vision.
With the notion of strategic thinking knowledge management naturally will be part of the strategic thinking but the planning, the implementation of "initiatives" will not be part of it. Furthermore the intentions of nursing the knowledge environments, the networks are a result of the strategic thinking and should be seen in the perspective of this process.
Having studied some of issues involved in strategic thinking, there is one final view on strategy process that will studied.

### 9.1.2 Strategic Perspectives

Jeffrey S. Harrison makes a distinction in [Harrison 2003] between the different approaches to strategy work :

**Traditional perspective** is characterized by having originated from the science of economics, other business disciplines and consulting firms, it views the organization as an economic entity. The approach to the strategy formulation is done through situation analysis of internal and external environments leading to formulation of mission and strategies. The aim is the adapt the organization in the best way to its environment and by taking advantage of opportunities and strengths and to overcome weaknesses and threats.

**Resource based view** origins from economics, distinctive competencies, and general management capability. The organization is viewed as a collection of resources, skills and abilities. The approach is through analysis of organizational resources, skills and abilities, and the acquisition of superior resources, skills and abilities is the aim.

**Stake holder view** origins from business ethics and social responsibility. The organization is viewed as a network of relationships among the firms and its stake holders. The approach is through analysis of the economic power, political influence, rights, and demand of various stake holders. The aim is achieve superior linkage with stake holders leading to trust, goodwill, improved business dealing and ultimately to higher firm performance.

Jeffrey S. Harrison has developed a model that combines the above three ones, though it will not be explained any further as it can be found in [Harrison 2003].
The business plan made by Niro A/S would according to Jeffrey S. Harrison be a traditional one, as will seen in the framework described in Chapter 10, as it relies heavily on a number of analysis aiming at analyzing the internal and external environments and through formulates mission, vision and strategies choices. The aim is clearly to adapt the Chemical Division in the best way to its environment and by taking advantage of opportunities and strengths and to overcome weaknesses and threats.

According to [Huysman 2002] the initiatives that are developed due to a strategic process should avoid several "traps" that are typical for the many KM initiatives developed for the last decade. They include the following three:

### The Management Trap

One of the most common risks to knowledge management initiatives is that they might be handled exclusively from a managerial perspective. There are several advantages for managers to manage the knowledge sharing within the organization. One is that knowledge is often scattered throughout the organization. With the emergence of the knowledge economy in which workers gain more and more knowledge specific to their own work process, organizations need to make these scattered knowledge domains more transparent. Next and related is the argument that transparency is needed in order to reduce the likelihood of reinventing the wheel. The ideal is that once the point has been reached when everyone knows what everyone else knows, people will then contact each other to exchange knowledge or to refer customers and clients more effectively.

Learning from each other has the additional advantage of filling up the knowledge gaps that would otherwise exist when people leave the organization or change positions. Because managers cannot force people to share their knowledge, knowledge management calls for the vast support of knowledge workers. Knowledge management relies heavily on the willingness of knowledge workers to take part in it. We encountered various reasons for knowledge workers to actually engage in knowledge management initiatives, such as an increase of job-efficiency, status, and fun! If the condition of a win-win situation is not taken care of, managers will be confronted with major rejections from the side of the knowledge workers [Huysman 2002].

### The Individual Learning Trap

Knowledge management is generally seen as the management of learning processes within organizations. The risk however lies in seeing this as the management of individual learning instead of collective learning. according to [Huysman 2002] there exist many initiatives that approach knowledge management as supporting knowledge development of individuals more than of collectives within organizations. Concentrating on individuals instead of collectives is understandable as tools to support individual learning such as training, education, or more explicit tools such as libraries or databases are part of every organization. Tools to improve the collective knowledge base are still only sporadically institutionalized. Much of the collective knowledge is gained during day to day interactions and is less easy to manage and support. Because of this bias towards individual learning, organizations might fall into the trap to focus on the development of individual knowledge instead of sharing and creating knowledge among individuals.

### The Information Communication Technology Trap

In general the ICT trap comes from a technology driven perspective on knowledge sharing. The underlying assumption is that ICT can support and improve the knowledge exchange within an organization. The trap lurks particularly in the assumption that ICT can positively support and improve knowledge-sharing while ignoring the conditions that stimulate or hinder people to share knowledge. The tendency to perceive IT as independent from the social environment of which it is part, has caused disappointing acceptance rates. It is not the technology itself but the way people use it that determines whether it will be used. This tendency to perceive IT as existing on its own, also feeds to the assumption that all knowledge can be transformed into data en stored into systems. Echoes from the legacy of the information-management era resound here. When knowledge is saved in a system it becomes transformed into explicit, codified knowledge. A lot of knowledge has however a large tacit dimension and appears to be difficult to share with others, let alone store in a system. In the case of implicit knowledge, the human being is both the knowledge carrier and the vehicle through with the knowledge is passed on. Next to the producer, the potential consumer of knowledge might also create pockets of resistance to using ICT tools for knowledge-sharing. People want to know from whom they learn as this provides important 'meta-knowledge'. Knowledge only has meaning if it can be related to people. This is one of the reasons why recorded knowledge seldom leads to the knowledge being re-used. Aids to knowledge-sharing such as Intranets and knowledge bases that are geared towards codifying knowledge are not effective enough. When sharing experiences, people prefer to look for support from personal networks rather than electronic networks. Meta-knowledge cannot be recorded in technical networks and requires the support of social personal networks. In that case, tacit knowledge does not need to be transformed into explicit knowledge in order to share it with others. What is needed is the support of social networks and knowledge connections to enable transfer [Huysman 2002].

There are naturally more than just those three "traps" but they sum up quite well some of the critical issues to avoid when working with KM and in particularly when designing how to nurse e.g. social networks.
The design, it was decided, should follow the principles from the previous chapter and the strategic process conducted in Niro A/S. We thus see the design as a *policy* defining KM based on some guiding principles and the strategic thinking that has already taken place. The operational planning and actual implementation will not be the primary objective, though the options and possibilities will be discussed (See Chapter 13).

One of the rationales for making a policy was among others the strategic work made at the DTU in late 2002, which was designed after a framework made by the management (See Appendix E). As some experience with the process of developing the strategy was obtained, through work in the studentunion at DTU, the framework was a inspiration that together with discussions with Niro A/S meant that the development of a knowledge management policy would be the natural extension of the strategic work already done in Niro A/S. The next question was how to design the policy and what was the context of a KM policy in relation to the strategic work made in Niro A/S?

As Niro A/S already had worked out a strategic business for each strategic business unit, it was decided that whatever work to be conducted in Niro A/S it should use the work already done in the strategy project and it had to be at a level in conjunction with the strategy work. It was furthermore decided that the level should be the level of policymaking.
In Danish the word *politik* has two main interpretations [Gyldendals Fremmedordbog], namely policy as plan of action or intentions. The other is politics and is the science art of political government. The first one is clearly the one to use the case of Niro A/S and knowledge management.
But what is the connection to between strategy and policymaking? Strategy is the general statement of the direction in which the organization wishes to develop, as discussed in the previous section. Policymaking in this context is thus seen as the level connecting the strategic thinking and the operational planning. A policy can thus be seen as a set of "ground

rules" designed to ensure that activities within the organization conforms to an agreed set of parameters. This view of policymaking is seen as the one to use for the development of a KM policy in Niro A/S.

In Chapter 11 the process of developing the policy it self is described. Besides from discussions with Niro A/S, the supervisor and some inspiration from the DTU the policy developed in Chapter 11 follows, to some extend, a framework made by the Australian health department [Policy Development Guidelines], which too will be described in Chapter 11. The decision to use this framework was made mainly to limit the time used in the development of the policy and it has naturally effected the it.
Still remains the question of what the context of a KM policy in relation to the strategic work made in Niro A/S. To answer this question a description of the strategy work and the conclusions drawn will follow in the following chapter.

## 9.2 Summary

In this chapter we have looked at strategy, perspectives of it and the concept of *strategic thinking*. Several "traps" were identified to be kept in mind in the development of a knowledge management policy in Niro A/S. The KM policy developed is seen as a link between the strategic thinking and the operational planning. As inspiration for the development of the KM policy were discussions at Niro A/S and the DTU strategy work.

# Chapter 10

# Strategic Work in Niro A/S

In this chapter follows a description of the strategic work that has taken place in Niro A/S during the last couple of years, though the focus of this description will be the the work relevant for knowledge management, including the principles outlined in Chapter 8. The description will thus not be complete, e.g. analysis of market segments in various countries are omitted, furthermore most of the work is highly confidential as well as not being particularly relevant for this project.
From this strategic work we will focus our attention on the business plan developed for the Chemical Division. The conclusions and main interpretations will be drawn and used to emphasize our own conclusions regarding the Chemical Division. From these conclusions and the discussions in the previous chapters follows the choice of making a Knowledge Management policy for Niro A/S.
The analysis that are the building blocks for the business plan for the Chemical Division will briefly be investigated.
Inspired by among others the strategy work made at DTU in 2003 it was decided to make a policy in KM, the context of this policy with other initiatives at Niro A/S will be discussed at the end of this chapter.

## 10.1 The Business Plans

During the last couple of years, a strategic project has been under its way in Niro A/S. Several consultants, many hours of work in the management and the divisions has been invested in making a business plan for Niro. The plan was divided into four separate plans with one for each strategic business unit (SBU) and contains a number of analysis and recommendations which lead to a number of *initiatives* for each of the divisions.

The strategic work is divided into four separate *business plans*, there is one for each of the *Strategic Business Units* (SBU), which the four divisions belong to. They have the same features and have been presented in November 2002 in France, where all the Managers of the four divisions meet. the main headlines are:

- Aspiration
- Mission

- Vision
- Goals
- Generic process
- Time schedule

The strategic work, made in the business plans, is quite similar to the framework for strategy work with a traditional perspective as described by [Harrison 2003] and in section 9.1.2. Whether the strategy work laid in the business plans is due to strategic planning or strategic thinking is not easy to tell for a non expert in strategy work, though it appears that a lot of attention has been laid on first developing the mission, vision and strategic choices and then plan the implications and implementations.

The entire business plan for the Chemical SBU has been studied and elements of the business plans for the other divisions have studied to in order to test conclusions drawn from the Chemical SBU. The tools used by the analysis contained in the business plans are the following:

- BCG matrix
- Porter's five forces
- SWOT
- GE matrix
- 7-s model

The analysis are characterized by several approaches, though we will only describe them briefly.[1]

**BCG growth-share matrix** describes the various business units on a graph of the market growth rate vs. market share relative to competitors:

The analysis is used to differentiate the the products produced or services made for a business unit and to put them into a frame in order to it is a *cash cow* characterized by a large market share in a mature, slow growing industry. Cash cows require little investment and generate cash that can be used to invest in other business units.
If it is *Star* we have a business unit that has a large market share in a fast growing industry.
A *Question Mark* (or Problem Child) is a business unit that has a small market share in a high growth market.
A *Dog* is a business unit that has a small market share in a mature industry. A dog may not require substantial cash, but it ties up capital that could better be deployed elsewhere.

[1] See [QuickMBA.com] for more elaborate descriptions of the different tools used.

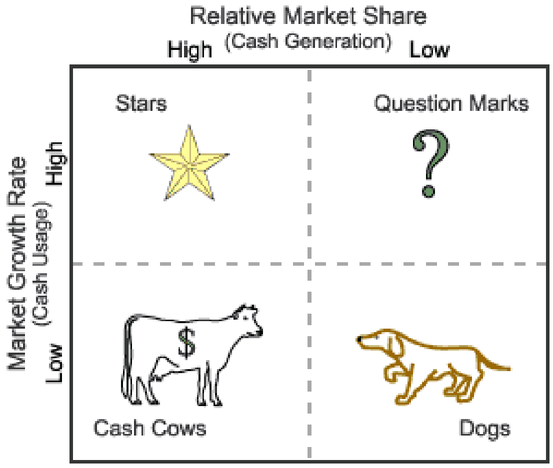


Figure 10.1: BCG Growth-Share Matrix [QuickMBA.com]

**Porters five forces** was developed by [Michael E. Porter]. Since that time it has become an important tool for analyzing an organizations industry structure in strategic processes.

Porters model is based on the insight that a corporate strategy should meet the opportunities and threats in the organizations external environment. Especially, competitive strategy should base on and understanding of industry structures and the way they change.

Porter has identified five competitive forces that shape every industry and every market. These forces determine the intensity of competition and hence the profitability and attractiveness of an industry. The objective of corporate strategy should be to modify these competitive forces in a way that improves the position of the organization. Porters model supports analysis of the driving forces in an industry. Based on the information derived from the Five Forces analysis, management can decide how to influence or to exploit particular characteristics of their industry.
The five forces are: Bargaining Power of Suppliers, Bargaining Power of Customers, Threat of New Entrants, Threat of Substitutes and Competitive Rivalry between Existing Players.

**SWOT** stands for Strengths, Weaknesses, Opportunities and Threats. It is a four-part approach to analyzing a company's overall strategy or the strategy of its business units. All four aspects must be considered to implement a long-range plan of action [QuickMBA.com].

**GE matrix** maps strategic business units on a grid of the industry and the SBU's position in the industry. The GE matrix however, differs from other models alike by:

- The GE matrix generalizes the axes as "Industry Attractiveness" and "Business Unit Strength" whereas the BCG matrix uses the market growth rate as a proxy for industry attractiveness and relative market share as a proxy for the strength of the business unit.
- The GE matrix has nine cells vs. e.g. the four cells in the BCG matrix.

Industry attractiveness and business unit strength are calculated by first identifying criteria for each, determining the value of each parameter in the criteria, and multiplying that value by a weighting factor. The result is a quantitative measure of industry attractiveness and the business unit's relative performance in that industry.

**7-s model** is a tool for managerial analysis and action that provides a structure with which to consider a company as a whole, so that the organization's problems may be diagnosed and a strategy may be developed and implemented. The Seven-S's is a framework for analyzing organizations and their effectiveness. It looks at the seven key elements that make the organizations successful, or not: *strategy*; *structure*; *systems*; *style*; *skills*; *staff*; and *shared values*.

It is clear, that one faces several potential risks, by not having conducted the analysis oneself, but instead have used exclusively the *results* found by Niro A/S. The possible mistakes and misjudgments made during the Strategic project are consequently inherited in the following analysis. However a lot of time have been saved by making this choice of reliance on the analysis work from Niro A/S. This combined with the fact that the author has no significant experience in conducting such analysis in this scale, have lead to the belief that is was worth risking the inheriting of possible mistakes and misjudgment.

The main results of the above analysis, in conjunction with knowledge management can be summed up by the following statements:

**Technology** : Base technology remains fairly unchanged, but new application areas, i.e. special products is expected.

**Customer problems/requirements** : Mergers/consolidation of major customers - global customers.

**Value chain** : The core competencies are highlighted to be Process & project engineering, Technical Sales

**Today** Large project capability

**Future** :

- Product development
- IT capabilities
- High performing test stations
- Global project capability

**Strengths SBU Chemical vs. competitors** :

- High market recognition large reference list.
- Technical skilled and experienced staff.
- Ability to select technology for specific customer needs
- Ability to service customers globally.

**Weaknesses SBU Chemical vs. competitors** : Technology pipeline running dry and slow to commercialization from R&D.

**Opportunities SBU Chemical vs. competitors** :

- Develop technologies and new markets.
- Develop technology for new markets e.g. Biotech.

**Threats SBU Chemical vs. competitors** :

- Fierce competition moving from low technology towards high technology.
- Ease of market entry by small companies with low technical capability.

**Sustainable Competitive advantages** :

- Staff skill and capabilities with regard to development, sale and project execution.
- Able to develop new, and apply current technologies to changing demands of leading customers.
- Capability to service global markets with local presence.

**Strategic choices** :

- Concentrating on high tech. solutions while at the same time filling capacity from the low tech. end of the market, utilizing a two-level business model.
- Apply technologies primarily within spray and fluid bed drying and agglomeration.
- Maintain Process and Project engineering as core competencies, out sourcing fabrication and field assembly.
- Focus resources and competencies on Fine Chemical, Polymer and Hard metal segment.

The results are taken directly from the business plan for the Chemical Division but the business plans for the other three divisions have been looked through and the same headlines can be summed up, though with different emphasis from division to division. The headlines therefore are good representatives for Niro A/S.

To the above should be added that people in general complain about the amount of information or databases available on the intranet - There are simply too many databases, and the general impression is that a lot of them have been created with sole purpose of fulfilling the needs of some unknown individuals. To this should furthermore be added the large amount of e-mails that are daily distributed internally in Niro A/S. It should however be emphasized that the complaints are dependent on the age of the people who complain, and on their background.

From these extracted headlines we have even further chosen to focus on the superior technical and the engineering skills in Niro A/S. These are of out most importance for a company relying on its engineering. This includes not only the technological expertise and innovation, but also the ability to define the needs for a customer, and finally the collective cooperation by the employees in enabling optimized large scale projects. Personal and social networks, experience and training are critical factors when maintaining superior such technical and engineering skills.

### Strategic Projects for the Chemical Division

The business plan *ends* with a number of strategic projects for the chemical Division:

- *Global SBU co-ordination*
- *Tendering and project handling*
- *Develop IT capabilities*
- *Develop the technology for commercialization*
- *Develop market opportunities*
- *Develop human resources*

These strategic projects combined with the superior technical and engineering skills, as mentioned in the previous section, should be seen as the context of the KM policy to be developed. A KM policy is as such not a specific part of the any of the above projects but should be seen as a link between the strategic work and the projects: Develop human resources, Develop the technology for commercialization and Tendering and project handling . The policy should thus *lead* to these projects.

The exact content of the policy remains to be worked out, though the principles have been found and reinforced by the business plans, still remains to adapt these principles to the users being effected by the KM policy. The process of doing so will be described in the next chapter together with an outline of the development process and the construction of the policy.

## 10.2 Summary

In this chapter we have looked at business plans made for the divisions of Niro A/S. This included some of the tools used in various analysis, outlining that superior technical and engineering skills in Niro A/S. These skills rely on the skilled and flexible employees, as mentioned in the business plans. The focus has been on the business plan for the Chemical Division, but similarities were found in the business plan for the other units.
The knowledge management policy is to be the link between the strategic thinking and the operational work. This will be a link to some of the strategic initiatives in the present business plan.

# Chapter 11

# Policy Development

In this chapter we will describe the process leading to the development of the KM policy for Niro A/S. The content of the policy itself is found in the following chapter 12 with comments. The process for this policy will be outlined and commented and used in the discussion. The development included a twice held vision conference (see Appendix A and B ), several interviews and many meetings in the Chemical Division and in the other units of Niro A/S.
The description of the development will be presented chronological as the events took place . As mentioned in Chapter 9 a guideline for policy development was used (see [Policy Development Guidelines]) and its content will be outlined in this chapter. Before describing development process we will first recapitulate focus areas for the policy:

1. Networks
2. Training & education
3. Responsibility
4. Relevance

These principles, were found, during the development of the policy, with the aid of the principles for nursing CoPs by Wenger (See Chapter 8). In the end we will outline some of the ideas for future implementation of the policy as well as what can be learned from the held Vision conferences in Niro A/S. The policy is found in the following Chapter 12, but now we will turn to the development itself

## 11.1 The Development of the Policy

The development of this policy has taken place as an overlapping process with several stages in collaboration with Niro A/S. The stages are the following:

- Work on theory about Strategy in conjunction to Niro A/S (early march)
- Strategy theory (late march)
- Intentions for developing a KM policy emerges (early April).

- Deputy-meeting vision conference held 8/4
- Confirmation of Policy as the desired end product of this thesis.
- Different frameworks for policy were investigated.
- Definition of policy making made.
- First draft made around 1/5
- Discussions in Niro A/S
- vision conference. at 3/6
- Policy made (mid June)

The first three stages were discussed in the previous chapter and ended with the intention of developing a KM policy for Niro A/S as the layer between the strategic thinking and the operational planning. The intentions for the policy were that it should be user oriented and thus be adapted to the people it would impact. Furthermore the policy should act as a framework for supporting the forums within the divisions and the attached departments where knowledge, e.g. work experience is exchanged and embedded. The support could given through increased collective awareness of what relevant knowledge is for Niro A/S, and by easing the use of the different tools involved in knowledge sharing Another area of interest the is how to make exchange and transfer of relevant knowledge and work experience a priority, as well as how to train and incorporate new employees .

## 11.2 Vision Conference 8th April

With above thoughts in mind a Vision conference for the deputies in the various departments and divisions of Niro A/S was held the 8. of April. In advance an invitation was sent to the participants with the following questions to the them:

- "What is knowledge for Niro A/S?"
- "Which kind of knowledge is adding value to Niro A/S?"
- "How is knowledge being shared and managed in Niro A/S?"

The questions were asked in order to allow the participants reflect in advance on what knowledge really is and what impact it had in their daily work. It was the hope that such reflections made in advance would ease the discussions.

In the invitation it was written, that they had been invited to the conference in order to ensure a common understanding of the aspects involved in KM. It had not been the intention to debate the specific content of a future KM policy for Niro A/S, instead the following topics as task questions were given (see section 2.2.4) for the conference:

- "Is there a need for a Knowledge Management policy in Niro A/S?"

- "How can knowledge be secured in Niro A/S in the future?"

This deliberate choice was made as we at that time had not settled entirely on developing a KM policy.

The conference was designed to follow the principles as described in section 2.2.4, though the time available limited the extend of the conference. The schedule for the conference:

15.30 Introduction to the Vision Conference.

15.40 Divergent phase with the purpose of producing as many ideas, visions and objectives as possible.

16.10 Convergent phase focusing on the most promising ideas.

16.40 Summary of the results.

For some unknown reason the invitational letter had not been sent to the participants which resulted in that the first 5 min. had to be used to sum up the content of the invitational letter. In Appendix A is described what took place during the conference. In short we sum up the main results that too was distributed to the participants.

**Divergent phase**
The participants sat in front of a semi circle in front of a white board A brainstorming was initiated as one of the facilitators placed the "post-its" made by the participants on the white board, while the other took notes. The main themes were:

- Culture and social events
- Strategy
- Senior policy
- IT/databases/Tools
- Core competencies in Niro A/S
- Procedures and routines
- Education

**Convergent phase**
It was decided that the "culture" was a key factor and the topic was further debated. Three main areas of focus were found.

- It should be easier to share and knowledge as well as the process of updating should be easy
- Knowledge sharing should be a two way process, meaning one should not only distribute relevant knowledge, one should also receive relevant knowledge.
- Personal networks, procedures and the various tools should be used in the best possible combination.

**Conclusion on the Vision Conference held 8th April**

There was a general understanding of the importance of knowledge management as a key factor in the continued development of Niro A/S. It was agreed that it consequently was necessary to create the right framework for knowledge sharing and use in order to more effectively use previous work and gained experiences throughout the company. Furthermore the importance of using the personal networks existing throughout Niro A/S was important, e.g. to help integrate new employees in Niro A/S. The culture of Niro A/S was too emphasized as being important for the company as it contained much of the willingness, responsibility and commitment existing among the employees.
It should be acknowledged that the participants were all managers and as such could have the same motives for emphasizing certain conclusions, this should be seen in the context that the participants have positions below the top management and above the rest of the employees in their respective units. The facilitators felt not that this effect was present and the conclusions written by the facilitators were sent to the participants who had no suggestions for changes. A little extra time would have help to elaborate further about the three focus areas.

## 11.3 Framework for a Policy

After the vision conference it was decided in collaboration with Niro A/S to focus the work on developing a KM policy as the desired end product of this thesis. There were however, still some unanswered questions, since it was not clear what definition should be used for the word *policy* and *policymaking*.
This definition was found by first looking at the definitions found in various English and Danish thesaurus, from these was found a fitting and one, as mentioned in chapter 9:

**Policymaking**
As mentioned before in Danish the word *politik* has two main interpretations, namely policy as plan of action or intentions. The other is politics and is the science art of political government. Policymaking in this context is thus seen as the level connecting the strategic thinking and the operational planning.

Having settled on this definition the continued work concentrated on finding a proper framework for a policy. Such a framework was found in [Policy Development Guidelines] developed by the Health department in North South Wales Australia and contains the following sections:

- Preface/Executive Summary
- Background
  - historical context
  - need for and intent of policy
  - policy development process (including consultation undertaken)
- Policy Context and Direction
  - goals and objectives
  - policy principles

  - consistency with government and other related policies

- Analysis of issues and preferred response (for each major issue)
  - description of current service levels and policy
  - discussion of issues requiring a policy response
  - preferred option based on policy context and directions
  - strategies (covering what, when, where and who)
  - resource, staffing and service implications

- Implementation plan
  - identify performance measures, time lines and key deliverables
  - clarify responsibilities for implementation
  - monitoring and review arrangements

Furthermore the policy had the following stages.

### Stages of Policy Development

The policy process should according to the [Policy Development Guidelines] be looked at as a cycle that typically moves through:

1. Evaluation and review.
2. Issue identification and policy definition: Scoping Paper
3. Clarification of policy issues and preferred options
4. Release of formal discussion paper
5. Development of final policy paper
6. Implementation

With consultations occurring throughout this cycle.

The above framework has been the inspiration[1] for the development of the KM policy though several adaptations have been made. Regarding the content it was decided that the structure of policy should be as in the Chapter 12 and it should contain the *Policy Context and Direction* and the remaining sections would be included in this thesis with the respective equivalent chapters:

- Preface/Executive Summary := Chapter 1
- Background := Chapter 3

[1] The impact of using this framework is discussed in Chapter 13.

- Policy Context and Direction := Chapter 12
- Analysis of issues and preferred response (for each major issue) := Chapter 12, Chapter 3, 5
- Implementation plan := Chapter 13

**Discussion Paper**

The stages were too modified, as in late April the stages 1-2 already had been completed and had a good comprehension about stage 3 had been achieved. The next stages would include the release of a formal discussion paper. However it was chosen to make one and discuss it with the contact person as well as with the H& R department at Niro A/S in early May in stead of distributing it to a lot of people who had not been involved in the project.
The paper, which can be found in Appendix F, contained the following topics for discussion:

- Background.
- Intention.
- Method.
- User adaptations.
- Knowledge (what knowledge is for Niro A/S).
- Context and aim.
- Areas of focus.
- Possible options.
- How to implement.
- Expected results.

After having revised the comments and suggestions from Niro A/S, it was decided in collaboration to arrange another vision conference at Niro A/S with more participants, who would represent a broader collection of employees from Niro A/S.

## 11.4 Vision Conference 3rd June

Prior to the vision conference an invitational letter was sent to the participants, who included persons from:

- Process technologists - Chemical Division
- Project manager - Chemical Division
- Project engineer - Chemical Division

- Sales engineer - Chemical Division
- Deputy - Chemical Division
- Project manager - Component engineering
- Engineer - Component engineering
- Engineer - Process Control

The letter explained the objective of the conference which was to discuss the principles of a KM policy in Niro A/S, how the employees could contribute and how such a policy should be implemented.
Several notes were made in advance with supplementary questions if the participants would run out of topics to discuss, they can be found in Appendix B. The conference was scheduled to last at least 30 minutes more than the last vision conference, and it had the following agenda:

**10.00** Introduction

**10.15** Divergent phase

**11.00** Convergent phase

**11.40** Summary

More time was, as seen, available compared to the previous one held, which proved beneficial. The task questions were:

- How is the sharing culture nursed?
- When knowledge is being shared - how do you consider the needs of your colleagues?

Compared to the first vision conference the participants were more eager to comment on the questions. One reason could be the fact that the participants this time were tabled around one table and one of the facilitators wrote on the white board while the other wrote everything down on paper.
The topics discussed and the all of the comments and suggestions can be found in Appendix B.2

### Conclusions

The following conclusions were sent to the participants too - no complaints about the conclusions have been received to this date. The conclusions are the following:
As most of Niro A/S's informal knowledge exchange and a lot of the explicit is carried out through peoples personal networks, it is imperative that these networks are kept as the backbone of the knowledge management policy. It is crucial that new employees are introduced to these networks meaning the relevant people in order to speed up the learning process (Learning curve) on could say the first period is a sort of practice in practicum (D. Schön) where the new employee is introduced while given tasks of limited difficulty by a mentor.

The specialized competence areas could be managed or supervised by a "manager", preferable more than one person (vulnerability), who responsible for the area. This means he knows the people throughout the division who have knowledge about the area. The purpose of such a person is to facilitate people who (i.e. new people) wants to acquire knowledge from the network (personal) but is not aware of its extend. Furthermore the "manager" is also the person who should recognize the needs of added training or education within his area, who it would relevant to give this training. It could also be that person people would contact in order to suggest new training.

The existing network of databases should be transformed from mainly being used as a storage bank for explicit knowledge and toward facilitating the individual user as well as storing the explicit information. It should be possible for the individual user to adjust the information he or she can retrieve from the system and the system should ease the personal contact between the users meaning that it should suggest relevant contact persons given at specific need of knowledge or experience. In general the databases should as interface to the user be a personal database.
Personal networks are an integral part of Niro A/S and the databases should consequently support the networks. However, the system should at the same time support the knowledge competence areas and their managers.

**Suggestions for future workshops**

From the vision conference held there are a few lessons the be learned. The vision conference went OK, and the expected results more or less came true. However, there are some remarks to the conduct of the conference. The meeting room was perfect for the conference, and the decision made to place all the participants around one table instead of a open semi circle proved to be a successful decision. Most people participated in the discussions though some did not, a reason for this could be the informal hierarchy among the participants. People were as such not afraid of criticize each other.
Placing people around one table was a good decision, but people still hesitated a little bit in the beginning of the conference, and they mixed the two phases (convergent and divergent). If a little extra time had been available, the conference could have started with a discussion of what is tacit and explicit knowledge in terms of Niro A/S.

An alternative given the limited time would be to conduct a meeting conference which is initiated with a brainstorm over the same topics as with the vision conference. The brain storm could the be followed by a traditional meeting with discussions about the most promising ideas.

After the vision conference a summary and the above conclusions were distributed to the participants for comments, and as mentioned no disagreeing comments were received. On the contrary it was noted that the summary and conclusions represented what really happened.

## 11.5 Further Development of the Policy

After the vision conference the conclusions from it were lined up and a number of areas of focus were extracted and are showed here:

- Networks and Culture
- Responsibility

- Relevance when Sharing and using
- Education & training.

The headlines combined with the all the work done previously were used to create a frame from which the policy eventually was written. This frame was then "filled" in, in accordance with principles and the collective work made so far. The topics, discussed and agreed on as the most important for Niro A/S at the vision conferences, have been incorporated.

After two weeks a follow up meetings was held at Niro A/S. In advance the policy proposal was sent. At the meeting it was agreed that the focus areas were fitting and exhaustive.

With these comments the final version of the KM policy was written and commented for each of focus areas were made and attached to the policy in such a way that the policy itself together with the comments should be comprehensible for the regular employee at Niro A/S though some instruction and publication work still remains to this date in order to implement it successfully.

The Knowledge Management policy, including the comments can be found in Chapter 12 succeeding this chapter. The policy itself is adapted to the users as it is relatively easy to understand, it incorporates most of the wishes from the users, though naturally the facilitators have emphasized certain aspects. These aspects are nursing the communities of practise, by telling people that their *social* and *personal* networks are key factors and people should use them. Another thing that has been particularly emphasized is the training of new employees. The inspiration for this is the practice in practicum by Donald Schön (see section 8.3.3) and the learning model by Dreyfus & Dreyfus (see section 8.3.1). It has been stated that the community the *novice* enters have a responsibility for helping the he or she. Finally people are told that whatever they share or distribute of knowledge, it has to be relevant and they them self have responsibility for ensuring this as well as they on their own initiative should try to *get* relevant knowledge in order to improve their own learning

## 11.6 Summary

In this chapter the process of developing the policy has been described. The process has taken place this spring and into the early summer, several approaches have been used, though the most notable was the conduct of two vision conferences. The first was held with broad participation from the deputies in the divisions and support units in Niro A/S. The second which was held as a continuation of the first one, this time the participants represented more or less all the layers of the employees in Niro A/S, though most came from the Chemical Division. From these held conferences and several interviews and meetings in Niro A/S the focus areas for a knowledge management policy in accordance with the already found principles were found:

- Networks and culture
- Responsibility
- Relevance when sharing and using
- Education & training.

These areas of focus are the key elements in the policy that consequently have been written, as they form the frame for it. The policy has at the present time been discussed in Niro A/S and the comments have been implemented into the policy which will be found in the next chapter.

# Chapter 12

# Knowledge Management Policy - Niro A/S

In this chapter, follows the proposal for a knowledge management policy in Niro A/S. It is a proposal, but is written as if it was the final version. The four focus areas are used as headlines. Besides from the four headlines, the policy includes an aim, definitions of *Policy* and *Niro-Culture* as well as a background.

## 12.1 The Policy

### Aim

This paper will define the Knowledge Management (KM) policy of Niro A/S, internally in the SBU's as well as between the divisions and support units. The policy will outline a framework for the employees in Niro A/S of how to share and utilize knowledge, experiences and thoughts related to the work within the company. Furthermore the policy aims at promoting a proactive approach to knowledge sharing and personal development besides reducing the risks from loss of key knowledge, i.e. by loss of employees.

### Definitions

Policy: In the following "policy" is regarded as the connection between strategic thinking and the operational planning. Thus, the policy outlines the fundamental elements of knowledge management in Niro A/S.

Niro-Culture: The Niro-Culture is the English translation of the Danish word "Niro-Ånd". The concept is based on the personal networks and the tradition of "open doors" resulting in mutual respect between colleagues. Alongside this everybody is expected to take responsibility for their actions.

### Background

The background for the development of this knowledge management policy in Niro A/S is the strategic business plans which has lead to the recognition of knowledge as one of the key assets for Niro A/S. The need for a KM policy is seen as a necessity for a company like Niro A/S that relies heavily on its expertise and knowledge about mastering large scale projects in the industrial drying technology market. The KM policy should be seen as one of the "tools" for maintaining Niro A/S as the dominant supplier of spray drying, fluid bed drying and powder technology products. It has been the intention to base the policy on the needs of the employees, wherefore representatives from all units have been involved. Hereby the policy is reflecting the aspects prioritized by those being impacted by the content.

**Areas of focus**

The focus of the policy is to support the exchange of knowledge between the divisions of Niro A/S and the support units. This support will take place through increased awareness of the nature of relevant knowledge in Niro A/S and by easing the use of different tools involved in the exchange of knowledge. Another focus area is by making knowledge management a natural part of our culture. The existing personal networks within Niro A/S are integral parts of this policy, the same is the existence of the Niro-Culture. Furthermore it will be emphasized that sharing and distributing relevant knowledge is only one part of this policy, using and applying relevant knowledge are equally important parts as well as introducing new employees these habits.

**Networks**

Niro A/S has an undisputed reputation worldwide, because of the high quality of our products. This is mainly due to the core competencies of project engineering, sales engineering and process engineering. The fundamental issue is the collaboration between all units which is based on the Niro-Culture. We rely heavily on collaboration and peoples willingness to pass on the hard won know-how. The networks we build up through our work are important for the company as they provide an informal infrastructure in which communication can thrive. The personal networks give rise to creative dialogues and are easy to use in our daily work. In addition to being easy to use they commit us to help each other in achieving something, and the commitment is inspired by the obligation to our colleagues. The personal network is a social environment having a significant effect on our level of intrinsic motivation as well as it helps integrating new employees into Niro A/S.

**Responsibility**

As employee in Niro A/S, one has a high degree of personal freedom in the daily work. This freedom naturally breeds responsibility for not only ones actions but also for the collective sharing of knowledge. We all gain knowledge and experience through our work and emphasis is put on the responsibility for sharing it with our colleagues. This will result in a synergy effect and give us the opportunity to benefit from the work of our colleagues. Training and personal education relevant to the work in Niro A/S is very important and can never be underestimated. Therefore ones continuous development is of great value for Niro A/S. Everybody is encouraged to become involved in the planning of the personal in-service training, both internally and externally. Likewise we are expected to be acquainted with knowledge and experience about the newest technology, as well as we are expected to use it in our projects.

**Relevance**

It is important that the knowledge being distributed is relevant for the receivers. When we share or distribute knowledge and experiences with our colleagues by mail, email, the intranet or through other channels, it is important to consider it's relevance. There are e few simple yet important guidelines to be followed when sharing and distributing information:

- Do others have interest in the knowledge you possess (old or newly obtained)?
- To whom is it relevant?
- How should it be distributed and/or shared (hard copy, electronic form, verbally)?
- Is it accessible (volume, quantity) or will take a lot of time to process?

As employees in Niro A/S we should always use the above guidelines when sharing and distributing knowledge and they should be used as a measure for the relevance. It is thus entrusted the individual employee to make the necessary judgments according to the above questions. Much of the sharing and distribution is done, and should be done, by email or on the intranet. However the use of personal networks is invaluable and it should be used when needed. This also give our colleagues insight in the experience we have gained through our work.

**Education & Training**

The personal networks play a key role in Niro A/S, and it is important that the employees participate in these networks as well as they introduce new employees to them. The new employees should not only receive training and advise from his or her mentor. The group he or she is part of should also contribute to the integration of the new employee in Niro A/S. We all have responsibility for improving our own knowledge as well as the collective one. Therefore we should prioritize participation in relevant seminars, workshops and other sessions with a training and/or educating perspective. This participation is needed as we are not only responsible for our own improvement, but also for the improvement of our colleagues. This in turn will increase the collective benefit of education and training relevant for Niro A/S. The importance of these benefits may not always be visible, but for a company like Niro A/S they are, crucial for maintaining Niro A/S as the dominant supplier of spray drying, fluid bed drying and powder technology products.

# Chapter 13

# Evaluation & Discussion

In this chapter we will discuss the consequences of the various decision made and results obtained. The presentation of these discussions and decisions will be done in accordance with figure 2.3 though some modifications have been made.

The course of the project can be divided into two parallel processes; the academic part where the project group has studied and evaluated relevant literature, and the practical part focusing on the KM in Niro A/S. This combination has been a success for both parties, since the company has received an external analysis of the current situation and a draft for a knowledge management policy, and simultaneously the project group experienced working with a real-life case combine with an educational study. Meanwhile, it has been a learning process for the people involved, and the ideas about KM that existed in Niro A/S have been discussed, defined, structured and opened for further debate.

The intention for this project was to facilitate Niro A/S in improving its knowledge management. It has greatly influenced the conduct and attitude to the project. The emphasis has been to facilitate Niro A/S and use the relevant literature as needed. By having such an approach, the learning process is motivated and experience in facilitating a private company is gained for the facilitator.
By focusing on facilitating a practical case, in depth analysis of literature is prioritized lower than in a theoretical study. A more thorough study of literature could have proved valuable in validating the analysis and theses conducted at the company. This emphasis on the facilitation process thus naturally have drawbacks but it was chosen to be the focus as the facilitator wanted to combine the more theoretic studies with the facilitation in the field.

The cooperation with Niro A/S has also been successful. From the beginning of the project a set of obligations were acknowledged, and there has not been any disagreement about the effort and resources required during the project. This underscores the importance of the initial meetings where the general project decisions, with great impact on the project, are made based on limited insight. This is a common dilemma in project management, since decisions are made in the early stages without sufficient knowledge, hence experience and intuition become significant. As the project progress, more knowledge is obtained, making more precise decisions possible. To avoid misunderstandings and conflicts the requirements were thoroughly debated, and the project became based on trust, shifting the intervention from research driven to participative. As argued in section 2.2.1 trust is amongst the factors supporting a dynamic process, and in an educational perspective this is of great interest, since future projects can benefit from the experience.

Many project planners would probably have argued, when looking at the initial project plan, that the project had several flaws. The plan did not contain the basic elements except the finish date. The objective and intermediate goals were not specific and therefore impossible to monitor and measure. Planners often postulate that participants will find it difficult to accept the project due to these reasons. Failure would be more realistic.
Nevertheless, many unknown variables are usually the case for the problematic situations described in chapter 2. Projects can be divided into two groups. The quantitative projects, like building a bridge or developing a new mobile phone, and the messes. The two types do, however, have similarities, since the former contain several underlying problematic situations. Messes exist whenever people have to communicate, and when the results are a matter of understanding and perception. People experience the same event in different ways, depending on personality, tolerance for ambiguity and perception of risk.
The project group has experienced a series of the elements of the complex environments that exist in real-life cases. This is probably due to the large number of stake holders involved, and the factors influencing the process. Again, these complication emerge due to interaction between individuals and groups. During the meetings the author has not experienced any major problems or turf battles. This might partly be due to the "Niro-Culture" and the mutual understanding between the employees. Another reason is that the author has been aware of these risks, and the intention of the creative approach was exactly to avoid such problems.

## 13.1 Approach

The approach chosen by the author has been a pragmatic combination of different types of problem solving and intuition. The reason is that no single approach is believed to be able to handle the problematic situation. The mess at Niro A/S was unique, and different aspects from different approaches had to be applied. Intuition has been important, too, making it possible to choose based on experience instead of analysis. Hereby, the extent of the project has been adjusted to the resources available. Thorough analysis might probably have given another result in some situations, but when working with real-life cases, progress is also necessary. As long as the use of intuition and cutting edges is reasoned, it is possible to compare it to the risk for analysing to much, ending up without a useful result. Thus, the actual approach, combining the ideas of several approaches, has not been revolutionary, but nevertheless creative, since it has combined known ideas, to be used in the case of Niro A/S.

The fundamental issue of the value basis has been to be optimistic, considering the opportunities in a given situation instead of focusing on the restrictions. The techniques applied underscore this attitude, focusing on creativity and participation. The participants have been motivated by the freedom necessary for creative processes. The alternative was a cogent application of specific procedures, but this would have excluded the used of suitable aspects from other approaches. The disadvantages might have been that the value basis has been too influential, resulting in the lack of guidance and structure. However, the employees at Niro A/S mainly have technical backgrounds and they are used to structure and define problems. The difficulty has been to loosen up, and encourage the creative process. When the participants have a tendency to jump to conclusions too early in the process, the facilitator must encourage the creative aspect.

## 13.2 Knowledge & Support

The initial studies undertaken in this project included the search for a "working" definition of knowledge, and what knowledge represented for a company like Niro A/S. The early stages of this search was influenced by a few authors, in particularly the work by Wenger [Wenger 1998] and Nonaka & Takeuchi [Nonaka & Takaeuchi 1995]. From them the notion of tacit and explicit knowledge as well as reification and participation was founded. Although the works of many other scholars have been studied too, the principles of these authors to some extend can be found in the view on knowledge and the conversion of it. In particular the stages of socialization and internalization [Nonaka & Takaeuchi 1995] are inherited in the way the focus is laid on the importance of the social and personal networks in Niro A/S, as channels for distributing and sharing knowledge.
The drawbacks form relying on the spiral model are thus inherited. One example of this could be the case with tacit knowledge that is inarticulable, the stage "tacit explicit" simply cannot work. This is a limitation in this presentation, but it has not influenced the facilitation process and development of a policy in particularly.
The concept of duality was much embraced, as it gave a relatively clear view on how to see knowledge in communities and in which forms it could be found. The concept was not abandoned, but in the view of the facilitation process, it was decided that using the simple distinction of tacit and explicit knowledge would be easier to use in Niro A/S. However, the use of duality was incorporated in the form of seeing all sorts of knowledge as a duality, as a coordinate pair consisting of tacit and explicit coordinates - a duality and not a dichotomy. The principles due to Wenger have still influenced the process of developing the policy as his principles for nursing CoPs are embedded in the policy.

Knowledge for Niro A/S, was defined after investigations, which were mainly conducted in the Chemical Division, and from here expanded to cover Niro A/S. The result is thus greatly influenced by the the situation and opinions in the Chemical Division. It is however, believed, that the findings will cover the entire company, as it has been more or less confirmed by the business plans for the other divisions in Niro A/S, the held vision conferences and the series of meetings throughout Niro A/S.

After having defined what knowledge is for Niro A/S, another process initiated, namely the process of getting an holistic view, on where knowledge is embedded and how it interacts in Niro A/S. The knowledge ecology became the metaphor used to describe the situation at Niro A/S. Three models were developed, in particularly the emphasis was laid on describing the connections between the units in Niro, and the importance of Sales Engineering in connection to the surrounding ecosystems.
Other models could have been used to get the same holistic overview, but the KE models were used as they showed the importance of the various social and personal networks in Niro A/S. The use of other models could have been used to pinpoint other issues, but it was decided that it was not necessary to do so.

In connection to the social and personal Networks a special topic was studied, namely communities of practice (CoPs). There was an interesting relation between the CoPs in the Chemical Division and the networks, as they were quite equal to each other. More studies in the other divisions are needed before conclusions can be drawn, but it appears to be the case in many instances, as many employees have worked in Niro A/S for many years and the personal relations are widespread. The investigations conducted in Niro A/S points at the importance of the social and personal networks in peoples daily work. They should be nursed, as Wenger

phrases it, and the initiatives will probably be a combination of ideas. IT supporting systems, like the described competence systems by Stenmark could be helpful, though the principles in nursing, due to Wenger, will need emphasis on supporting the personal relations.
Many IT tools are available and only one has been presented, as it was user friendly and effective in creating interest driven contact and sharing. One of the reasons for only presenting one "solution" is that the networks have not been thoroughly mapped, as well as many of the "IT KM solutions" on the market are driven by the use of the technology and not by the need of the users (the ICT trap). Therefore, though the presentation does not contain many nursing solutions it is a deliberate choice as defining the principles and values for the nursing was seen as being of greater value in particularly when formulating a policy the underlying principles and values have to be defined before initiatives are conducted.
An obvious result of the analysis was the importance of integrating new employees in the networks. The learning model by Dreyfus & Dreyfus in combination with Schön's practice in praticum has the inspiration for studying this aspect in Niro A/S. The work of these scholars was chosen as many of the elements in their theory about learning fits with Niro A/S in terms of learning stages and the need for reflection for a "novice". The reality in the Chemical Division is quite similar to the suggestions by Dreyfus & Dreyfus and Schön, and it could be interesting to test if similarities are present in the other divisions. The training discussion is interesting in terms of reflection as a new employee need to be given the necessary room to reflect on his or hers actions. It is not enough for the new employees to know what to do, since the interesting part is the reason why it is done. Explaining what instead of why will leave the company in the past, whereas the dynamic organization must know why to become better in the future, staying ahead of the competitors. Though interesting it was decided not to pay further attention to this discussion as it appeared that the training conducted in the Chemical Division is working well and in accordance with the Dreyfus & Dreyfus and Schön and further studies were not needed in order to use training as one of the main principles in the KM policy for all of Niro A/S.

## 13.3 Strategy

There are many definitions and views on strategy and how to it should be worked out. Mintzberg points out 10 "strategy schools" while proclaiming that strategic planning is a contradiction, whereas strategic thinking is the key issue. This view is shared by the author, and a KM policy in this context was seen as the link between the strategic thinking and the operational planning. Besides from Mintzberg, the inspiration came from Porter and Harrison, and is was these three scholars that have influenced the view on policy. More views could have been interesting to use, but it was found that it was not an critical issue.
As the strategic work made in Niro is rather traditional in its reliance on various analysis as the building blocks for the strategy. In accepting the analysis a choice was made, and the work building on these analysis thus inherit the possible mistakes made. This decision is vital, though it is difficult to evaluate the consequences as the analysis would have to be made again. From the results in the business plans the KM policy was compared to the "strategic initiatives" and it was seen that three initiatives would be linked by the KM policy to the overall strategy in the business plans. This context of the KM policy is important and it could have been interesting if more work had been laid in actually incorporating the KM policy in these three initiatives, but time has stopped these considerations.

## 13.4 Policy

The development of the policy followed to some extend principles from a framework developed in Australia. Other frameworks could have been used, but it contained some relative simple elements that could be used in Niro A/S in terms of involving the users.
The policy has four main headlines, one for each of the principles: Network, Relevance, Responsibility and Training. The policy has been held in general terms in such a way that it can be used as a policy for all of Niro A/S, and with some adaptations it could probably be easily be used by the P-division in terms of relevance, responsibility and training. Networks are important, but they are in particular important for Niro A/S and it is not necessarily the case in all the parts of the P-division, thus some adaptations should be made. The time for investigating possible adaptations have not been prioritized as the focus was Niro A/S.
The development however differs in the way the users are involved since the draft of the policy was only distributed to a few persons in Niro A/S and no official deadlines for comments were made for all the employees etc. The aspect of user adaptation was involved primarily through the held vision conferences. More user adaptation is probably needed, but the proposal of the KM policy could now be used as a proposal and request for comments would be the next phase before actually implementing it.

## 13.5 Future work

How can the policy be implemented? An intriguing question that requires some considerations. The implementation is not difficult itself, since the remaining part is a period where the employees can comment on the proposal. Thereafter, these comments should be considered and changes must be added to the final version. If the policy should have any effect, it must be distributed to all employees and the management should motivate everyone to follow the guidelines and the supporting initiatives should be prepared.
Quite simple, in theory at least - getting to follow the principles will lay a heavy burden on the management as people will need to know what impact it will have in their daily work!
The policy will need to be interpreted by every unit in Niro A/S. The project engineer must understand that he or she must follow the principles, never distribute information, data etc. to other people in Niro A/S without briefly considering to whom it is relevant, accessible etc. People who are appointed mentors, must engage in a mutual learning process with the new employee and the rest of working group must resume responsability for integrating the novice and give he or she time to reflect.
Another issue is responsibility, as people now are not only encouraged to further educate themselves - they are responsible for doing so! One have to make some considerations of what kind of education could be interesting and relevant for Niro A/S as well as for oneself. It should ultimately be followed up at the yearly employee conversations, in order to ensure continuous education.

All these initiatives will have to be planned and implemented in a top down process, but still, the individual should be given the necessary time and space to adapt to the changes.
The implementation process and the accompanying aspects have not been regarded as a part of this project, due to the extent and ressources available.

### 13.5.1 Following the Policy

A number of initiatives and suggestions for the future work following the KM policy are the next steps of the knowledge management in Niro A/S. Their impact has not fully been studied, but they are indeed visionary and it should be the focus for the further work.

Keeping the employees is vital for Niro A/S, and a number of initiatives or effects of the policy can be extracted that collectively will help keeping the staff:

- Personal networks will motivate people to stay, but also to "spread" the tacit knowledge of experience, minimizing loss of key knowledge.
- Small teams help collectively the new employee or novice into the "Niro-culture". This initiative will help people to be a part of the above network, but it will also let the existing members of the networks reflect on their own work and the collective experience will hopefully increase.
- One official mentor for each new employee, although it must be regarded as group work.
- Training and development of existing staff - employees are encouraged to reflect on their work, training and development, considering the personal direction of the future.
- Emphasis on the social dimension of working in Niro A/S - people will increase their shared experiences and the collective experiences increase.

These initiatives are as such only suggestions for supporting the policy, but nevertheless, they are important. Another supporting initiative is a Personal Backbone Network characterized by:

- Knowledge managers in the sense that they know the people who are working within a specific area, and they can help people, who contact them, finding the right information in this personal network.
- Two or three knowledge managers should work closely together in order to maintain the specific area. Consequently a group of persons, should be responsible for a number of areas.

In the Chemical Division these initiatives are to some extent used in practice. The knowledge managers are the process technologists, though they do not know all areas. It should however be a part of all divisions, as it then can be supported by an Electronic Backbone Network with the following characteristics, inspired by the work of Dick Stenmark in developing competence systems:

- An electronic backbone network of databases is necessary to order and store the explicit information availably in Niro A/S. However, the way to retrieve and select this information could be greatly improved with an intelligent search engine based on the competence and interest driven competence system and it should be possible to integrate it with a competence map. Thus with a personal database for each person with the ability to adjust the content to his or hers needs.

- Competence maps for use by, among others, the network managers. It should be possible for the network manager to adjust some of the content or to notify or assemble for workshops for the people who are subscribing to the specific area or are using reasonably large amounts of information from the area. New people should also be introduced to these areas on the electronic backbone as well as to the personal backbone network.

In this way the personal backbone network can be supported by the technological developments that constantly are becoming more sophisticated. There are indeed some troubles ahead before these networks are operating, but the visions are clear, and the focus should be to fulfill them, not to neglect them.

## 13.6 The Learning Process

The value basis has undoubtfully influenced the conduct of this project and the developed policy. The emphasis, on the more softer aspects by studying the social networks in Niro A/S, was deliberate, though the initial intention was to combine qualitative and quantitative operation research.
As seen, it soon became evident that mathematical modeling probably would not be part of the KM project. The "real life" proved complex with many unknown issues and aspects. This meant that a lot of study of literature had to be conducted. As time was limited the phases of the project, including the study of literature, were characterized by a tradeoff between the in-depth analysis and the achievement of a "broad" perspective.
This tradeoff was harder than expected as the background from the DTU meant that a natural desire for conducting these in depth analysis was present. It was therefore challenging to pace through the different phases, and make compromises as well as using intuition, in order to progress. In making the decisions, rationality was predominant while creativity was used in connection with exploring certain topics. This tradeoff is considered the right way of conducting such a project as it combines many sciences in a real-life environment as well as the focuses on reaching a *result*.

#### General comment

The literature studies have mainly been guided by the need and desire for exploiting relevant fields. As always, more time could have been spent on studying more literature to gain a more complete picture of the work already done, as well as to compare and try to validate the work of the various scholars. It was not the main objective in this project to conduct a literature study, though if more time should be spent, it would have been interesting to make such work and in this way further cement the policy development.

Is this project at all relevant for engineers and can this way of conducting a project be recommended as an educational approach?
The answer is definitely: "Yes!" - Working this way is indeed highly relevant for an engineer, as most real-life cases have to be "solved" in highly complex environments, with many stake holders, aspects etc. Defining a problem from this mess requires skill and expertise, and the process is of extreme importance. Furthermore, time is usually a critical factor that forces the work to be paced through and tradeoffs must take place. Still a lot of analytical work will be required in order to obtain the necessary and valid results, thus the solution finding is critical,

too.
Traditional training in the field of the sciences of engineering focus on the solution finding and in obtaining the necessary results, while the process of defining a problem from a mess is not emphasized. Nevertheless, it is important to be able to combine the processes and that is exactly what an engineer is doing. Therefore this project is indeed highly relevant for engineering student. The project has not "redefined" the work of engineers as it actually just follows the processes many "real" projects will go through. Through this project a great deal of learning has thus been achieved, in being a real life engineer that has to master both the theory and the practical use of it.

# Chapter 14

# Conclusion

The intention of this project was to facilitate Niro A/S in a knowledge management process. A successful combination of academic studies and collaborative work in Niro A/S has been employed. The project has been a success for both parties, since the company has received an external analysis of the current situation and a draft for a knowledge management policy, and simultaneously the facilitator has gained experience in working with a real-life case combined with an educational study.

In connection to the study of KM in Niro A/S, several key factors were identified. Process technologists are vital links in the project handling, due to experience and knowledge about past projects. The risk of losing knowledge, due to loss of employees, is always present, though not an unsolvable problem. The departure of a process technologist have to be scheduled, and keeping an experienced and flexible staff is important, especially maintaining the ability for the division to conduct large scale projects.

Several ways of regarding knowledge has been studied. In the end it was chosen to use a distinction of knowledge as tacit or explicit, though the concept of duality of knowledge is acknowledged.

The knowledge of greatest importance for Niro A/S was found to be the personal and technical experience embedded in the employees in the units attached around project handling. Furthermore it was found that Process engineering, Sales engineering and Project engineering, make up the core of what Niro A/S is known for, namely high quality plants. Maintaining, supporting and keeping this knowledge is absolutely crucial for Niro A/S. It should be emphasized that this expertise, experience or just knowledge is highly tacit.

A number of metaphors describing organizations were studied. Knowledge Ecology, was found useful for getting a holistic overview of an organization. Three KE models for Niro A/S were made. The first showed an overall view of the Niro A/S ecosystem, with the relations between the divisions and supporting units. The second focused on the Chemical Division compared to the rest of Niro A/S and showed that there are not many official relations to the other divisions. Increasing the personal relations between the divisions will undoubtfully be beneficial for Niro A/S. The last ecosystem showed the importance of the sales engineers, since they have great contact to the surrounding ecosystems. Often the sales engineers in the "field" are to decide what knowledge to pass on to many of the departments in Niro A/S.

It was furthermore found that many of the social networks existing were similar to Communities of Practice, due to the many years of employment in the Chemical Division. Networks are, thus a key element of the organization.

The communities and networks in Niro A/S form the backbone of the project handling and nursing them is consequently vital as they embed the knowledge of greatest value for Niro A/S. Five principles for nursing the communities and networks were found:

- Legitimizing participation
- Negotiating their strategic context
- Being attuned to real practices
- Fine-tuning the organization.
- Providing support

Some IT tools were considered and a promising "Competence system" was studied. There were some remarks to the system, among others that it should help the distribution and sharing of relevant knowledge.

The various networks are vital for Niro A/S, and the introduction of new employees is a necessity that simply can not be overestimated. This introduction is seen as a way to nurse communities such as ecosystems. The literature contains many different ideas and principles for designing mentor programs. Some of these have been mentioned, but it should be emphasized that no exact solution exist.

Several approaches and creativity tools have been used, the most notable was the successful conduct of two vision conferences. The first was held with broad participation from the deputies in the divisions and support units in Niro A/S. The second which was held as a continuation of the first one. This time the participants represented more or less all the different groups of the employees in Niro A/S, though most came from the Chemical Division. From these held conferences and several interviews and meetings in Niro A/S the focus areas for a knowledge management policy in accordance with the already found principles were found:

- Networks and culture
- Responsibility
- Relevance when sharing and using
- Education & training.

These areas of focus are the key elements in the policy that consequently has been written, and is the link between the strategic thinking and the operational planning.
A number of initiatives have to take place in order to fully implement the proposal. Furthermore, a personal and electronic backbone network has been suggested for supporting the policy, though not in detail.
Some of the needed initiatives have been outlined, and the key elements are that the policy and its consequences must be communicated throughout Niro A/S. It is vital that this communication process is initiated by the management as soon as the policy is employed.

# Bibliography


[Amabile 1997] Amabile, Teresa M., (1997). "Motivating creativity in organizations: On doing what you love and loving what you do", *University of California, Walter A. Haas School of Business.*

[Barnes 1954] Barnes, J. (1954). Class and committees in a Norwegian island parish. Human Relations, 7, 39-58.

[Baumgartner & Payr 1995] Baumgartner, Peter, Payr, Sabine (1995),"Speaking Minds." Princeton, NJ.: Princeton University Press.

[Bertelsen 1996] Bertelsen, Sven (1996) "Om viden i vidensbaseret virksomhed",Foreningen af Rdgivende Ingeniører F.R.I., Mohns bogtryk.

[Boswell & Endicott 1964] Boswell James, Frank S. Endicott (1964),"Life of Samuel Johnson", McGraw-Hill Humanities/Social Sciences/Languages; Abridged edition (September 1, 1964).

[Brown & Duguid] Brown, Seely, J. Duguid, P. (1998) "Organizing knowledge." California Management Review, 40(3), 90-111.

[Cook & Brown] Cook, S.D.N. Seely Brown, J. (1999). "Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing", Organization Science, 10.( 4), 381-400.

[Campbell & Marsden] Campbell, K. E. & Marsden, P.V. (1984). Measuring tie strength. Social Forces, 6, 482-501.

[Chaffee 1985] Chaffee, E (1985) "Three models of strategy" Academy of Management Review 10(1)89-98.

[Conklin 1996] Conklin, E. J. (1996)."Designing organizational memory: preserving intellectual assets in a knowledge economy. Glebe Creek, MD: CogNexus Institute. Available at: http://cognexus.org/dom.pdf

[de Bono 1995] de Bono, Edward, (1995), "Serious Creativity", The Journal for Quality and Participation.

[Dreyfus & Dreyfus 1986] Dreyfus, Hubert L. og Stuart Dreyfus (1986): Mind Over Machine: The Power of Human Intuition and Expertice in the Era of the Computer. Free Press, New York.

[Eisner 1985] Eisner, E. W. (1985) The Art of Educational Evaluation. A personal view, Barcombe: Falmer. 272 + viii pages.

[Eraut 1994] Eraut, M. (1994) Developing Professional Knowledge and Competence, London: Falmer.

[Freeman 2000] Freeman, L. C. (2000). "Visualising social networks". Journal of Social Structure, 1

[Goguen 1997] Goguen J. A. (1997) "Toward a social, ethical theory of information," in: Social science, technical systems and cooperative work: beyond the great divide," edited by G.C. Bowker, Susan, L. Star, W. Turner and L. Gasser, pp.27-56. Mahwah, NJ: Lawrence Erlbaum Associates

[Hamel 1994] Hamel, G., Prahalad, C. K. (1994). "Competing for the future". Boston: Harvard School Press.

[Harrison 2003] Harrison, Jeffrey S. (2003), "Strategic Management Of Ressources And Relaionships", John Wiley & Sons, Inc., Cornell University.

[Hildreth & Kimble 1999] Hildreth, P., Wright, P. Kimble, C. (1999). "Knowledge management: are we missing something?" in: 4th UKAIS Conference, York, UK pp347-356. London: McGraw Hill.

[Hildreth & Kimble 2002] Hildreth, P., Wright, P. Kimble, C. (2002). "The duality of knowlege" Information Research, Vol. 8 No. 1, October 2002

[Hillier & Lieberman1995] F. S. Hillier & G. J. Lieberman (1995),"Introduction to Operations Research",McGraw-Hill, Inc..

[Huang 1997] Huang, K. (1997). "Capitalizing collective knowledge for winning execution and teamwork." Journal of Knowledge Management, 1(2), 149-156

[Huysman 2002] Marleen Huysman (2002), ,"Knowledge Sharing in Practice", Vrije University Amsterdam

[Jeffrey S. Harrison] Jeffrey S. Harrison (2003), Strategic Management of Ressouces and Relationships", Cornell University, John Wiley & Sons inc

[James Lawley 2001] James Lawley (2001), "METAPHORS OF ORGANISATION", Effective Consulting Vol. 1, No. 4, September 2001

[John Dewey 1933] Dewey, J. (1933), "How We Think", New York: D. C. Heath.

[Kimball & Rheingold 2000] Kimball, L., Rheingold, H. (2000). "How online social networks benefits organizations",rRetrieved March 6, 2003 from www.rheingold.com/Associates/onlinenetworks.html

[von Krogh 1998] von Krogh, G. (1998) "Care in knowledge creation." California Management Review, 40(3), 133-153

[von Krogh 2002] von Krogh, G. (2002) "The communal ressource and information systems." Journal of Strategic Information Systems, 11 (2002) 85-107, 85-107.

[Kogut & Zander 1992] Kogut, B. Zander, V. (1992). "Knowledge of the firm, combinative capabilities and the replication of technology." Organization Science, 3(3), 383-397

[Lave & Wenger 1991] Lave, J. Wenger, E. (1991) "Situated learning. Legitimate peripheral participation." Cambridge: Cambridge University Press

[Leidner & Pan] Leidner, Dorothy E., Pan , Shan L. (2003) "Bridging communities of practice with information technology in pursuit of global knowledge sharing", Journal of Strategic Information Systems, 12 (2003) 71-88.

[Leonard & Sensiper 1998] Leonard, D. Sensiper, S. (1998) "The role of tacit knowledge in group innovation." California Management Review, 40(3), 112-132

[Mintzberg] Mintzberg, H. (1994, January-February). "The fall and rise of strategic planning". Harvard Business Review, 107-114.

[Mintzberg 1998] Mintzberg, H., Ahlstrand, B. and Lampel, J. (1998), "Strategy Safari: A guided tour through the wilds of strategic management", The Free Press.

[Morgan 1986] Morgan, Gareth (1986), "Images of Organisation", Sage, 1986/1997.

[Morgan 1997] Morgan, Gareth (1997), "Imaginization", Sage.

[Nonaka 1991] Nonaka, I. (1991) "The knowledge creating company." Harvard Business Review, 69, (Nov-Dec), 96-104

[Nonaka & Takaeuchi 1995] Nonaka, I., & Takaeuchi, H. (1995). "The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation". New York: Oxford University Press.

[North & Probst 2001] North, K./Romhardt, K./Probst, G. (2001) "Keimzellen lebendigen Wissensmanagements."

`www.cck.uni-kl.de/wmk > papers.`

[Polanyi 1967] Polanyi, M. (1967). "The tacit dimension." London: Routledge and Kegan Paul

[Policy Development Guidelines] Department of Health North South Wales APRIL 1998, "Policy Development Guidelines"

[George Pór 2001] George Pór (2001) "Designing for the Emergence of a Global-scale Collective Intelligence: Invitation to a Research Collaboration", the Global Brain Workshop, Brussels, July 3-5, 2001

[George Pór 1997] George Pór (1997), " Designing Knowledge Ecosystems for Communities of Practice", at the conference on Advancing Organizational Capability Via Knowledge Management Los Angeles, September 29-30, 1997

[Michael E. Porter] Michael E. Porter (1980), "Competitive Strategy: Techniques for Analyzing Industries and Competitor"

[Portes 1995] Portes, A. (1995). "The economic sociology of immigration". In A. Portes (Ed.), "Economic Sociology and the Sociology of Immigration: A conceptual Overview"(pp. 1-41). New York: Russell Sage Foundation

[Portes 1996] Portes, A. (1996). "Global villagers: The rise of transnational communities." The American Prospect(25), 74-77

[QuickMBA.com] http://www.quickmba.com/strategy/matrix/bcg/

[Richardson 1990] Richardson, V. (1990), "The evolution of reflective teaching and teacher education" in R. T. Clift, W. R. Houston and M. C. Pugach (eds.) Encouraging Reflective Practice in Education. An analysis of issues and programs, New York: Teachers College Press.

[Russell & Munby 1991] Russell, T. and Munby, H. (1991) "Reframing. The role of experience in developing teachers professional knowledge" in D. A. Schön (ed.) The Reflective Turn. Case studies in and on educational practice, New York: Teachers Press, Columbia University

[Buckingham Shum 1998] Buckingham Shum, S. (1998). "Negotiating the construction of organisational memories", in: Information technology for knowledge management edited by U.M. Borghoff and R. Pareschi, pp. 55-78 Berlin: Springer. (Reprinted from: Journal of Universal Computer Science, 3 (8), 1997, 899-928 )

[Schein 1994] Schein, Edgar., (1994), "Cultures in Organizations: Three Perspectives" , Administrative Science Quarterly, Ithaca vol. 39, issue 2, ISSN: 00018392.

[Schein 1997] Schein, Edgar., (1997), "The concept of "Client" from a process consultation perspective - A guide for change", Journal of Organizational Change Management, Bradford vol. 10, issue 3, ISSN: 09534814.

[Schön 1983] Schön, D. (1983) "The Reflective Practitioner. How professionals think in action", London: Temple Smith.

[Smith 2002] Mark K. Smith (2002), "www.infed.org/thinkers/et-schon.htm".

[Stenmark 2002] Stenmark, D. (2002). "Designing the new intranet", Doctoral thesis, Gothenburg Studies in Informatics, report 21, March 2002.

[Stevens 1995] Stevens, Tim, (1995), "Creativity killers", Industry Week, Cleveland.

[Teece 1998] Teece, D.J. (1998). "Research directions for knowledge management." California Management Review, 40(3), 89-292

[Ulrich 2003] Ulrich, Werner (2003), "Critical Systems Thinking (CST) for Professionals and Citizens", www.geocities.com/postfach1/cst.html

[Usher et al. 1997] Usher, R. et al (1997) Adult Education and the Postmodern Challenge, London: Routledge.

[Varela 1979] Francisco J. Varela. Principles of Biological Autonomy.North Holland, Amsterdam.

[Vertovec 2001] Vertovec, S. (2001). "Transnational social formations towards conceptual cross fertilization". Paper presented at the Transnational Migration: Comparative Perspectives, Princeton University

[Vicari 1996] Vicari, S., von Krogh, G., Roos, J. Mahnke, V. (1996). "Knowledge creation through cooperative experimentation." In: Managing knowledge. perspectives on cooperation and competition, edited by G. von Krogh and J. Roos, pp. 184-202. Thousand Oaks, CA: Sage.

[Vidal 2003a] R. V. V. Vidal (2003), "Dealing with problematic situations", Informatics Mathematical Modelling, Technical University of Denmark, Lyngby, Denmark.

[Vidal 2003b] Vidal, René Victor Valqui, (2003), "The Vision Conference - Facilitating creative Processes," Informatics Mathematical Modelling, Technical University of Denmark, Lyngby, Denmark

[Vidal 2003c] Vidal, René Victor Valqui, (2003), "2. Creativity and problem solving," Informatics Mathematical Modelling, Technical University of Denmark, Lyngby, Denmark

[Vivian 2003] Nathan Vivian and Fay Sudweeks Murdoch, University, Perth, Australia "Social Networks in Transnational and Virtual Communities", June 2003

[Waloszek 2001] Waloszek, Gerd (2001) "Personal Networks" SAP AG, Product Design Center, www.sapdesignguild.org/editions/edition5/personal$_networks.asp$

[Waloszek 2002] Gerd Waloszek (2002),"Personal Networks" SAP AG, Product Design Center.

[Wellman 1999] Barry Wellman (1999),"Living Networked in a Wired World" Department of Sociology, University of Toronto, Toronto Canada M5S 1A1

[Wenger 1998] Wenger, E. (1998). "Communities of practice. Learning, meaning and identity." Cambridge: Cambridge University Press. exibitions

[Wenger 2000] Wenger, E. (2000). "Communities of practice: The Organizational Frontier" Harvard Business Review Jan-Beb 2000, 139 - 145. exibitions

[Whitehill 1990] Whitehill, A.M. (1990), "Japanese Management: Tradition and Transition,Routledge."

[Winograd & Flores(1986)] Winograd, T. Flores, F. (1986). "Understanding computers and cognition: a new foundation for design." Norwood, NJ: Ablex

**Dictionaries**

[Gyldendals Fremmedordbog] Gyldendals Røde Ordbøger, Fremmedordbog, 9. udgave, 1983.

[Schultz synonymordbog] Schultz, 1984, Dansk Synonym ordbog 6. udgave.

[Gyldendals Engelsk] Gyldendals Røde Ordbøger, Dansk - engelsk, 9. udgave 3. oplag, 1984.

[Gyldendals Dansk] Gyldendals Røde Ordbøger, Engelsk - dansk, 9. udgave, 9. oplag 1987.

[Oxford advanced Learner] Oxford advanced Learner's of current English, Oxford University Press, and 3rd edition 10. Impression 1979.

[Webster] Webster's New world dictionary of the American language, The world publishing company, College edition 1968.

[Roget] Roget's International Thesaurus, Crowell, Harper  Row, 4th edition, 1979.

[Shorter Oxford English dictionary] Shorter Oxford English dictionary vol. II, N-7, Oxford at the Clarendon Press, 3rd Edition 1964

# Appendix A

# Deputy-Meeting Vision Conference

## A.1 Invitation

### Invitation

Dear participant,

During the previous two months we have studied different elements of knowledge in Niro A/S. Based on several interviews and the SBU Business Plans, some fundamental questions have emerged:

- "What is knowledge for Niro A/S?"
- "Which kind of knowledge is adding value to Niro A/S?"
- "How is knowledge being shared and managed in Niro A/S?"

In order to ensure a common understanding of the aspects involved, we would like to include your opinions and input in our future work. Therefore we have organized a vision conference on 8th April following the KOO-meeting. This involves a creative problem solving process aiming at combining the ideas and wishes of all units i Niro A/S. The task of the conference is to discuss the following topics:

- "Is there a need for a Knowledge Management policy in Niro A/S?"
- "How can knowledge be secured in Niro A/S in the future?"

The schedule for the conference:

15.30 Introduction to the Vision Conference.

15.40 Divergent phase with the purpose of producing as many ideas, visions and objectives as possible.

16.10 Convergent phase focusing on the most promising ideas.

16.40 Summary of the results.

Shortly after the conference we will distribute a summary of the outcomes to all participants.

If you have any questions, please do not hesitate to contact us.

Best regards

Jacob Yttesen
e-mail: jy@pf.dtu.dk
TEL: 2896 1790

Stefan Reib
e-mail: sreib@vjk.dk
TEL: 2087 1379

## A.2 Summary

**Opfølgning på Visionskonference d. 8. april 2003**
Deltagere:
Georg Henriksen
Erik Larsen
Jesper Thorlack
Henrik Petersen
Knud Andresen
Jens Brinch-Nielsen
Jørgen Petersen (ankom senere)
Anne Mogensen
Stefan Reib
Jacob Yttesen

**Formål:**
Afholdelsen af visionskonferencen er en del af et projekt om knowledge management i Niro A/S. Formålet var at skabe en fælles forståelse for de tværorganisatoriske aspekter og problemstillinger, der er i denne forbindelse. Samtidig vil resultaterne indgå i planlægningen af det videre forløb. Udgangspunktet var at debattere, hvordan viden skal sikres i Niro A/S i fremtiden.

**Metode:**
Gennemførelsen fulgte de guide lines, der er for en visionskonference.1 Hensigten med at følge disse var at understøtte en kreativ problemløsningsproces for at skabe en samhørighed mellem de involverede parter i Niro A/S, samt at skabe interesse for det videre forløb. I den divergerende fase blev brainstorming anvendt til at få produceret så mange ideer og synspunkter som muligt. Dette blev efterfulgt af en kortere grupperingsfase, hvor disse blev inddelt i emner. Derefter blev det emne, som deltagerne fandt vigtigst, udvalgt til yderligere debat, hvorefter mødet blev afsluttet med en kort opsummering af diskussionen og afrunding.

**Diskuterede emner:**
Mødet indledtes med en kort beskrivelse af begrebet viden, som kan opdeles i to overordnede

grupper: implicit og eksplicit viden. Herefter fulgte en brainstorming, og der fremkom følgende hovedproblemstillinger:
Kultur og holdning.
Strategi.
Seniorpolitik.
IT/Databaser/værktøjer.
Kernekompetencer i Niro A/S.
Procedurer og rutiner.
Uddannelse.

Det blev besluttet, at kulturen og holdningerne til vidensdeling er afgørende for overhovedet at kunne skabe et grundlag for sikring af viden. Efter udvælgelsen fremkom der en del udsagn om, hvad "Kulturen og holdninger" er for Niro i forbindelse med knowledge management: 1.Det skal i endnu højre grad end før være lettere at dele sin viden via fastsatte procedurer, der samtidig skal sikre, at denne viden bliver opdateret i organisationen. 2.Den vidensdeling, der foregår, skal være tovejs, således at ingen føler, at de blot giver relevant viden fra sig, men at de også modtager relevant viden. 3.Der skal skabes en fornuftig balance mellem det personlige netværk2, værktøjer og procedurer.

**Sammenfatning:**
Der er en general erkendelse af, at vidensdeling og vidensledelse er vigtige faktorer i Niro A/S's fortsatte udvikling. Derfor er det også nødvendigt at skabe de rette rammer for vidensdeling, således at nye medarbejdere hurtigere kan inddrage tidligere erfaringer i deres arbejde. Det er desuden vigtigt, at nye medarbejdere bliver en del af Niro A/S's kultur og netværk - men hvad er Niro A/S's kultur så for en størrelse? Emnet blev ikke diskuteret i dybden, men det blev klart, at det forbindes med en stor grad af åbenhed og villighed til at hjælpe hinanden i hverdagen samt en respekt for hverandres arbejde og stolthed for ens eget arbejdsområde. De ovenstående udsagn skal ses i forbindelse med Niro A/S's kultur. De personlige netværk er vigtige og skal nok i højere grad styrkes for at udnytte de i Niro indbyggede styrker. Det skal samtidig understreges, at en styrkelse af de personlige netværk kun er et blandt flere tiltag, og der er brug for en kombination af tiltag for at få den bedste udnyttelse af ressourcerne.

Nedenfor er listet nogle delkonklusioner, som kan drages ud fra folks generelle kommentarer under mødet. Der fokuseres på understøtning af personlige netværk i lyset af den arbejdskultur, der er til stede i Niro A/S.
Det skal være lettere at starte arbejdsnetværk op, hvis folk ønsker hjælp, her tænkes på en vis formel facilitering og eventuel IT hjælpeværktøjer.
Arbejdsnetværk skal være lette at lukke igen, hvis der er tale om formelle enheder, og interessen begynder at svigte. Der skal være formelle procedurer for opstart af netværksgrupper, og opstarten skal have et nærmere defineret formål og ligge i naturlig forbindelse med medarbejdernes daglige arbejde.

For at netværksdannelser skal kunne tilføre noget nyt og ikke blot tære på ressourcerne, er det således vigtigt, at de har et formål, at de i højere grad også inddrager de "unge", og sidst men ikke mindst skal de øge flowet af relevant viden i Niro A/S.

**Videre forløb:**

Det fremtidige arbejde for projektet vil sigte på at udarbejde en knowledge management politik, der vil kunne implementeres i Niro A/S. Politikken skal tage udgangspunkt i de tre ovenstående punkter og således støtte og facilitere netværk, formelle som uformelle. Samtidigt skal politikken danne rammen for vurderinger af de enkelte netværk og deres værdiskabelse. Understøttelse af netværk kræver en kombination af tiltag, herunder procedurer, værktøjer, og ledelsesopbakning. Her tænkes især på en værdisættelse af vidensdeling, således at det i et vist omfang anerkendes på lige fod med eksempelvis projektarbejde. For at det skal være til nytte for Niro A/S at udarbejde en knowledge management politik, er det nødvendigt at skabe en bred accept af politikken, og indholdet skal derfor omhandle de elementer, som brugerne finder nødvendige.

# Appendix B

# 3rd June Vision Conference

## B.1 Invitation

Invitation til seminar om Knowledge Management politik.

I løbet af dette forår er vi to projektstuderende fra DTU, der har undersøgt vidensdelingen i Niro A/S og hvorledes viden er integreret i Niro A/S.

Vi vil derfor gerne invitere dig til et seminar tirsdag d. 3/6 kl. 10, med følgende indhold.

- Niro A/S's principper for KM.
- Medarbejdernes ejerskab og deltagelse i KM
- Implementering af politikken

Da politikken kommer til at påvirke alle i Niro A/S er det vigtigt, at brugerne af den får indflydelse på den indhold. Workshoppen skal derfor ses som den første indledende diskussion, hvor der vil være rig mulighed for at påvirke denne.

Med venlig hilsen:

Jacob Yttesen e-mail: jy@pf.dtu.dk TEL: 2896 1790

Stefan Reib e-mail: sreib@vjk.dk TEL: 2087 1379

## B.2 Summary

**Participants:** Jens Tousig Møller
Jens Binch-Nielsen
Per Pukgaard
Lars Hesselberg
Claus Blak
Jens Cordt
Jens Halskov
John Henriksen
Peder Brander

Niels Jacobsen
Stefan Reib
Jacob Yttesen

**Agenda:**

**10.00** Introduction

**10.15** Divergent phase

**11.00** Convergent phase

**11.40** Summary

**Comments made in advance:**

10.00 Introduction

- Ourselves: Jytte & Stefan, Stud.polyt, KM-project, Feb.-July, Policymaking
  It is your project!
- Programme
  * Intro
  * Vision Conference
  * Summary
- Intro Vision Conference
  * Concept (Why → to acknowledge the different views of KM in Niro)
  * Task: "Knowledge management culture - Policy"
  * Div: Brainstorming, Create ideas, No criticism, No need for related ideas, Hitch-hiking is allowed.
  * Grouping of ideas
  * Conv: Choose theme(s), Focus on most promising ideas, Development of ideas, "Solutions".
  * Results: Større åbenhed, Problemstillinger, Indsatsområder, Fremhævelse af synspunkter, "Prioritering".
- Gennemførelse (fysisk)
  * Halvmåne, Post-it, To runder, Herefter frit.

10.15 Divergent Phase

- Watch out for "Engineeering" solutions!
- No "but/Men" sentences.

11.00 "Convergent" Phase

11.40 Summary

**Task:**

- How is the sharing culture nursed?
- When knowledge is being shared - how do you consider the needs of your colleagues?

## The divergent phase

- What is knowledge for Niro?
  - Technology (process, components)
  - IT-capabilities?
  - Training and education
  - Project Engineering
  - Customer relations
- Which kind of knowledge is adding value to Niro?
  - Definition of customer needs?
  - Global network?
  - Project handling?
  - Experienced and dedicated staff?
  - Internal network?
- How is knowledge being shared and managed in Niro?
  - IT, databases
  - "Open doors"
  - Network within division/project group
  - Social network

## The divergent phase

- How can knowledge be secured?
  - IT - usage, sharing, update
  - IT - restructuring (personal database)
  - Reward system (projects vs. sharing of knowledge)
  - Reward system (money, education, carrier)
  - Mentor
  - CoPs (process technologist meeting is working)
  - Seminars or Workshops
  - Internal education
  - External network (universities, etc.)

## The convergent phase

- How can knowledge be secured?
  - IT - usage, sharing, update
  - IT - restructuring (personal database)
  - Reward system (projects vs. sharing of knowledge)
  - Reward system (money, education, carrier)
  - Mentor
  - CoPs (process technologist meeting is working)
  - Seminars or Workshops
  - Internal education
  - External network (universities, etc.)

## The convergent phase

- How to evaluate the relevance of knowledge?
  - Relevance of distributed knowledge?
  - Accessibility?
  - To whom?
  - Volume?
- It is expected that people share their relevant knowledge?
  - How could this attitude be supported?
  - Awareness?
  - Priority (time)?

**Topics placed on the white board:**

Groups of important topics

- The red book (electronic version), facts.
- Design Memoer.
  - Routines/Procedures.
- IT tools
  - Personal tools → toolbox.
  - Case story database.
- Databases.
  - Should be easy to update / non bureaucratic
  - The different databases should be synchronized.
  - Lack of adequate updating
- Economy
  - Cost benefit (an optimum between added resources and the outcome chould be reached)
  - A budget for KM should be made.
  - New projects should be a priority.
- Organization
  - The right people should be available from the beginning of a project.
  - Sharing of responsability.
- interface between colleagues and departments
- Networks
  - Inter organizational (professional / kompetences)
  - The build up of personal networks could be nursed by sending people into the field.
- Seing the finished plants could be useful.
- The test report, erect reports and test reports XXX
- Culture
- Relevance of gained knowledge
  - The best should be used
  - amount
  - Some gained experience is that vital or is not up to date and loss of that knowledge is not great loss.
- Knowledge
  - The formel knowledge is relativily well kept within Niro
  - The informal (tacit) knowledge is difficult, and efforts should concentrate on the tacit dimension.

  - The level of formel reports about the informal information should be lowered and made more accessible for other people through personal contact.
- Education
- Training
  - Not many successors to some individuals in the company, sharing of their knowledge could be improved.
  - Loss of valuable experience can be expected in the future.
- Mentor training could be useful in terms of:
  - Training
  - On all levels
  - Basic training
  - More people are qualified for the same work, and Niro is less vulnerable to loss of employess.

**Resumé**

**10.05** Introduction

**10.10** Divergent phase

- *Difficult to obtain a usably (academic) level of insight (knowledge) within the limited time available.*
- *The elder employees were more active during the discussions (also influenced by the hierarchy).*

**10.55** Moving from divergent to convergent phase - No sharp cut between the two phases.

**11.00** Convergent phase, Focusing on networks and training.

- Knowledge intensive company.
- Open communication.
- Behjælpelig / Hjælpsomhed
- Communication between projects groups and the support units could be improved.
- *The vision conference concept is not suitable for this groups of engineers within the limited time available - Brainstorming followed by discussions of the topics might be preferred*
- Mapping of specialized areas of excellence - Who has the needed knowledge? - managers for each area might be the solution.
- Learning by doing - education might be waste of money since it is often superficial.
- Instead of organized education on a yearly basis, it is better for new employees to be involved in the discussion when the themes are hot.
- Responsibility is usually taken automatically by all employees → Niro-ånd - there might be a need for official responsibility within certain areas.
- The "optimal" solution is a combination of informal networks, procedures and formal tools.
- Managers for specific knowledge areas.

**Conclusions:**
As most of Niro A/S's informal knowledge exchange and a lot of the explicit is carried out through peoples personal networks, it is imperative that these networks are kept as the backbone of the knowledge management policy. It is crucial that new employees are introduces to these networks meaning the relevant people in order to speed up the learning process (Learning curve) on could say the first period is a sort of practice in practicum (D. Schön) where the new employee is introduced while given tasks of limited difficulty by a mentor.

The specialized kompetence areas could be managed or supervised by a "manager", preferable more than one person (vulnerability), who responsible for the area. This means he knows the people throughout the division who have knowledge about the area. The purpose (Kulturansvarlig) of such a person is to faciliate people who (i.e. new people) wants to aquire knowledge from the network (personal) but is not aware of its extend... Further more the "manager" is also the person who should recognize the needs of added training or education within his area, who it would relevant to give this training. It could also be that person people would contact in order to suggest new training.

The existing network of databases should be transformed from mainly being used as a storage bank for explicit knowledge and toward faciliating the individual user as well as storing the explicit information. It should be possible for the individual user to adjust the information he or she can retrieve from the system and the system should ease the personal contact between the users meaning that it should suggest relevant contact persons given at specific need of knowledge or experience. In general the databases should as interface to the user be a personal database.
Personal networks is an integral part of Niro A/S and the databases should consequently support the networks. However, the system should at the same time support the knowledge competence areas and their managers.

**Suggestions for future workshops:**
The vision conference went OK, and the expected results more or less came true. However, there are some remarks about hte conduct of the conference. The meeting room was perfect for the conference, and the decission made to place all the participants around one table instead of a open semicircle proved to be a succesfull decission. Most people participated in the discusssions though some did not, a reason for this could be the informal hierarchy among the participants. People were as such not afraid of criticize each other.
Placing people around one table was a good decission, but people still hesitated a little bit in the beginning of the conference, and they mixed the two phases (convergent and divergent). If a little extra time had been available, the conference could have started with a discussion of what is tacit and explicit knowledge in terms of Niro A/S.

An alternative given the limited time would be to conduct a meeting conference which is initiated with a brainstorm over the same topics as with the vision conference. The brain storm could the be followed by a traditional meeting with discussions about the most promissing ideas.

# Appendix C

# Preliminary Paper on Knowledge in Niro A/S

**Viden for Niro**
Hvad er viden for Niro? Dette spørgsmål prøves besvaret i denne artikel , der bygger på i de sidste par ugers litteraturstudium og ikke mindst ved gentagne ekskursioner til Niro A/S, især kemidivisionen,
CH-Niro. Strategiplanen for CH-Niro har også været en vigtig informationskilde, men det skal dog understreges, at der kun er set på CH-Niro, hvorfor der stadig mangler noget arbejde med at se på om de samme spørgsmål og konklusioner er valide at opstille og besvare for resten af divisionerne i Niro A/S.
Kemidivisionen har en lang tradition for at fremstille, sælge, udvikle, levere eller servicere procesanlæg til partikel spraytørring i kemiske industrier i hele verden. Dette har gjort, at CH-Niro har en enorm ekspertise og erfaring inden for de førnævnte områder. Kernekompetencerne for CH-Niro er: proces- og projekthåndtering samt technical sales [Business Plan, CH-Niro, Nov. 2002], der igen primært bygger på en dedikeret medarbejderstab, men også en række dokumenterede rutiner, som er blevet udarbejdet gennem tiden.
Medarbejderstaben er kendetegnet ved at have en enorm erfaring, hvilket primært skyldes en høj anciennitet i blandt medarbejderstaben, idet 2/3 af denne har arbejdet i CH-Niro i mere end 10 år. Medarbejderstaben er del af et globalt netværk, med mange kontakter til datterselskaber og salgskontorer, hvilket har tilvejebragt et stort markedskendskab og en stor kontakt til nuværende, tidligere og potentielle kunder. Endvidere er der opbygget iblandt medarbejderne en stor fortrolighed og kendskab til de teknologier, der er involveret i proces- og projekthåndtering. Her tænkes ikke kun i forbindelse med afviklingen af ordrer, men også i forbindelse med opfølgning af disse.
Der er som sagt før udviklet en række rutiner og procedurer til proces- og projekthåndtering samt technical sales, som er tilgængelig elektronisk. De er et udtryk for den store erfaring, som CH-Niro har opnået indenfor fremstilling, salg, udvikling og servicering af procesanlæg til partikel spraytørring i kemiske industrier. Rutinerne og procedurerne er vigtige værktøjer, som former, definerer og kvalitetssikrer arbejdsgangen i CH-Niro, men de er dog "kun" værktøjer og er afhængige af de medarbejdere, som anvender dem. Erfaringen i blandt medarbejderne i CH-Niro gør, at divisionen relativt let kan anvende nye teknologier inden for deres kernekompetenceområder. Nye spraytørringskomponenter og lignende kan relativt let implementeres i nye projekter, hvilket dog kræver en god kommunikation mellem divisionen, R&D, indkøb og relevante forskningsmiljøer. Sidstnævnte forbindelser vil i fremtiden være vigtige og kan blive

lige så vigtige som medarbejdernes erfaring. Dette begrundes i, at alle sammenligninger med andre teknologitunge brancher peger på nødvendigheden af disse forbindelser.

Det intranet, der er opbygget i CH-Niro fungerer udmærket, der er en række databaser, hvoraf især tre er meget anvendte af medarbejderne, og som beskriver procedurer og forretningsgange for proces- og projekthåndtering samt technical sales. Derudover findes der et "hav" af andre databaser og biblioteker, som den enkelte medarbejder kan "tilmelde" sig. Anvendeligheden af disse er ikke afdækket pt., men det er dog sikkert, at de mange valgmuligheder har bidraget til det, der refereres til som "mailstormen". Denne opfattelse skal dog ses i sammenhæng med medarbejders alder.
Medarbejdernes erfaring og høje anciennitet er kun et problem for så vidt, at en medarbejder forlader virksomheden inden, at han eller hendes viden og erfaring, er blevet videregivet, eller nedarvet til resten af CH-Niro.

**Viden - erfaring**

Samlet må det understreges, at CH-Niro's erfarne medarbejderstab udgør den vigtigste videns ressource for divisionen. I den er der ophobet ekspertise og erfaring i at afvikle CH-Niros ordrer. Viden for CH-Niro er derfor, hvordan man sikrer, at medarbejderstaben fortsætter med at have denne ekspertise og erfaring, og hvordan den videregives til nye medarbejdere i CH-Niro såvel som til resten af Niro. Denne viden forudsætter en samtidig udvikling og prioritering af, hvordan erfaring suppleres af relevante procedurer, elektroniske opsamling og ikke mindst, hvordan ny teknologi inden for procesanlæg til partikel spraytørring sikres. CH-Niros styrke er samtidig også dens akilleshæl, idet denne erfaring, der ligger i medarbejderstaben, relativt let kan mistes ved "pludselig" afgang. Det er en problematik, der altid har eksisteret og er ikke begrænset til kun CH-Niro eller for den sags skylds Niro A/S.

**Mulige indgangsvinkler til løsning af problemstillingerne**

Der er to fundamentale indgangsvinkler til at "løse" eller afhjælpe tabet af erfaring. Den ene lægger vægt at skabe tværorganisatoriske fora, hvor erfarne og mindre erfarne medarbejdere mødes og fremlægger deres resultater eller erfaring inden for bestemte områder. Det kunne være inden for projektering, salg, eller opsamling af gode ideer i forbindelse med førnævnte. Foraene skulle dels fungere som sociale samlingssteder, men i ligeså høj grad tillægges konkrete opgaver. Et eksempel kunne være at forumet skulle udarbejde nye retningslinier for tværdivisionel rapportering af salgsmuligheder på forskellige markeder.
En anden indgangsvinkel er at forsøge at dokumentere flere erfaringer, dvs. en medarbejder skal eksempelvis som en naturlig del af projektafrunding skrive et papir om de erfaringer vedkommende har gjort sig på området og opsummere disse i nogle konkrete emner, der gør det let for en elektronisk "agent" at kategorisere og videregive den relevante dokumentation til folk, der er i gang med relevante projekter.
Vi har pt. ikke undersøgt hvilken indgangsvinkel, der bør have størst vægt, om end noget tyder på, at der er størst gevinst ved den første?

# Appendix D

# Prelimelary Project Description

**Baggrund**
Denne projektbeskrivelse er udarbejdet på baggrund af møder med Niro A/S og projektets vejleder. Ved møderne med Niro har Jens Brinch-Nielsen, Steen Larsen og Claus Blak været involveret, mens vejlederen på DTU er Victor Vidal.
Grundlaget for projektet er et ønske om at gennemføre et samarbejde med en virksomhed om knowledge management. Det valgte fagområde er fremkommet ved drøftelse med virksomheden, og der har været en gensidig interesse for at undersøge emnet, således at der en faglig gevinst samtidig med, at virksomheden får et brugbart resultat. Knowledge management er ledelsen af den viden, der er grundstenen i en virksomhed som Niro A/S. Derfor betragtes viden også som en ressource på lige fod med fysiske produkter.

**Behovsafklaring**
Projektet gennemføres for at opfylde en række kriterier. Dels har der været et ønske om et praktisk projekt i samarbejde med en virksomhed, og dels et ønske om at arbejde med både kvantitativ og kvalitativ operationsanalyse, kreativitet og projektledelse. Et praktisk projekt giver samtidig mulighed for at anvende en bred vifte af kompetencer, fordi det oftest ikke er muligt at kvantificere virkeligheden. Niro A/S har gennemført et strategiprojekt, der har frembragt nogle problemstillinger i virksomheden, som det ønskes at få belyst. Samarbejdet giver mulighed for at få et eksternt syn på udvalgte problemstillinger, samtidigt med at ressourcerne ikke skal findes internt i organisationen.

**Målbeskrivelse**
**Formål**
Projektet gennemføres for at undersøge den nuværende vidensdeling i Niro A/S, og dermed danne grundlag for processer, der kan forbedre udnyttelsen af ressourcerne. Samtidig skal deltagerne opnå både teoretiske og praktiske kompetencer indenfor knowledge management.

**Mål**
Der skal udarbejdes en analyse af den nuværende vidensdeling i virksomheden. Der skal udarbejdes en anbefalet handlingsplan for den fremtidige knowledge management. Handlingsplanen skal desuden fungere som kick start til den fremtidige struktur. Succeskriterier Ved projektets afslutning skal der være nedsat mindst en permanent arbejdsgruppe, der behandler handlingsplanen.

**Idegrundlag**
Det er hensigten at indlede projektet med at danne et overblik over den nuværende situation, sideløbende med at deltagerne tilegner sig teoretisk viden indenfor knowledge management.

På baggrund af viden om den nuværende organisation og andre eksempler på knowledge management udarbejdes der en handlingsplan, der vil være tilpasset forholdene hos Niro A/S. Der vil blive fokuseret på, at handlingsplanen er et resultat af de enkelte brugeres behov, således at det er medarbejdes engagement, der er i højsædet. Dette er afgørende for, at vidensdeling bliver en integreret del af virksomhedskulturen, og i forbindelse hermed ligger en vurdering af de nødvendige støtteværktøjer. Afhængig af tid og ressourcer vil projektet række videre og danne grundlag for en arbejdsgruppe, der skal lede det faktiske implementeringsprojekt. Da projektet samtidig har et uddannelsesmæssigt perspektiv, vil der også blive lagt vægt på denne del.

**Forløb**

Projektets varighed er fra 3. februar 2003 til 7. juli 2003, med fremlæggelse i august.

**Organisation**

- Deltagere:
  - Jacob Yttesen, eksamensprojekt (30 ECTS point) svarende til fem måneder på fuld tid.
  - Stefan Reib, specialkursus (20 ETCS point)
- Foreløbig kontaktperson hos Niro:
  - Jens Brinch-Nielsen Gladsaxevej 305 2860 Søborg
- Vejleder:
  - René Victor Valquí Vidal, www.imm.dtu.dk/ vvv, vvv@imm.dtu.dk, Informatik og Matematisk Modellering, DTU, Lyngby.

**Krav**

- Fysiske rammer
  - DTU: Gængse faciliteter for eksamensprojektstuderende
  - Virksomheden: Afhængig af projektet fastsættes rammerne i samarbejde med Niro A/S.
- Fast kontaktperson hos Niro A/S
- Såfremt Niro A/S ønsker projektet skrevet på engelsk, er dette også muligt.
- Der skal udarbejdes en skriftlig aftale mellem Niro A/S og DTU.

**Fortrolighed**

- Al information i forbindelse med projektet vil have den fortrolighed, som Niro A/S kræver. Dog skal vejleder og censor per definition være clearet.
- Da DTU er en uddannelsesinstitution ønskes flest mulige projekter publiceret men fortrolighed er muligt. Evt. kan navne etc. fjernes.

# Appendix E

# The DTU Strategy

| Strategy | | Operations | |
|---|---|---|---|
| **Aims** | **Ressources** | **Structure** | **Implementations** |
| Mission | Values | Policies | Procedures |
| Vision | Organization | Delegations | Projects |
| Strategic goals | Strategy plan | Milestones | Budgets and action plans |

Table E.1: The DTU strategy scheme - connection between Strategy and Operations

# Appendix F

# Discussion Paper - Knowledge Management Policy