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# Enabling Smart Research and Development through Knowledge Conversation

FEK591-Master Thesis in Strategic Management

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## Abstract

<b>Title:</b>	Enabling Smart Research and Development through Knowledge Conversation
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<b>Key words:</b>	Knowledge management, Knowledge conversation, Research and development, Ba, Trelleborg
<b>Purpose:</b>	The purpose of the thesis is to create a model that shows how knowledge management aimed at research and development processes can be used and how the theoretical fields can be connected.
<b>Methodology:</b>	The thesis is based on abductive perspective where empirical and theoretical material has been mixed to create a foundation for the analysis.
<b>Theoretical perspectives:</b>	Theories concerning knowledge management and research and development have primarily been used. These have been complemented with material about team structures and incentive systems.
<b>Empirical foundation:</b>	The empirical material is based on semi structured, mostly qualitative interviews and strictly quantitative inquiries performed at Industrial Hose within the Trelleborg group.
<b>Conclusions:</b>	We conclude that knowledge management supports research and development activities. A model which shows how the different theoretical fields can be connected is constructed. The model can be used either as a theoretical explanatory model or as a helping illustration in the practical knowledge management aimed at research and development. The thesis also includes practical advice to Industrial Hose.

## Sammanfattning

<b>Uppsatsens titel:</b>	Enabling Smart Research and Development through Knowledge Conversation
<b>Seminariedatum:</b>	2005-06-08
<b>Ämne/kurs:</b>	FEK 591 Magisteruppsats, Strategic Management, 10 poäng
<b>Författare:</b>	Andreas Johnsson, Johan Rosendahl
<b>Handledare:</b>	Lars Bengtsson
<b>Fem nyckelord:</b>	Knowledge management, knowledge conversation, forskning och utveckling, Ba, Trelleborg AB
<b>Syfte:</b>	Uppsatsens syfte är att skapa en modell som visar hur knowledge management inriktat mot forskning och utveckling kan användas och hur de teoretiska områdena kan sammankopplas.
<b>Metod:</b>	Uppsatsen är baserad på ett abduktivt perspektiv där empiri och teori blandas för att skapa en analytisk grund.
<b>Teoretiska perspektiv:</b>	Teorier som behandlar knowledge management och forskning och utveckling har primärt använts. Dessa har kompletterats med material kring teamstrukturer och belöningsystem.
<b>Empiri:</b>	Det empiriska materialet baseras på semistrukturerade, mestadels kvalitativa intervjuer och strikt kvantitativa enkäter som utförts på Industrial Hose inom Trelleborgkoncernen.
<b>Slutsatser:</b>	Vi drar slutsatsen att knowledge management stödjer forsknings- och utvecklingsaktiviteter. En modell som visar hur stödet byggs upp har konstruerats. Modellen kan användas antingen som en teoretisk förklarande illustration över sambandet mellan forskningsområdena eller som en hjälpande illustration vid knowledge management inriktat på forskning och utveckling. Uppsatsen inkluderar också praktiska råd till Industrial Hose.

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# 1 Introduction

*The chapter introduces the thesis by giving a short background about organic growth. In the problem discussion we present what former theses in the joint research program, in which this thesis is a part, of Lund University and Trelleborg AB, engaged in the subject of organic growth, have shown. The need for the thesis is discussed and the purpose of the thesis is made clear. In the end of the chapter the delimitations of the purpose and the disposition of the thesis is presented.*

## 1.1 Background

Growths in enterprises have taken different form over different periods of time. The industrialisation in the nineteenth century made growth possible due to better communications and efficiencies when production became mechanized.<sup>1</sup> In the beginning of the twentieth century the functional structure of many companies was replaced, for instance in General Motors, by divisions.<sup>2</sup> This organisational change opened for a more efficient use of the resources in the companies, due to better possibilities for communication and overview within the smaller unit. In the seventies and eighties many business groups acquired companies in different sectors and thereby lowered their financial risk.<sup>3</sup> In this process many business groups were developed to virtual business conglomerates, producing anything from ketchup to heavy lorries, Volvo being a good example. Economic research showed that there really was no reason for this action, in the investor's point of view, since they could diversify their stock portfolios, lowering risk, themselves.<sup>4</sup> Companies often found that diversifying acquisitions led to lower operational gains and market value of the firm compared to acquisitions targeted on the core competence of the firm.<sup>5</sup> In recent years many firms have been focusing their organisations towards a decided core competence through sell outs and acquisitions. On mature markets, for example the automotive industry, a number of mega mergers have taken place, and the process of outsourcing none-core competence actions has been very intense for a couple of years in the business world according to Kakabadse & Kakabadse.<sup>6</sup> When a company has focused on the core competence and made the major acquisitions which create synergies as well as the right strategic market position it needs to grow from within to increase its value. It needs to grow organically.

*Growth: "The process to increase in size through natural internal animality."<sup>7</sup>*

Ansoff divides organic growth into four categories. *Market penetration* means that there is an increase of sales of existing products on existing markets. *Market development*

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<sup>1</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

<sup>2</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

<sup>3</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

<sup>4</sup> Brealey, Richard; Myers, Stewart: *Principles of Corporate Finance*, 2005

<sup>5</sup> Doukas, John A.; Holmen, Martin; Travlos, Nickolaos G.: *Diversification, Ownership and Control of Swedish Corporations*, 2002

<sup>6</sup> Kakabadse, Andrew; Kakabadse, Nada: *Outsourcing: Current and Future Trends*, 2005

<sup>7</sup> www.ne.se 19-04-2005

means that the company finds new markets for their existing products/services and *product development* means, according to him that, new products/services are created replacing the old ones. The last category, *diversification* is the development of new products/services for new markets, also called innovation or more specifically intrapreneurship.<sup>8</sup>

The concept of strategies for organic growth has been studied in a number of theses within a joint research project between Lund University and Trelleborg AB commencing in spring of 2004. Each semester two to three master theses are conducted in cooperation with Trelleborg AB. This thesis is one of them. The concept of organic growth is used at the moment in many annual reports as one of the prime focuses for the companies. One of the companies that use this buzz-word in its external and internal communication is Trelleborg AB. The CEO Fredrik Arp states that the effort to generate organic growth continues to be prioritised within the group.<sup>9</sup>

## **1.2 Problem discussion and problem formulation**

One of the studies that was carried out within the project, described above, considered the managerial/strategic level and which tools that can be used at that level to support organic growth. Fridh and Reuter found ten general tools for top management that with good fit among them would support organic growth. In addition to tools directly controllable, in a detailed way, by the corporate management like *the Control System, Communication, Strategic Themes* and *Direct Suggestions of ways* the authors also identified *Resource Allocation, Decentralised Organisational Structure* and *Strategic Trust* that really hands down the locus of control and responsibility to the operative lower level management. What should be done with the allocated resources and strategic trust in the operative parts of the decentralised organisation to support organic growth was not a subject of the theses.<sup>10</sup>

In the theses *Barriers for Organic Growth* the focus is set on a lower organisational level. In a quantitative survey the middle management in the Business Unit Industrial Hose participated to identify barriers that hinder organic growth. In the process Månsson et al found that the middle management believes that organic growth can be achieved through innovation and entrepreneurial activities within the company. Completely new solutions are also needed to grow, according to the survey, not only more sales of old products and small improvements of old solutions. Among a couple of other things the distribution of information and knowledge as well as the structure, culture and incentive system was found to be a critical success factors in innovation and the creation of new business.<sup>11</sup> These terms are all part of the theories of knowledge management.<sup>12</sup> Månsson et al

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<sup>8</sup> Ansoff, Igor H.: *Praktisk företagsstrategi*, 1971

<sup>9</sup> Annual report, Trelleborg AB, 2004

<sup>10</sup> Fridh, Jeanette; Reuter, Helene: *Verktyg för organisk tillväxt i koncerner*, 2004

<sup>11</sup> Månsson, Hans; Mårtensson, Emma; Sjölander, Christina: *Barriärer för organisk tillväxt*, 2004

<sup>12</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001



suggest, among other things, further, qualitative studies in Industrial Hose in how the factors can be used to create entrepreneurial activities.<sup>13</sup>

A third theses in the project named Customer Oriented Product Development in the Industrial Activity, states that the existence of good explicit cross functional knowledge distribution channels and a formal knowledge system is essential for the development of products to existing costumers.<sup>14</sup>

Within the knowledge management field there are currently a number of frameworks being used. The main difference between them is the level of theoretical height. There are frameworks with roots in practical management literature and other theories with a more scientific point of view.<sup>15</sup> In this field, as many others, there are not always any clear links between models of different academic research areas. There are theories supporting the idea that knowledge management is important to the innovating processes. Innovation and product development is often derived from implicit or tacit knowledge that through interaction between people becomes ideas and solutions to problems.<sup>16</sup> However, in the knowledge management theories knowledge distribution is often treated as a goal itself that will lead to better performance in general. The link to other specific areas of theory, like research and development (R&D), is not made clear as often.

Identifying knowledge management as an essential tool leads to a set of questions. For instance, how are the tools of Knowledge Management used in an industrial company to support research and development today? How could the theories of Knowledge Management add value to the used practises and to the theories of R&D? Are the different models congruent with each other? Can a model be created that links the theoretical areas?

### **1.3 Purpose**

The purpose of the thesis is to create a model that shows how knowledge management aimed at research and development processes can be used and how the theoretical fields can be connected.

### **1.4 Delimitation**

The purpose can be interpreted either as a purely theoretical one or as partly a consulting purpose. We try to explore both aspects considering our major stakeholders; the academic world and the business unit of Industrial Hose and management of Trelleborg Group. We intend to present the result in two parts emphasising the facets.

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<sup>13</sup> Månsson, Hans; Mårtensson, Emma; Sjölander, Christina: *Barriärer för organisk tillväxt*, 2004

<sup>14</sup> Borgström, Martin; Hallerby, Henrik; Winnert, Niklas: *Kundorienterad produktutveckling i industriell verksamhet*, 2004

<sup>15</sup> Armbrrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>16</sup> Afuah, Allan: *Innovation Management*, 2003

## **1.5 Disposition**

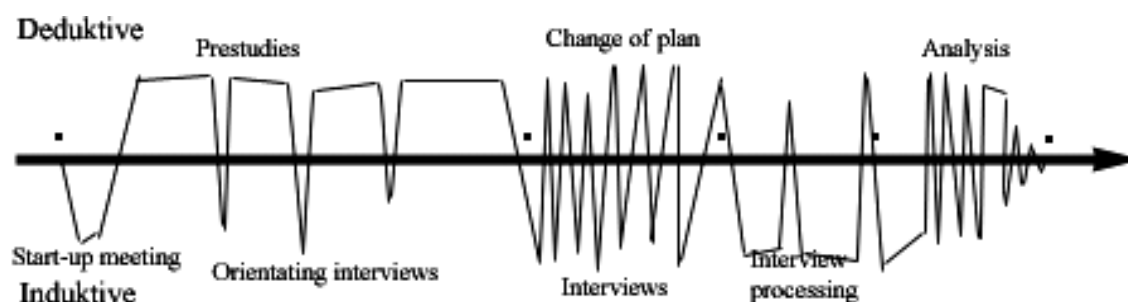
The thesis is divided into six chapters and appendices. The first chapter is the introduction and contains the background and problem formulation in the thesis. It also includes the purpose of the thesis and its delimitations. The second chapter discusses the methods that have been used in the research process and to what extent they are valid. The choices and work processes are also presented and discussed. In the third chapter we present the theoretical framework and the specific models used in the thesis. The empirical material is presented in chapter four and analysed, with the help of the theory, in chapter five. In chapter six the results from the analysis are presented and conclusions are drawn concerning the generalisation of the results. Four appendixes are placed last in the thesis. Three of them have been used to collect our empirical data and are included for referential purposes. The last one is a summary over the development process used by Industrial Hose.

## 2 Method

*In this chapter we present the methods used in the thesis. We start with how we chose the theoretical framework in the thesis and how we have treated different kind of written sources. Then we discuss our own studies and how our interviews, inquiries and document studies complete each other. Last in the chapter we discuss the validity and reliability of our investigations.*

### 2.1 Choice of theories

When our theoretical models have been chosen we have studied their ability to explain the path from knowledge management and knowledge distribution to their part in successful organic growth. We have therefore started with theories concerning research and development and market development since they have an established effect on organic growth.<sup>17</sup> These led us to theories which support development activities both within products and markets. From them we chose those which had relevance to our empirical studies. This was done according to the abductive view described above.



*Figure 2.1 The inductive and deductive contributions during the work process*

In parallel with the abductive way of work we have studied the aspects which are found both in theories concerning knowledge management and R&D. We then chose those which were found important in the interviews and which had linkages to both knowledge management and R&D. The theories that were chosen deal with team structure and incentive systems since those fulfilled both of these criteria. The different contributions to our conclusion from the empiric and theoretical material came in different periods of the work. As can be seen in figure 2.1 the dominant contributor has changed many times during the workflow, which makes the conclusion deductive.

In the process of creating a model we have focused on finding the key elements of the subject of knowledge management connected to research and development both in the theories as well as in the empirical material. Since a model is a fairly downsized and simplified illustration of reality we have tried to explore the most important connections

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<sup>17</sup> Ansoff, Igor H.: *Praktisk företagsstrategi*, 1971

and causality of the key elements. We have been well aware of that it is important to see to that the variables are controllable by management.<sup>18</sup>

## **2.2 Literature**

When discussed here we divide the literature into books and articles. The distinction is made to express that the articles come from different kind of journals and have a research focus. The books on the other hand are mostly literature used in teaching and the authors normally refer to research instead of conducting it.

To obtain a higher level of understanding for the theoretical models taken from the literature we have included a part where we criticise them. The criticism is placed in direct connection to the model in the theory chapter and includes criticism both from ourselves and from other authors. Included is also a part where we explain why the model has been chosen and which other models we could have used instead.

### **2.2.1 Books**

The literature used in the thesis was chosen through searches in the databases of the Lund University Library on topics like organic growth, product innovation, R&D and knowledge management. We have also looked for older thesis touching the same subject in the database of the Economic Library affiliated to Lund University Library and studied their references for suitable literature. Certain books have also been suggested by our advisor.

We have not taken any special actions to control the relevant origin in books that have been used in university level courses. For other books we have made a search on some random references to make sure that the origin of the book is serious.<sup>19</sup> We have not taken the age of the books into consideration as long as the used theories have had relevance to our purpose. This is because many of the books have been used only for referential purposes.

### **2.2.2 Articles**

As with the books some of the search has been conducted through the databases of the university library and through older theses. The search topics have been words like team, R&D, innovation and knowledge management. We have also used material from courses related to the subject and references from material from courses. Our advisor has also suggested authors of articles that have been searched for in the database and downloaded.

The serious origin of the articles has been controlled by using only journals which are supplied by the university libraries. As with the books we have also controlled a random

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<sup>18</sup> Andersen, Ib: *Den uppenbara verkligheten*, 1998

<sup>19</sup> Holme, Idar Magne; Solvang, Krohn Solvang, Bernt: *Forskningsmetodik*, 1997

number of references if we felt unsure about the material.<sup>20</sup> In the searches we have prioritised newer articles and material. This has been done to reassure that our own study rests on the most recent findings. It is also connected to the study's theoretical contribution which we think should be as modern as possible.

## **2.3 Data collection**

Overall we have chosen to work in rather close cooperation with Industrial Hose. This is because of the relatively complex purpose of the thesis which affects many parts of the company. It would be very difficult to study many aspects of the organisation without getting close to, and speak with people within it. An observation study is therefore out of the question. We are however aware of the dangers of working too close to an organisation in a research project. Actions have therefore been taken to minimise these dangers. These actions are presented in the subchapters which correspond to the different data collection methods below. The data collection part is divided according to the methods used for collecting the material.

### **2.3.1 Interviews**

In our study we have conducted nine interviews with people in the studied organisation. Eight of these were semi structured interviews and one was unstructured. Seven of the respondents are members of senior management in the business unit Industrial Hose and have all been recommended by the head of the business unit after the first interview with him. The remaining interview was held with a member of the strategic development team at the Trelleborg group. This was also the unstructured interview. The first two interviews had a main purpose to investigate a reasonable problem formulation for the thesis and to gather empirical data concerning the overall functions in Industrial Hose. The unstructured interview was conducted as the first of these. The later seven interviews were more targeted at specific information regarding the organisation. These interviews were taped so no information should get lost in the work process. All the interview plans for the semi structured interviews can be found in appendix 1.

Most of the respondents were located in France. The interviews were therefore conducted over the phone. To hold the interviews over the phone limits the feedback from the respondent by not allowing us to see how the respondents react to our questions. Body language and facial expressions which can be of help to us are therefore lost.<sup>21</sup> Because of this we have limited our questions to subjects which we deemed not to be too emotional for the respondent since these questions create the most of these reactions. We also took extra care in listening to the voice and attitude towards the questions with the respondents to be able to detect sensitive subjects and support the respondent, assuring we could omit that detail in the thesis if he or she wanted. In one occasion a respondent judge a question as sensitive. We have also emphasised the questions in the beginning of

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<sup>20</sup> Holme, Idar Magne; Solvang, Krohn Solvang, Bernt: *Forskningsmetodik*, 1997

<sup>21</sup> Andersen, Ib: *Den uppenbara verkligheten*, 1998

the interview on things that are held valuable by the organisation. This is done to legitimate our study to the respondent.<sup>22</sup>

The questions in the last seven interviews have, in general, focused on how R&D processes and day to day business are being run from a knowledge management perspective. Practically the questions have investigated how the research and development process in Industrial Hose is conducted and what knowledge management tools that is being used. Questions which relate to different theoretical material within the field have been asked as well. The respondents have also had opportunities to speak about their own ideas and views on knowledge management and research and development.

The questions themselves have been held in a rather open manner, which corresponds to the concept of semi structured interviews.<sup>23</sup> This is to avoid influencing the interviewee as much as possible. We have nevertheless tried to control the interview if the respondents' answers have eluded the intended question too much or if the answers were becoming too broad or getting lost to the subject.

We have tried to gather as much information as possible about the organisation from the interviews and at the same time tried to find theories which can be combined to fit the subject. This corresponds to an abductive view of the thesis process.<sup>24</sup> More precise this has been carried out by studying more theory on those areas which we felt came up during an interview and incorporate them into the questions to the next respondent. An example of this is the question of incentive systems which was only touched upon briefly in the first interview. Later we recognised that this played an important part in the performance of knowledge management. We therefore studied theory on the subject and incorporated questions based on the theory in later interviews. In the case of the theories about teams it was the other way around. During the interviews we found that a lot of knowledge management issues in Industrial Hose were closely connected with the team structure, we therefore incorporated theories in the subject.

The respondents were, as mentioned, from senior management of the organisation. Interviews with high level persons like these are associated with special problems.<sup>25</sup> This is mostly due to the difference in status between the interviewer and the interviewee with the interviewee having the upper hand. This might go as far as the respondents ignore questions and treating the interviewer as a less knowledgeable part and therefore conducting the interview in a teaching form.<sup>26</sup> To prevent this we have tried to seize the initiative in the interview from the start, cutting to the chase more quickly than what would be done with other respondents. We have also made extensive studies within the subject before the interview to show the respondent that we master the questions under discussion in a reasonable way. In couple of the interviews it became evident that the

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<sup>22</sup> Andersen, Ib: *Den uppenbara verkligheten*, 1998

<sup>23</sup> Andersen, Ib: *Den uppenbara verkligheten*, 1998

<sup>24</sup> Jacobsen, Dag Ingvar: *Vad, hur och varför?*, 2002

<sup>25</sup> Andersen, Ib: *Den uppenbara verkligheten*, 1998

<sup>26</sup> Andersen, Ib: *Den uppenbara verkligheten*, 1998

interviewee wanted to make a certain point. We found that when the point was made we could present the same question in a different way to get a relevant answer. Showing a knowledge and curiosity in the interviewees' special area proved to be an efficient way to reach information, which would otherwise be missed. Six of the interviews were held in English with French people. This helped us in our purpose to maintain the initiative in the interview since neither we nor the respondents had the advantage of our mother tongue. We started the interviews in French, presenting our selves and so on to show good will. We felt that this was appreciated by the interviewees. The problem with using a foreign language is that there could be misunderstandings between us and the respondents. To avoid this we have tried to recapitulate the facts by using different words to verify the answers.

The interviews lasted for about one hour. We deliberately tried to limit the time for each interview because of the respondent's time constraints. This was done to maintain the respondents focus on the interview even if he or she had other responsibilities. One hour is also the recommended maximum length for semi structured and structured interviews because of these reasons.<sup>27</sup>

### 2.3.2 Inquiries

One inquiry has been made in this study. It is based on an inquiry from the book "The Smart Organization" by Matheson and Matheson (1998). The inquiry has a theoretical base and is used to gather empirical information about the studied organisation, which makes it deductive.<sup>28</sup> We have not used the whole inquiry from the book but rather chosen the parts corresponding to our objectives. This means that we have chosen the parts related to knowledge management and learning. We have chosen this inquiry since it is founded on a very large research material and since it has a benchmarking opportunity where the result can be compared to other organisations.<sup>29</sup> The reason for choosing only parts of the inquiry is once again time constraints with the respondents. The complete inquiry takes more than an hour to complete while the chosen parts can be filled out in ten to fifteen minutes. The complete inquiry from Matheson and Matheson can be studied in appendix 2. The parts that were used in this study can be seen in appendix 3.

The respondents of the inquiry were seven of the eight members of senior management who were interviewed. No inquiry was sent to the first respondent in the first interview since it was performed to discuss the problem formulation in the thesis. The respondents were asked to fill out the inquiry in the end of the interview and the form was sent to them immediately by e-mail. This approach was chosen to get as many responses as possible since the respondents could see the related inquiry at once. During the interview we tried to show that our study would be valuable to the organisation and that our results

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<sup>27</sup> Andersen, Ib: *Den uppenbara verkligheten*, 1998

<sup>28</sup> Jacobsen, Dag Ingvar: *Vad, hur och varför?*, 2002

<sup>29</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

could be beneficial to the respondents. This was also made to get as many responses as possible.<sup>30</sup>

Five of the seven respondents answered the inquiry. This is about 70% of the respondents. The answers had some spread but a clear trend could be seen. The response rate must be considered as high. Our opinion is that this is due to the preparations that were done in the interviews which were discussed above. Because of the high answering rate and since the results point in the same direction no studies of reasons for not answering have been made.

Another important part was the time aspect. Using this form of inquiries enables us to get the response input to our research process earlier. An alternative way would have been to design our own forms. This would have resulted in a more targeted inquiry with a more direct approach to what we wanted to know but it would not have given us the opportunity to compare our results with other studies. It would also have taken a longer time to get the responses from a study of this kind since more time has to be spent on the design of the inquiry. In this case we think that the advantages from more standardised form compensate for the slightly less targeted information we would have gotten from a form of our own.

The inquiry from Matheson and Matheson (1998) is a strictly quantitative investigation.<sup>31</sup> This has implications since there is no room for extra information in the form of words around the questions in the inquiry. This is a disadvantage for the investigation but the primary goal with the survey is not to gather information about what people within the organisation think about the past, present or the future. This kind of qualitative data is instead collected via the interviews. The inquiry is rather an investigation made for bench-marking purposes in quantitative terms in the present. This is the strength of the survey and due to the large benchmarking material it does this very well.<sup>32</sup> This is discussed further in the reliability section below.

### **2.3.3 Document studies**

During the work on this thesis we have had access to internal documents describing different parts of the organisation. These documents and reports have not been made especially for this thesis and are therefore considered as secondary data.<sup>33</sup> Due to this we have committed extra effort on our understanding of these documents and taken extra care not to deduce too much from them. Primarily the information has been presentations of the business area Industrial Hose and how they work in different projects but more formal documents like annual reports have also been used.

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<sup>30</sup> Andersen, Ib: *Den uppenbara verkligheten*, 1998

<sup>31</sup> Jacobsen, Dag Ingvar: *Vad, hur och varför?*, 2002

<sup>32</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>33</sup> Rienecker, Lotte; Stray Jörgensen, Peter: *Att skriva en bra uppsats*, 2002



## 2.4 Validity

### 2.4.1 Interviews

Before the interviews we had studied many fields with connections to R&D and knowledge management and the questions were constructed from this information. As more interviews were conducted we changed the questions to fit better with our existing empirical knowledge to get more precise answers. We had also studied literature on special methodological issues concerning these types of interviews as described above. Many of the situations that were described in the literature occurred but since we could recognise them we were able to put the interviews back on our own track. This together with a quite large research material concludes that the internal validity of the interviews is good.<sup>34</sup>

The external validity of the material is harder to judge. This is due to the different personal views of the respondents. To improve it we have asked questions from different angles and to different respondents in order to triangulate the information for a more valid result.<sup>35</sup> We conclude that the information from the different sources converges and that the external validity should be satisfactory.

### 2.4.2 Inquiries

The inquiry from Matheson and Matheson has been tested on hundreds of companies and the results have been compared to their performance in research and development issues.<sup>36</sup> Matheson and Matheson found a strong connection with the results in the inquiry and R&D performance. This fact gives a high external validity for the tool.<sup>37</sup> The internal validity is not necessarily as good. This is related to the nature of the inquiry where Matheson and Matheson mean that the nine dimensions they measure affects an organisations performance in R&D issues. It could be that these dimensions measure other things that indirectly affect R&D or that companies that perform well in these dimensions in many cases also perform well in R&D. We therefore conclude that the internal validity might be low but that the results nevertheless relate to companies R&D performance.

The questions used from the inquiry are related to learning and knowledge management. This implies that knowledge management and learning have effect on the performance of R&D.<sup>38</sup> This assumption is backed up by the empirical data from which the inquiry was created.<sup>39</sup> We conclude that our inquiry measures performance within knowledge management and learning and that this is related to performance within R&D.

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<sup>34</sup> Lundahl, Ulf; Skärvad, Per-Hugo: *Utredningsmetodik för samhällsvetare och ekonomer*, 1999

<sup>35</sup> Denscombe Martyn: *Forskningshandboken*, 2000

<sup>36</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>37</sup> Lundahl, Ulf; Skärvad, Per-Hugo: *Utredningsmetodik för samhällsvetare och ekonomer*, 1999

<sup>38</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>39</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

### **2.4.3 Document studies**

The quantitative information in the formal reports fall under the jurisdiction of Swedish corporate law and have been reviewed by authorised accountants. We therefore conclude that both the internal and external validity should be high. For other material such as market investigations and other internal reports there are none formal scrutiny of this sort and the validity must be considered as lower.<sup>40</sup> Most of this information is not critical to our investigation and if that has been the case we have not taken measures to control the validity. In the cases where the information is important for our study we have asked control questions regarding the facts in the interviews.

The qualitative information in the formal reports has had a great importance in our study. For that reason we have asked control questions investigating the organisational framework and the proposed strategies during the interviews. From this we conclude that the validity of the reports often is rather low. We have therefore taken extra care when the material has been used and mainly used it as comparison against other results. The informal material has a higher level of convergence with our control questions and thus has a higher level of validity.

## **2.5 Reliability**

### **2.5.1 Interviews**

The reliability of the interviews could be affected by the fact that they are conducted over the phone and that we therefore have no insight in the respondents' situation at the time of the interview.<sup>41</sup> If the respondent has a stressful situation it can affect the answers in ways that are difficult to foresee. To avoid this, the respondents were contacted well in advance and they have had the opportunity to pick a time of their choice for the interview. We have also informed the respondents of the time frame of the interviews and gotten their approval of it. Our impression is that all of the respondents have been calm and focused on the interview.

Phone interviews lack the dimension of the so called "interview effect" which means that the respondents were unaffected by our body language, clothes and other actions.<sup>42</sup> This affects the reliability since there are fewer sources of influence on the respondents. The results from the interviews and the inquiries have also been compared. We conclude that the results converge and that they therefore should be reliable.

### **2.5.2 Inquiries**

The respondents have answered the inquiries without us being present. The reason for this is the physical location of the respondents since many of them work in France. That we are not present during the answering process can have negative aspects on the

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<sup>40</sup> Lundahl, Ulf; Skärvad, Per-Hugo: *Utredningsmetodik för samhällsvetare och ekonomer*, 1999

<sup>41</sup> Lundahl, Ulf; Skärvad, Per-Hugo: *Utredningsmetodik för samhällsvetare och ekonomer*, 1999

<sup>42</sup> Jacobsen, Dag Ingvar: *Vad, hur och varför?*, 2002

reliability of the study when we do not know if the respondents have laid enough time on and fully understood the inquiry.<sup>43</sup> We have therefore given the respondents an opportunity to contact us if they think there are things in the inquiry that needs clarification.

The discussion on interview effect above applies here to. As with the phone interviews the respondents could have been affected by our presence.<sup>44</sup> The result is the same as in the interviews as the sources of influence become fewer.

Since the inquiry incorporates a grading between two statements there is a risk that the respondents' grades differ even though they have the same impressions of the answer. The control function used to test this has been the comparison with the interviews mentioned above. As stated, the results congregate.

### **2.5.3 Document studies**

The quantitative material from the formal reports has, as mentioned, been reviewed by accountants and we therefore feel that it is reliable. In the internal reports are not as reliable and we can not exclude the possibility of random errors. Since the quantitative information in the internal reports has been of little importance in our study we have not taken any measures to control this.

We do not think that the qualitative information in the reports have any random errors which could be considered as lack of reliability.<sup>45</sup> The errors are instead connected to the fact that the material is secondary in our study.<sup>46</sup> The material is aimed at another purpose and our other studies show that they often have little relevance to our investigation other than for comparison.

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<sup>43</sup> Lundahl, Ulf; Skärvad, Per-Hugo: *Utredningsmetodik för samhällsvetare och ekonomer*, 1999

<sup>44</sup> Jacobsen, Dag Ingvar: *Vad, hur och varför?*, 2002

<sup>45</sup> Lundahl, Ulf; Skärvad, Per-Hugo: *Utredningsmetodik för samhällsvetare och ekonomer*, 1999

<sup>46</sup> Rienecker, Lotte; Stray Jörgensen, Peter: *Att skriva en bra uppsats*, 2002

### 3 Theory

*In this chapter we present the theories used in the thesis. The first part deals with knowledge management and theories related to that field. After this part we discuss teams and how different team structures affect interaction between people in an organisation. Next we deal with incentive systems and the effects they have on culture and strategies in an organisation. The chapter ends with a discussion about performance in research and development and how it can be raised. The reason for the models being placed in this order is cause and effect. Knowledge management, teams and incentive system all have potential to affect a company's R&D performance.*

*In the cases where a complete model is presented we also include a part in which it is criticised. The criticism includes both our own views and criticism from other authors. The part also includes some comparisons with other models within the field. This part is placed in direct connection to the model.*

#### 3.1 Knowledge Management

This part will discuss and compare different theories within the field of knowledge management, and knowledge distribution. The expression knowledge management is used as overall structure although we recognise that knowledge due to its complex nature can not be managed in the traditional sense.<sup>47</sup> Knowledge management are instead related to the flow of knowledge and how to facilitate it.<sup>48</sup> In order to discuss this we first present different approaches to knowledge and then proceed to discuss different ways of transferring it.

##### 3.1.1 Knowledge as an asset contra Knowledge as a process

There are two main models for of knowledge in an organisation. These are knowledge as an asset and knowledge as a process.<sup>49</sup> The models are not opposite but rather give complementary views of knowledge. When knowledge is considered as an asset it is seen as a mixture of capabilities and competences which have been put together to create competitive advantage.<sup>50</sup> This corresponds to a functionalistic view of knowledge and how knowledge is created. As an asset knowledge is also considered to be objectively definable and easy to distinguish. This also has implications since knowledge then can be seen as easy to codify and to transfer between individuals and systems. The main focus is normally the knowledge within an organisation. If knowledge is thought of as a process it is considered to be a social construct created by individuals in a social context.<sup>51</sup> In this form knowledge is not necessarily something that an organisation can benefit from. It is rather a question of interpretation of the knowledge. The focus in this model is on the

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<sup>47</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>48</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>49</sup> Styhre, Alexander: *Understanding Knowledge Management*, 2003

<sup>50</sup> Styhre, Alexander: *Understanding Knowledge Management*, 2003

<sup>51</sup> Styhre, Alexander: *Understanding Knowledge Management*, 2003

individual and how different individuals handle knowledge. This means that knowledge and information is not as easy to codify and to transfer in this view since different individuals have different perspectives on the same knowledge.

These two models can be combined to get a clearer picture of knowledge in organisations and how this knowledge can be codified. The result is the knowledge based view of the firm in which it is recognised that knowledge and information can be codified in some cases while in other it resides within the structure and the routines of an organisation. These differences must be recognised in order to build an effective organisation for knowledge management and successful knowledge distribution.<sup>52</sup>

### 3.1.2 Tacit contra Explicit Knowledge and concept of Ba

Knowledge can take two forms in respect to how it is used. Explicit knowledge is easily codified and shared between individuals both within and outside the organisation. It could be technical designs or other kinds of hard facts.<sup>53</sup> Explicit knowledge is normally related to knowing about something. Tacit knowledge, on the other hand, is more related to knowing how. It normally resides within the individuals of the organisation and is usually not easy to codify.<sup>54</sup> The transfer of tacit knowledge must therefore generally be done through observation and practice which is more expensive than for explicit knowledge.<sup>55</sup>

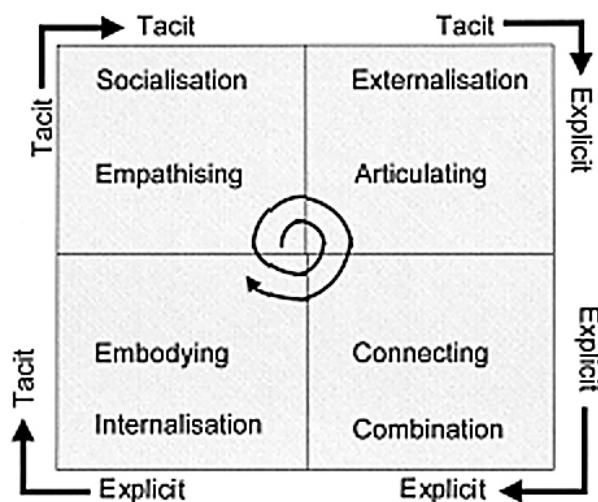


Figure 3.1 The Knowledge Conversation Matrix, the SECI-process<sup>56</sup>

<sup>52</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

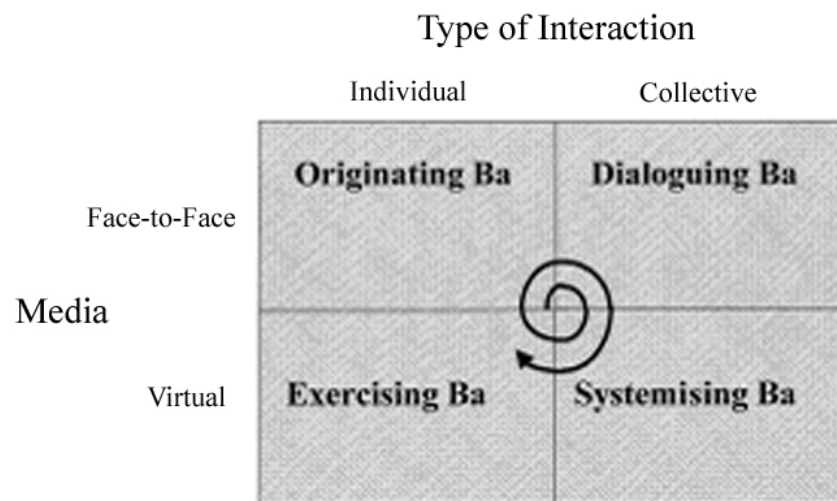
<sup>53</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

<sup>54</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

<sup>55</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

<sup>56</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

The knowledge conversation matrix is a framework for how knowledge can be communicated between the tacit and explicit dimension.<sup>57</sup> The matrix is presented in figure 3.1. It contains four different conversational modes for transferring knowledge between the two dimensions. Transfer from explicit knowledge to tacit knowledge is done by internalisation. This means that formal instructions and principles are made into routine and intuition. If explicit knowledge should be made into new explicit knowledge it is done by combination, where different forms of codified knowledge blend into each other creating new codified knowledge. Tacit knowledge could be turned into new tacit knowledge by socialisation. This is normally done when people with different kind of tacit knowledge interact and learn from each other. Tacit knowledge can also be turned into explicit knowledge. This is done by externalisation. It is the most complex form of knowledge conversion and normally requires extensive systematisation and articulation of the tacit knowledge. It's not only the codifying of processes and know-how, though. The process of conceptualising an idea for a new product is to a great extent externalisation as well. The knowledge movement through the model in a spiral is referred to the SECI-process and the idea is that the knowledge grows while passing the different stages.



*Figure 3.2 Four types of Ba*<sup>58</sup>

The different forms of knowledge conversation have different levels of effectiveness in different settings. This follows from the insight that knowledge needs a context or a place in order to be created.<sup>59</sup> A name for this place is Ba. Ba is the Japanese word for place but it is also related to time or a specific location which includes both time and space. The space dimension does not have to be related to a physical place, it could also be a virtual

<sup>57</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>58</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>59</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

one and even a mental space such as shared ideals. Ba is defined in two dimensions which are the type of interaction and the media for its transfer. The type of interaction can be either individual or collective and the media for knowledge conversation can be either face to face contact or a virtual form of interaction. These dimensions can be combined into four different kinds of Ba as presented in figure 3.2.<sup>60</sup>

These different types of Ba are related to the efficiency in the conversation between tacit and explicit knowledge. Originating Ba is connected to socialisation because of the links to individuals interacting with each other. Dialoguing Ba is more related to discussion and thereby to systematisation. This makes it related to externalisation since it is there that tacit knowledge is brought to the surface and examined in an organised fashion. The systemising part of Ba is closely connected to codified knowledge and to the transmittance of such knowledge to large numbers of people. It is thereby related to combination and most often to tools like databases and intranet functions but also such a thing as the annual report. The last type of Ba, exercising, is related to internalisation since individuals takes in codified knowledge though virtual channels and reflect on it.<sup>61</sup>

### 3.1.3 Criticism

Nonaka's models have a focus on knowledge distribution and how knowledge can be transformed between different classifications. Another approach would have been to study the functional areas in a company and how knowledge is distributed between them and the environment. This is done in the Information Ecology Model.<sup>62</sup> Our focus is however fixed on knowledge management and knowledge creation with a R&D perspective. Such models are therefore too general because they apply to an entire corporation and lack the more specific focus on how knowledge is created.

In the presented framework it is assumed that there is an interest in knowledge transfer by the participants. In many cases individuals have no interest in this and can see knowledge as a source of personal power or as a business secret that needs to be preserved.<sup>63</sup> This could be considered as a threat towards the creation of Ba when people consciously or unconsciously try to interfere with this process.

### 3.1.4 Enablers of Knowledge Management

Many authors have identified three common features to make practical improvements in knowledge management.<sup>64</sup> These are culture, infrastructure and technology.<sup>65</sup> They were first formalised by Frank Blackler (1995) but have been used by other authors in more or

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<sup>60</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>61</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>62</sup> Davenport, Thomas H.: *Information Ecology*, 1997

<sup>63</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>64</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>65</sup> Collins, Mike; et al: *Fem röster om Knowledge Management*, 1998

less the same form.<sup>66</sup> Here we use the enablers as presented by Armbrecht, et al (2001) as can be seen in figure 3.3. The main difference from the original is that technology dimension is focused on information technology.<sup>67</sup>

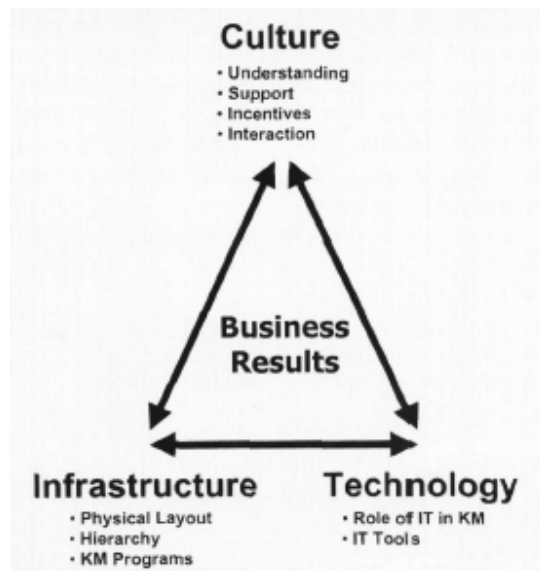


Figure 3.3 The three enablers for knowledge flow<sup>68</sup>

### 3.1.4.1 Culture

The cultural dimension controls the values and paradigms which affect an organisation.<sup>69</sup> These are normally hard to change but they have a big influence on knowledge distribution within an organisation.<sup>70</sup> There are some important reasons to why it is so hard to change the culture concerning knowledge management. One of the most important is the lack of understanding of why knowledge management is important.<sup>71</sup> This could be related to lack of support systems for knowledge management and to employees finding the concept relatively fuzzy. The key to making the changes are thereby to make knowledge management easier to understand and that the system has managements support.<sup>72</sup> Understanding of knowledge distribution comes from clarifying the knowledge transfer process. The process states that there are two main modes for knowledge distribution. These are codification of individual knowledge and exchange of knowledge by the means of discussion.<sup>73</sup> The first of these are related to knowledge becoming explicit while the second are corresponds more to tacit knowledge within an organisation.

<sup>66</sup> Collins, Mike; et al: *Fem röster om Knowledge Management*, 1998

<sup>67</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>68</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>69</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>70</sup> Johnson, Gerry; Scholes, Kevan: *Exploring Corporate Strategy*, 1999

<sup>71</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>72</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>73</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001



To make people in an organisation take part in a process they must feel that their own personal goals and objectives align with the targets of the organisation.<sup>74</sup> This can be done by the incentive system in an organisation.<sup>75</sup> To create a suitable environment for knowledge distribution the organisation then has to reward behaviour which supports such activities. Such a system is not always easy to create since knowledge and knowledge distribution are hard to measure.<sup>76</sup> The companies that succeed often combine formal measures and more subjective information with both monetary and non monetary rewards.<sup>77</sup>

### 3.1.4.2 Infrastructure

This enabler focuses on the layout and hierarchy of an organisation. It also covers the processes in an organisation which are specifically related to knowledge management. The layout is represented by the physical placement and design of offices and work areas.<sup>78</sup> This affects knowledge distribution by making it harder or easier for people to interact in different situations. The geographical placement of the company and its employees is also represented here and affects the ability to hold meetings and other activities which demand that people are at the same place.<sup>79</sup> In many cases flexibility and ability to change the layout of work areas is needed since a company have many functions that need support.

The internal structure in the form of hierarchy also affects knowledge distribution.<sup>80</sup> An example can be a functional organisation where people from different departments seldom interact. Other organisational forms, like matrix organisations, where people from different functional areas interact can have a more positive influence on the distribution of knowledge. The organisation's willingness and ability to create different kinds of teams also affects this area.<sup>81</sup>

To help knowledge distribution many companies have special programs in the field.<sup>82</sup> The formats of these programs vary considerably and they can begin both as a project installed by management or as an initiative started by employees. Variance also occurs in formality and the use of expertise like consultants. The most important aspect in making knowledge management programs successful is resources.<sup>83</sup> This is linked to the management support discussion above and consists of personnel resources as well as time and management dedication.<sup>84</sup>

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<sup>74</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>75</sup> Anthony, Robert N.; Govindarajan, Vijay: *Management Control Systems*, 2004

<sup>76</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>77</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>78</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>79</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>80</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>81</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

<sup>82</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>83</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>84</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

### 3.1.4.3 Technology

This enabler includes technical tools for the distribution of knowledge. The focus is on computerised system even though the original model also incorporates other tools like phones and fax machines. The computerised system includes all structures used for storing, manipulation and transferring of knowledge.<sup>85</sup> The exact role of the system varies between companies and their abilities within the other enablers. Influence on the system's role can come from such factors as geographical spread of the organisation and the need for codified explicit knowledge.

Much of the efforts today are concentrated on the codification of knowledge in databases often with access from the company's internal network or from the internet. The reasons given for this are often that knowledge should stay in the organisation even if key employees quit their jobs.<sup>86</sup> Success with databases and other IT tools comes from two sources. The first is to find the right kind of tools for the organisation in form of platforms, storage and software systems.<sup>87</sup> The second is related to the participation in knowledge charring by the employees which is being closely related to the organisational culture.<sup>88</sup>

## 3.2 Team

In this part we present and discuss some theories around teams and how teams can interact. The discussion focuses on teams involved in research and development in an organization but can also contain members from other parts of the organization. These teams are commonly referred to as cross functional development teams.<sup>89</sup>

There are many definitions of the word team.<sup>90</sup> Lind and Skärvad (1998) refer to teams as "a number of individuals - normally not so many - with different competencies who work together or with integrated assignments to achieve certain objectives". Other authors have a more strict view of teams, often including a common responsibility for the teams result and a certain level of commitment.<sup>91</sup> When we study recent articles with a knowledge perspective on teams we find that the authors normally don't give a separate definition of the word team, instead focusing on which skills in knowledge distribution that is important. We therefore conclude that the exact definition of a team is of less importance and focus on what the team shall accomplish.

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<sup>85</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>86</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>87</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>88</sup> Jassawalla, Avan R.; Sashittal, Hemant C.: *Cross-Functional Dynamics in New Product Development*, 2000

<sup>89</sup> Jassawalla, Avan R.; Sashittal, Hemant C.: *Cross-Functional Dynamics in New Product Development*, 2000

<sup>90</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>91</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

### 3.2.1 Team integration

Lind and Skärvad (1998) present three levels of integration for the members in a team. They also assign some common characteristics to the different kinds of teams. The teams with the least level of integration are called differentiated teams. Those are characterized by sequential work tasks which are most commonly performed by experts.<sup>92</sup> Contacts with other team members are often limited and the team is therefore relatively insensitive to personal conflicts.<sup>93</sup> These kinds of teams are best suited for clearly defined repetitive work tasks. The personnel in a restaurant are an example of a differentiated team because the waiters and chefs work together but sequentially in order to serve the customers.

The team form with the intermediate integration level is called integrated teams. These have characteristics like parallel work tasks and a higher level of adjustment in the tasks between team members.<sup>94</sup> The work tasks are normally specialised but not defined in advance.<sup>95</sup> This structure requires more knowledge transfer between the team members and thereby more interaction. Product development teams are normally integrated teams.

Teams with the highest level of integration are called completing teams. The main difference from the two other team structures are that team members must be able to complete and take over for each other's tasks in these kinds of teams.<sup>96</sup> Leadership is also more flexible in a completing team since it's the tasks at hand which control who is the team's leader. The leadership can also change during the team's existence. Rescue units like ambulance personnel and firemen often work in this team structure.

### 3.2.2 Project teams

Wheelwright and Clark (1992) present different kinds of structures for project development teams which includes several of the company's functions. They identify four types which mainly differ in the role of the project leadership. Each of the types has its own strengths and weaknesses which makes it suitable for some but not all kind of development projects.

The first structure presented is the functional structure. Here people involved in the team work within their own functional areas.<sup>97</sup> Leadership and responsibility in these teams are shared between managers from different functional areas of the organisation.<sup>98</sup> The structure means that work tasks are often performed sequentially and responsibility follow the work tasks through the functional areas. The strengths with this organisation are that specialists work on the parts within their area of expertise and that managers have control over both performance and resources in their part of the project.<sup>99</sup> The

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<sup>92</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>93</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>94</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>95</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>96</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>97</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

<sup>98</sup> Ricciardi, Max: *Team-baserad produktutveckling*, 1999

<sup>99</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

weaknesses are mainly that people work within their own area of expertise with very little knowledge transfer to others within the project which could lead to suboptimisations.<sup>100</sup>

Two of the team structures can be considered to be matrix organisation.<sup>101</sup> This means the team members resides in their respective functional areas but also work in the project which has a separate project leader. The difference in the two structures is the position of the project manager.<sup>102</sup> The project manager can either be lightweight or heavyweight within the organisation.<sup>103</sup> Lightweight project managers are often from the middle level in an organisation and normally have a background in one of the functional departments. These managers can have a considerable level of expertise but lack the authority to draw upon the resources in the functional departments.<sup>104</sup> This means that the lightweight project manager often has more of a coordinating role in the project. The heavyweight project manager has more authority in the organisation. They are senior managers and have the power to draw upon resources in the organisation.<sup>105</sup> The accesses to the functional departments are also normally more direct. The differences in authority can make the heavyweight project team more effective but the manager's ability to pull people from their places within the normal organisation is a ground for conflict.<sup>106</sup> Conflicts can also appear in the lightweight organisation. There they are related to the manager's lack of authority. The main strength of the matrix organisation is that there are more ways for knowledge distribution open between the different functions.<sup>107</sup>

The last structure is the autonomous team which are also referred to as "tiger team" structure. In this structure the members are moved from their jobs in the functional departments to serve in the project organisation.<sup>108</sup> The project manager is an organisational heavyweight who has full accountability for the project. The strength lies in the team's ability to focus on the project full time.<sup>109</sup> Teams which are working free from the organisation in this way have the ability to show good results quickly.<sup>110</sup> The weakness is that the solutions produced are often unique and there is not always a clear link to the parent organisation.<sup>111</sup>

### 3.2.3 Criticism

Some theories concerning teams and teamwork identify critical aspects and important tasks in a general manner without recognising that teams can be very different. The form

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<sup>100</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

<sup>101</sup> Ricciardi, Max: *Team-baserad produktutveckling*, 1999

<sup>102</sup> Ricciardi, Max: *Team-baserad produktutveckling*, 1999

<sup>103</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

<sup>104</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

<sup>105</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

<sup>106</sup> Ricciardi, Max: *Team-baserad produktutveckling*, 1999

<sup>107</sup> Ricciardi, Max: *Team-baserad produktutveckling*, 1999

<sup>108</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

<sup>109</sup> Ricciardi, Max: *Team-baserad produktutveckling*, 1999

<sup>110</sup> O'Reilly III, Charles A.; Tushman, Michael L.: *The Ambidextrous Organization*, 2004

<sup>111</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

for this is often checklists of abilities that are important in teams.<sup>112</sup> Differences that can affect the suitability in such checklists can come from company culture or work tasks that differ in some projects. The strength in the two presented frameworks is that a team form can be applied based on the facts concerning the local conditions in which the team has to work.<sup>113</sup>

Although we have chosen the two frameworks to complete each other there are still some areas that are not covered. One is the absence of psychological factors that can influence how and why teams are formed.<sup>114</sup> This factor is not of great importance to us since our study does not include the basic human needs of interaction. Another is that both models have an internal focus on what is good for the team and little emphasis is placed on the teams interactions with the larger part of the organisation. We conclude that this part is absent but also recognise that many studies have confirmed the effectiveness of teams in many forms of organisations.<sup>115</sup>

### **3.3 Incentive Compensation System**

Incentive systems have two main purposes. Those are to reinforce the strategies in an organisation and to motivate employees to act according to organisational needs.<sup>116</sup> To accomplish this there must be an alignment between the organisation's objectives and the individual goals of the employees.<sup>117</sup> The largest part in this is the incentive system.

Anthony and Govindarajan (2003) discuss incentives systems and how incentive systems differ in companies with different strategies. They have developed a framework where the most likely incentive system is presented in reference to the strategies build, hold and harvest. The framework is presented in figure 3.4. The strategies are often connected to the maturity in the market in which the unit acts. Build strategies then corresponds to the growth stage in the industry life cycle, harvest are linked to the maturity stage and hold strategies are most likely connected to the decline stage.<sup>118</sup>

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<sup>112</sup> Lynn, Gary S.; Reilly, Richard R.: *Measuring Team Performance*, 2000

<sup>113</sup> Ricciardi, Max: *Team-baserad produktutveckling*, 1999

<sup>114</sup> Ricciardi, Max: *Team-baserad produktutveckling*, 1999

<sup>115</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>116</sup> Ledford, G.E.; Lawler, E.E.: *Reward systems that reinforce organisational change*, 1994

<sup>117</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>118</sup> Anthony, Robert N.; Govindarajan, Vijay: *Management Control Systems*, 2004

	<i>Build</i>	<i>Hold</i>	<i>Harvest</i>
<i>Percent compensation as bonus</i>	Relatively high	➔	Relatively low
<i>Bonus criteria</i>	More emphasis on nonfinancial criteria	➔	More emphasis on financial criteria
<i>Bonus determination approach</i>	More subjective	➔	More Formula-based
<i>Frequency of bonus payment</i>	Less frequent	➔	More frequent

*Figure 3.4 Strategies and Incentive Compensation System*<sup>119</sup>

The framework suggests that harvest strategies are connected to relatively low bonuses compared to the normal salary and that it is paid more frequently. It is also more often based on a formal system which relates to the financial performance of the company.<sup>120</sup> Build strategies are related to relatively higher bonuses that are based more on subjectivity and are paid less frequently. The bonuses are more likely based on non financial criteria. Hold strategies have bonus criteria that are a mixture of those for harvest and build.<sup>121</sup>

Incentive compensation does not have to be monetary bonuses. It can also take the form of encouragements, career possibilities and opportunities.<sup>122</sup> Motivators which can be part of an incentive system include recognition from superiors, empathy and symbolic values like features in company newsletters and employee of the month awards.<sup>123</sup>

### **3.4 R&D Terminology**

In order to discuss R&D in a constructive way we present and discuss some of the basic terminology in the field. The starting point is the differences between research and development. Research is then classified as a more fundamental understanding and creation of knowledge and theory. It can be subdivided into basic and applied research.<sup>124</sup> Basic research are used to create new knowledge in which the practical purpose is not always clear while applied research is done with a practical aim.<sup>125</sup> Development is then

<sup>119</sup> Anthony, Robert N.; Govindarajan, Vijay: *Management Control Systems*, 2004

<sup>120</sup> Anthony, Robert N.; Govindarajan, Vijay: *Management Control Systems*, 2004

<sup>121</sup> Anthony, Robert N.; Govindarajan, Vijay: *Management Control Systems*, 2004

<sup>122</sup> Palmer, Ian; Hardy, Cynthia: *Thinking about management*, 2000

<sup>123</sup> Nelson, Bob: *The Ironies of Motivation*, 1999

<sup>124</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>125</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

connected to the creation of products and processes.<sup>126</sup> The output from research is normally reports, papers or patents while development creates designs and prototypes.

R&D can be performed at different levels of an organisation. In larger companies R&D can either be centralised and connected to the company headquarter or decentralised in the different business areas. The centralised form has its strength when an organisation wants to perform R&D with a long term focus.<sup>127</sup> This is because it is closer to headquarters where the long term decisions are made. It is also freer from the short term demand of the business units. The decentralised R&D organisation's advantages are that it is close to the market where it is easier to respond to customer requirements.<sup>128</sup> It is also closer to other functional areas as quality and production.

R&D can also be expressed in different levels of technological evolution. Generally four levels are used.<sup>129</sup> The first is Minor Improvements which includes new products with only minor differences in features from already existing lines. Second is Major Enhancements which represents larger advances in a company's technology. The third is New, Related Technology which is related to new core technology in the company's product line. Last is New, Unrelated Technology which includes brand new core technology not related to existing products.

R&D is to its nature associated with risk.<sup>130</sup> There are also studies that show that companies with a high level of understanding in uncertainty and risk management excel in R&D activities.<sup>131</sup> These studies show that companies that encourage risk taking and have a forgiving attitude towards failure provide better results than those who don't.<sup>132</sup> Risks in R&D include market risk which includes uncertainties in demand and competitive risk which refers to the actions of the competitors. There are also risks associated with technology and production as well as financial risk since many projects needs investments before there is any certainty about revenues. The last type of risk is organisational because there can be doubts concerning necessary changes in the company's organisation.<sup>133</sup>

### **3.5 The R&D Grid: Project Portfolio Matrix**

Common frameworks are important to organisations which want to distribute knowledge. In order to communicate efficiently the frameworks must contain a view shared by everyone in the organization. The Project Portfolio Matrix contains such a view on investments in R&D.

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<sup>126</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>127</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>128</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>129</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

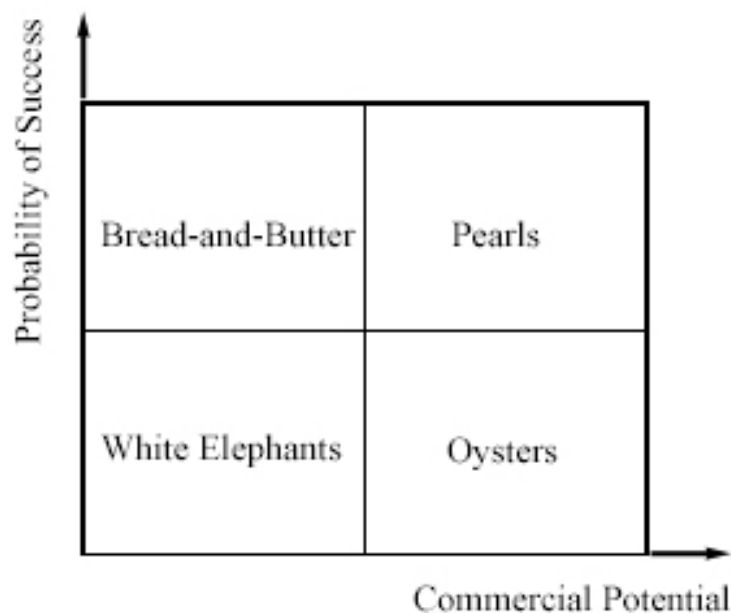
<sup>130</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>131</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>132</sup> Gupta, Ashok K.; Wilemon, David; Atuahene-Gima, Kwaku: *Excelling in R&D*, 2000

<sup>133</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

The portfolio matrix is a classical model within R&D. It has been used by many authors in different forms but with same purpose. Its main use is to compare a portfolio with what is considered ideal and to evaluate the existing portfolio.<sup>134</sup> This is done by creating a matrix with commercial potential on the x-axis and probability of success on the y-axis in which the projects in the portfolio are placed. The terminology used by different authors is not always the same. On the y-axis some discuss risk instead of probability of success.<sup>135</sup> The x-axis could include many measures of commercial potential but some form of discounted cash flow is the most common.<sup>136</sup> In this study we have chosen a matrix from Matheson and Matheson (1998). The matrix is presented in figure 3.5 and presented in more detail below.



*Figure 3.5 The Product Portfolio Matrix*<sup>137</sup>

The different quadrants of the matrix have different names according to the projects it contains and their implications for the organisation. These are Bread-and-Butter, Pearls, Oysters and White Elephants. Bread-and-Butter projects are projects with good but not exceptional commercial performance with a high probability of success. Projects of this kind normally focus on extensions of existing technology or added features to existing products. Customization of products for specific customers are normally also found in this quadrant. Pearls are projects with both a high probability for success and a very good

<sup>134</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>135</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>136</sup> Tritle, Gary L.; Scriven, Eric F.; Fusfeld, Alan R.: *Resolving Uncertainty in R&D Portfolios*, 2000

<sup>137</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998



commercial potential. It is this kind of projects which is expected to create the future economic wealth for the organization. These projects are often generated by research rather than product development. The problem for the organization is to identify the pearls in the R&D-portfolio. In order to do this the organization must open a lot of oysters. The oysters are located in the bottom right of the matrix. They are characterized by a potentially high economic value but a relatively small probability of success. Most development projects in an organization start out as oysters and can then move to other quadrants. In reality a large part of these projects are expected to fail but the rest should be able to generate a significant number of pearls and bread-and-butter projects to obtain the necessary performance of the organization. The last quadrant contains the white elephants. These are projects which consume the resources in an organisation without having a good probability for success. The projects often start out as oysters in which the difficulties then prove to big. White Elephants should be finished of or be repositioned whenever found in an organization. The name, white elephants, comes from the kingdom of Siam where legend says that the king gave these animals to troublesome underlords. The white elephant was considered as a holy animal and could not be expected to work and required large amounts of care and food. The elephants therefore reduced the underlords ability to rebel against the king by consuming large amount of resources.

### 3.5.1 Criticism

As mentioned this framework has been presented by many authors in various forms. Most of these are only connected to the two dimensions in the grid without any more information or terminology.<sup>138</sup> Others only show which project that are acceptable without recognizing the dynamics in moving between the quadrants.<sup>139</sup> The reason we have chosen the framework as illustrated here are that it comes with a pedagogical terminology which makes it easier to understand.

In the model pearls are expected to create long-term competitive advantage. The model also states that the pearls have a grand economic potential and high probability of success.<sup>140</sup> Such a combination is likely to attract competitors as the business gets more attractive. This will increase the competition within the business and therefore erode the competitive advantage of the product.<sup>141</sup> It can be possible to protect a project by legal means e.g. patents but this protection have in many cases proven to be insignificant.<sup>142</sup> This criticism does not imply that companies should not look for pearls but that the long-term competitive advantage may be exaggerated for these projects.

The different projects in the R&D portfolio can move between the quadrants in the grid.<sup>143</sup> Even if this possible the model are often considered as static.<sup>144</sup> In order to

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<sup>138</sup> Tritle, Gary L.; Scriven, Eric F.; Fusfeld, Alan R.: *Resolving Uncertainty in R&D Portfolios*, 2000

<sup>139</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>140</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>141</sup> Johnson, Gerry; Scholes, Kevan: *Exploring Corporate Strategy*, 1999

<sup>142</sup> Frank, S.J.: *Patent do's and d'oh!*, 2003

<sup>143</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>144</sup> Tritle, Gary L.; Scriven, Eric F.; Fusfeld, Alan R.: *Resolving Uncertainty in R&D Portfolios*, 2000

emphasize the uncertainty in R&D projects the points in the grid could be replaced by ellipses which illustrate the potential differences in cash flow and probability of success.<sup>145</sup>

### 3.6 Nine principles of smart R&D

The nine principles of smart research and development is a framework developed by the consulting firm Strategic Decisions Group seated in Menlo Park, California. The model is collected from the book “The Smart Organization” written by David Matheson and Jim Matheson (1998). The principles are based on an extensive study of best R&D practices in hundreds of companies made by the firm.

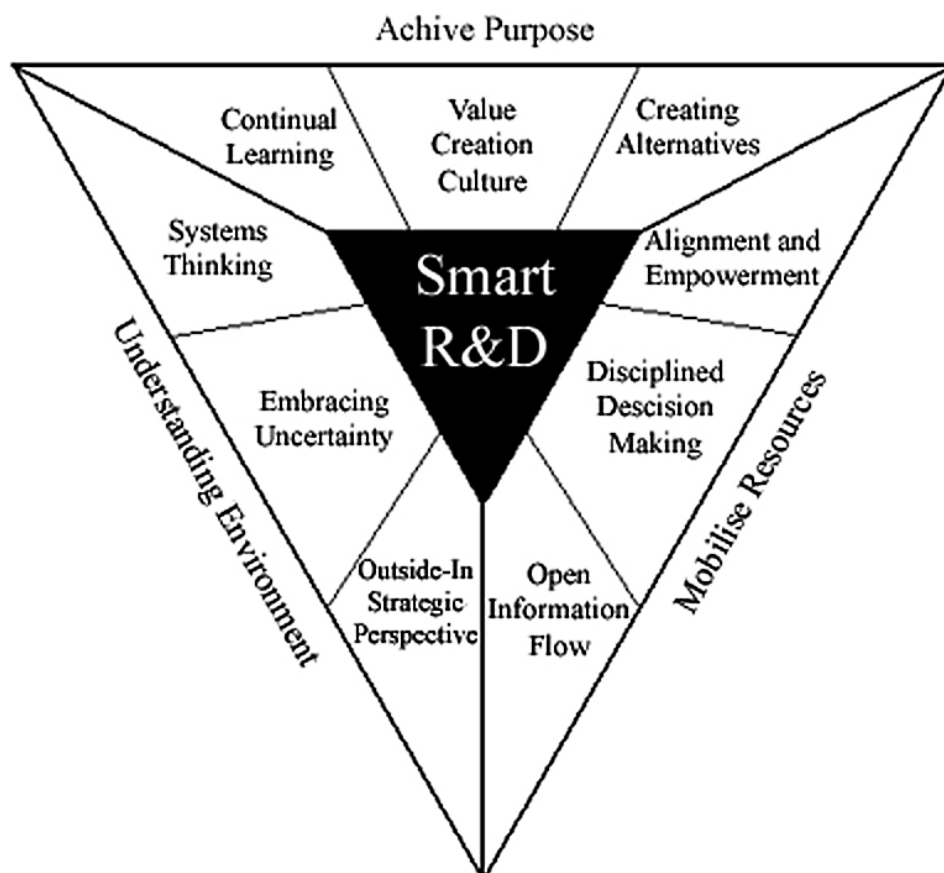


Figure 3.6 Nine Principals for Smart R&D<sup>146</sup>

Matheson and Matheson’s framework centre on R&D activities and how to make these activities more efficient. Some parts of this framework focus on knowledge distribution and learning. The principles focusing on knowledge can be used to measure an

<sup>145</sup> Tritle, Gary L.; Scriven, Eric F.; Fusfeld, Alan R.: *Resolving Uncertainty in R&D Portfolios*, 2000

<sup>146</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

organisation's momentary abilities in the knowledge management and knowledge distribution areas using Matheson and Matheson's standardised test presented below.

The nine principles are subdivided into three groups, as can be seen in figure 3.6, each organized around a generic function. These groups are Achieving Purpose, Understanding the Environment and Mobilizing Resources. Two of the principles in the framework are used for measuring purposes in this study. These two principles are Continual Learning from the achieve purpose group and Open Information Flow from the mobilise resources group. The rest of the framework is used to analyse R&D performance in a qualitative way. All the principles are presented below within their respective group.

### **3.6.1 Achieving Purpose**

The principles in this group are related to how the organization creates value and to the organizations fundamental values and beliefs. An organization with good abilities within the principles related to Achieving Purpose have the ability to see the overall goal and what can be done to get there without letting the conflicting purposes of every day business life get in the way. The three principles in this group are Value Creating Culture, Creating Alternatives and Continual Learning.

#### **3.6.1.1 Value Creating Culture**

This principle states that all activities in an organisation should be aimed at creating value. The value is normally related to cash or cash flow even though it does not have to be directly. An indirect method for value creating could be to expand customer relationships. The principle also affects the measurement system in a company by dictating what is considered important. An example of a measurement could be expected Net Present Value.

#### **3.6.1.2 Creating Alternatives**

Creativity and choice are key words for this principle. The members of the organisation should routinely create doable alternatives when choices or investments are to be made. That the alternatives are doable are important. There are no reasons for creating bad alternatives to make the main alternative look good. Decision quality is closely linked to this principle.

#### **3.6.1.3 Continual Learning**

This principle affects the organisations ability to learn how to create value. It could be achieved by both formal and informal means. Some formal means could be meetings and information support systems in the form of IT solutions while informal means can be discussions during coffee breaks and a learning culture. An organisations incentives system could also affect this principle.

## **3.6.2 Understanding the Environment**

This group of principles relates to an organizations ability to make sense of the often complex and uncertain environment. This includes cause and effect relationships, interpretations of the environment and how different players on the market interact. An organisation which does well within these principles can interpret the environment well and use the information to make efficient and informed decisions. The three principles in the group are Embracing Uncertainty, Outside- In Strategic Perspective and Systems Thinking.

### **3.6.2.1 Embracing Uncertainty**

An organisation should have a feeling for the uncertainties that affects it. This should have a form were opinions concerning both internal and external uncertainty can be discussed openly. The advantage from this is that understanding of the drivers of uncertainty leads to more informed decisions. It also effect peoples credibility internally since many decisions, especially in R&D, are uncertain to their very nature.

### **3.6.2.2 Outside- In Strategic Perspective**

This principle deals with on organisations understanding of the business it is in. It could take the form of formalised business analysis but also as a cultural feeling which values impressions from the external environment. The principle is not limited to a customer perspective or even the customer's customer. Instead the focus is on the fundamental drivers in the organisations line of business.

### **3.6.2.3 Systems Thinking**

Cause and effect relationships and full implications of actions are two fundamental concepts in this principle. The effect should be that members in the organisation can see their, and the organisation's actions as a part of a larger system. This should give the organisation a whole systems view over their present situation and what consequences they can expect from a certain cause.

## **3.6.3 Mobilizing Resources**

The resources in a company are often diversified but need to work together and support each other. The principles in this group relates to that. Companies with advantages within this group can use the different competences and perspectives within their organization to make more efficient use of their resources. The three principles in the group are Open Information Flow, Alignment and Empowerment and Disciplined Decision Making.

### **3.6.3.1 Open Information Flow**

An organisations ability to let information flow freely affects its performance many ways. Free information often prevents a company from reinventing the wheel and it can be used as a mean for dialog where the company's best interest comes first. Information can also

be a source of illegitimate power which is normally negative for an organisation. The principle says that virtually all information in a company should be available to everyone. The only exceptions should be information that is secret due to personal or legal reasons.

### **3.6.3.2 Alignment and Empowerment**

The values and strategies of an organisation should be clearly communicated to everyone in the company. If all members know what is considered most important more decisions could take place at a lower level of the organisation and thereby freeing up top management for more important decisions. The organisation must therefore create a culture where the members feel empowered to act and know which kind of decisions they should take part in.

### **3.6.3.3 Disciplined Decision Making**

This principle links strategy, value and decisions. The organisation has a number of views which are considered more important than others. These views must be considered and acted on in the day to day decisions. This could be done with formal decision support tools linked to strategy and objectives or by more informal ways as culture. The important thing is to not lose the strategic focus in the day to day decisions.

## **3.7 Organizational IQ**

Matheson and Matheson also present a method for measuring performance within the nine principles with the help of a standardized inquiry, see appendix 2. The results from the inquiry can be transformed to a benchmarking value. This is done by comparing the firm's score with a database containing hundreds of companies and their test scores. The benchmarking value takes the same form as an IQ-test. The score is thus a normal distribution with a mean of 100 and a standard deviation of fifteen. The results can also be interpreted graphically and then show an organization's abilities within each of the nine principles. This is done by placing the positive and negative sum from the five questions graded from minus three to three on the axis in figure 3.7.

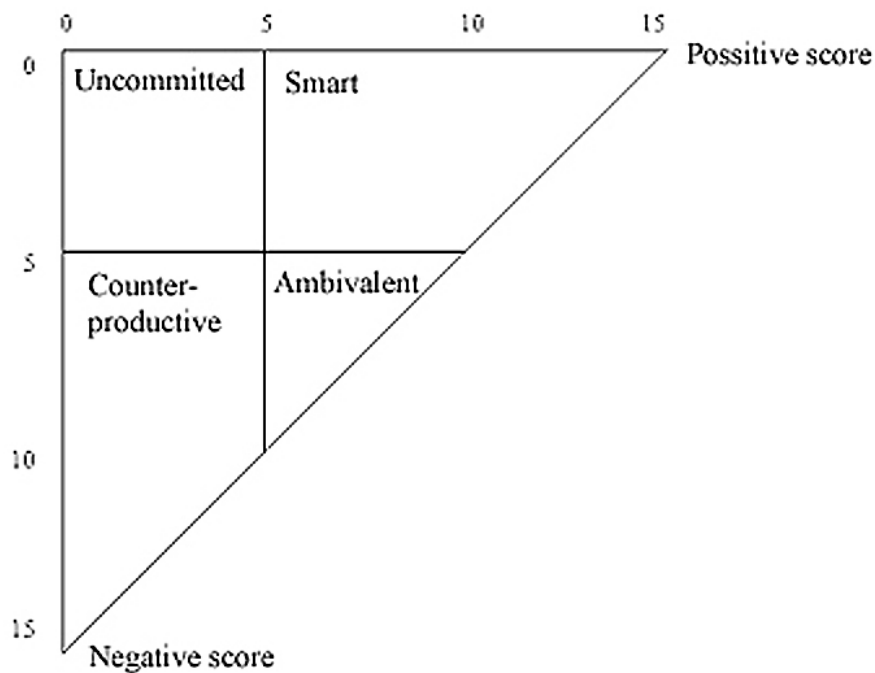


Figure 3.7 The Organisational IQ Assessment Profile<sup>147</sup>

In our study there are some principles that are more important than others. We have therefore chosen to measure only those principles that are important to our work. This means that we can't get an overall benchmark in the form of an organizational IQ value but we can still use the framework to get a graphical interpretation of the studied principles.

### 3.7.1 Criticism

The nine principles for smart organisation is a framework for measuring an organisation's R&D potential. There are many frameworks which claim to do this. One example is "The Innovation Report Card" which measures in a number of dimensions but is focused on the performance of a single team.<sup>148</sup> Another is a study which presents a framework containing sixteen practices for senior R&D managers.<sup>149</sup> The nine principles have an advantage on many of the other theories since it have a focus on the R&D for the entire company.<sup>150</sup> It is also founded on a large empirical material.<sup>151</sup> We therefore think that the nine principles are a suitable tool for our purpose.

<sup>147</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>148</sup> Lynn, Gary S.; Reilly, Richard R.: *Measuring Team Performance*, 2000

<sup>149</sup> Harris, Richard C.; Lambert, Jean Trescott: *Building Effective R&D Teams: The Senior Manager's Role*, 1998

<sup>150</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>151</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

There are some general difficulties with frameworks focusing on a limited part of an enterprise. These are linked to the focus in itself and its exclusion of other parts of the company. The nine principles for example lack the finance dimension of R&D in respect to the costs for transforming an organisation from bad R&D to good. It can therefore not answer the complete question on how to be an excellent R&D organisation.

In the framework all principles are considered equally important. This follows from the lack of weighting the principles against each other.<sup>152</sup> This could lead a company to improve principles that are not important to them or to the business they are in. This is however not critical in our study since we choose the dimensions to measure in reference to what's important in our study.

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<sup>152</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

## 4 Empirical Studies

*The chapter starts with a small description of Trelleborg AB and the company's concept and strategic platform are presented. The division of Industrial Hose is then described briefly. The R&D process of Industrial Hose is presented both portraying the strategic approach and the process using primarily the interviews as a source. The knowledge management aspects of the firm are presented in a certain section.*

### 4.1 Trelleborg AB

Trelleborg AB is a global industrial group focused on industrial appliances containing polymer materials and technical solutions relating to their products. During its one hundred year old history the company has developed from being a local manufacturer of bicycle tires and industrial rubber to one of the worlds biggest producers of industrial rubber employing 22000 people in 40 countries. During its one hundred year history the company has faced a couple of financial crises leading to big redefinitions of the strategy and the business profile. In one period of time the company was a conglomerate with businesses primarily in mining and rubber. The latest shift came in the mid nineties when the company was struck by a recession that led to ruthless sinking of the metal prices and the Swedish building market to collapse. Big parts of the concern were sold and in the fall of 1995 the group was on sound financial ground, still very differentiated. At the turn of the millennium a new strategic approach was initiated by Fredrik Arp. The business was concentrated to the identified core competence, being polymer technology and applications. The change was made possible through sell-outs and acquisitions. Throughout its history the company has been in the frontier of the technical area in its market niche through strong R&D focus, strategic alliances, mergers and acquisitions. For instance was the world's first winter tire developed and produced by the company in the fifties.<sup>153</sup>

#### 4.1.1 Concept and strategic platform

Trelleborg's business concept is, quote:

*“Trelleborg damps, sea s and protects in demanding industrial environments worldwide. We offer our costumers designed solutions based on leading polymer technology and unique applications expertise.”*

The group uses three fundamental tools to meet the expectations of its shareholders, costumers and employees. They are its *values*, *strategic platform* and *financial targets*, as seen in figure 4.1. The strategic platform is built on four cornerstones.<sup>154</sup>

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<sup>153</sup> [www.trelleborg.com/centenary](http://www.trelleborg.com/centenary), 22-04-2005

<sup>154</sup> Trelleborg AB Annual Report 2004



#### 4.1.1.1 Leading positions in attractive segments and markets

Trelleborg wants to achieve market-leading positions, which they define as first, second and third within clearly defined product and market areas. The reason is that they believe it will lead to added value for their customers and gives the company a stable ground for financial growth.<sup>155</sup>

#### 4.1.1.2 Organic growth

Trelleborg focuses on creating stable and continuous organic growth. The company identifies three dimensions of organic growth.<sup>156</sup>

- Product
  - Customer focused research
  - Development in new product applications and functions.
- Market
  - Penetration of new geographical markets.
- Customer
  - Penetration of new customer segments.



Figure 4.1 Values, strategic platform and financial target<sup>157</sup>

<sup>155</sup> Trelleborg AB Annual Report 2004

<sup>156</sup> Trelleborg AB Annual Report 2004

<sup>157</sup> Trelleborg AB Annual Report 2004

#### **4.1.1.3 Acquisitions that generate synergies**

The Group has quite aggressive growth targets that presuppose a continuous acquisition strategy based on a number of criteria.<sup>158</sup>

- They shall contribute advanced engineering or technologies that create added value.
- They must support the build-up of critical mass in attractive markets necessary to achieve leading positions.
- They shall offer solid potential for organic growth.

#### **4.1.1.4 Operational excellence**

The concern strives to provide its customers with products and solutions of high quality and to offer competitive prices at the same time. According to the company this requires that they constantly develop their cost effectiveness. The Group continuously reviews aspects such as purchasing, processes and production localization.<sup>159</sup>

## **4.2 Industrial Hose**

Trelleborg consists of five major business areas (BA), Automotive, Wheel Systems, Engineered Systems, Building Systems and Sealing Solutions. The BAs are self managed profit centres sharing a number of services such as legal, finance, high level HR, taxes and group structure.<sup>160</sup> Engineered Systems employs more than 3000 people and has net sales of 430 million Euros. The headquarter is located in Trelleborg. The EBTA was about 30 million Euros in 2004. The business area is divided into two equally big market segments, Fluid Systems and Engineered Solutions and the production is spread among twelve countries.<sup>161</sup> Industrial Hose is the biggest out of eight business units (BU) in Engineered Systems.<sup>162</sup> Trelleborg Industrial Hose Business Unit is dedicated to develop, manufacture, market and distribute rubber-based hoses and assemblies.<sup>163</sup> In 1996, the Trelleborg Group had a strong position in Scandinavia and a weak position in the rest of Europe, whereas CMP/Kléber Industrie was strong in France, Germany and Southern Europe according to the Trelleborg homepage. When Purchasing the CMP/Kléber Industrie company from the international French Michelin group in 1996, Trelleborg felt they took advantage of geographical complementarities of the two companies and argues that they became one of the leading producers of industrial rubber hoses in Europe.<sup>164</sup>

According to Christian Caleca, president of the BU, the sales amount to roughly 100 million Euros (94 M€, 2004<sup>165</sup>) and the unit is organised in four product areas (PA) as well as four geographical sales areas (SA) in a form of a matrix. The organisation chart is presented in figure 4.2. The PA's are small teams consisting of six to eight people

<sup>158</sup> Trelleborg AB Annual Report 2004

<sup>159</sup> Trelleborg AB Annual Report 2004

<sup>160</sup> Stéphane de Tavernier, Group Business Development at Trelleborg AB, interview, 19-04-2005

<sup>161</sup> www.trelleborg.com, 21-04-2005

<sup>162</sup> Stéphane de Tavernier, Group Business Development at Trelleborg AB, interview, 19-04-2005

<sup>163</sup> www.trelleborg.com 20-05-2005

<sup>164</sup> www.trelleborg.com 20-05-2005

<sup>165</sup> Internal material, Industrial Hose, Trelleborg AB

including a manager, a director of marketing, a research engineer, a couple of technicians for production matters as well as prototyping and a couple of assistants. The PA is responsible for the products; including R&D, marketing and sales. The SAs each consists of about 10 to 25 people where about half of them are sales managers on specialised markets and the rest are indoor salespeople. The PAs or even the plants can choose to use the SAs or to sell to the customer directly. There is also a central structure with an operations department in charge of production and logistics. Support functions as technology development, quality, human resources and controller functions are run centrally as seen in figure 4.2.<sup>166</sup>

The Geographical areas are Northern, Western and Central Europe along with the area named Overseas. *Northern Europe* is observed from Trelleborg and the area is believed to have a good development due to the economic growth in the area. Of course the market in Norway is closely connected to the oil price, Mr Caleca says, and he also believes that the Baltic has got good potential. The region of *Central Europe* is watched from Germany. The regions potential is closely connected with the German economy. The penetration of Eastern Europe is a burning platform and Poland is seen as a key market.<sup>167</sup> *Western Europe* (and southern) is monitored from France. Problems in France are connected to politics since army and navy budgets do influence the business. In Spain there has been an extensive growth but the future seems uncertain. The geographical area *Overseas* (UK and the rest of the world) consists of every other country. The different product areas are represented in very different amounts in the Americas, Africa & Middle East along with the Pacific & Asia. The Geographical area where Mr Caleca thinks Industrial Hose can grow the most is Asia, excluding Oil & Marine which has global potential.<sup>168</sup>

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<sup>166</sup> Internal material, Industrial Hose, Trelleborg AB

<sup>167</sup> Internal material, Industrial Hose, Trelleborg AB

<sup>168</sup> Christian Caleca, President of Industrial Hose, telephone interview 19-04-2005

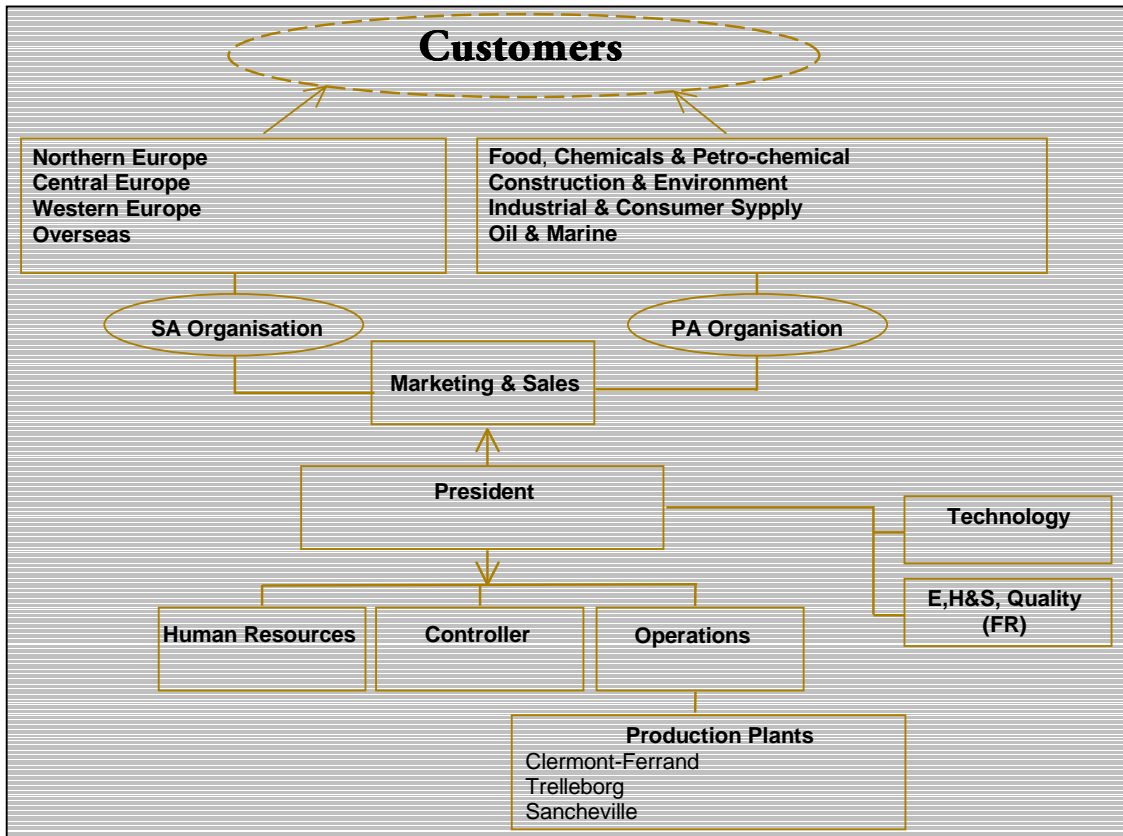


Figure 4.2 Organisation chart Industrial Hose<sup>169</sup>

The product area of *Industrial and Consumer Supply* makes up circa 39% of the sales in Industrial Hose 2004 and has its action area mainly in Europe and a little overseas. The PA primarily feels competition out of Asia in general and China in particular and experience low growth and low profits.<sup>170</sup> The market diminishes 2% yearly except in some niches.<sup>171</sup> The area also feels pressure from the commoditization of some products.<sup>172</sup> About 19% of Industrial Hose consists of *Oil and Marine* which, according to Mr Caleca, is active in an attractive market. The products are mostly large bore diameter hoses for Oil transfer at offshore terminals. The PA is growing 10-15 % on a yearly basis in a market where high quality is demanded and the price of oil has made the buyers less cost sensitive. There are 5-6 major players on a global market.<sup>173</sup> The PA *Food, Chemical and Petrochemical* constitute 22% the BU Industrial Hose. The products are many and quite diverse. For example hoses for the dairy, wine and hydrocarbon industry. The annual growth is approximately 5-10%, and the areas have good profit.<sup>174</sup> *Construction & Environment* comprises the remaining 30%. The products include hoses for concrete, waste, mining materials, the cleaning of sewers and so on, but also

<sup>169</sup> Internal material, Industrial Hose

<sup>170</sup> Christian Caleca, President of Industrial Hose, telephone interview 19-04-2005

<sup>171</sup> Internal material, Industrial Hose, Trelleborg AB

<sup>172</sup> Christian Caleca, President of Industrial Hose, telephone interview 19-04-2005

<sup>173</sup> Christian Caleca, President of Industrial Hose, telephone interview 19-04-2005

<sup>174</sup> Christian Caleca, President of Industrial Hose, telephone interview 19-04-2005

installations like ventilation systems. The areas have limited profit due to the dependence to the price of the dollar. The market is recognised as a highly competitive and mature one. The growth of the product area is roughly 3-5% per year.<sup>175</sup>

### 4.3 Research and development in Industrial Hose

#### 4.3.1 The strategic approach to R&D

On the managerial level of Industrial Hose there is a long time plan for the product, research and market portfolio of the business unit. The management uses the concept of different horizons to illustrate the strategic thoughts. The matrix consists of the three aspects product/segment/application, technology/materials and geographical markets as well as the dimension of time, divided in the three horizons. The chart in figure 4.3 is emptied because of confidentiality reasons but show the concept. In the first time horizon the extension and the defence of existing core business are urged. This could be the marketing activities of an existing product or the small continuous development of products, materials and markets. In the second time horizon the building of emerging business is emphasised. The focus is on new products and applications within the existing product areas. The specific projects are in different faces of the development and marketing. The material research in this time span is well defined and on its way, for example being new composites and rubber mixtures with sought for characteristics. The third time horizon is named “create viable options” and is the most visionary. The future options are evaluated including completely new segments, business concepts and markets. Even materials outside the identified core competence of Trelleborg are considered.<sup>176</sup>

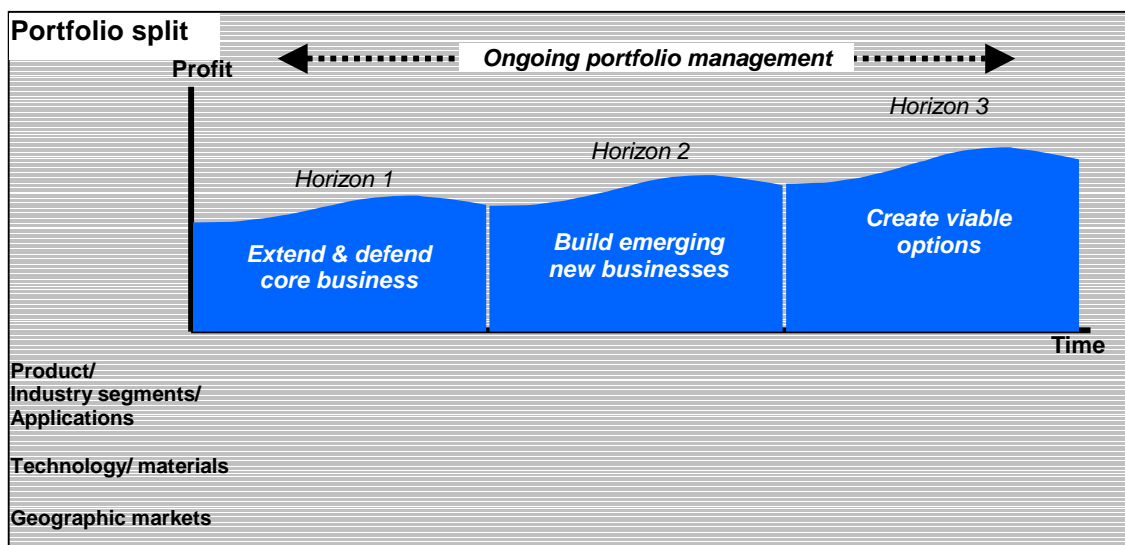


Figure 4.3 The Portfolio Split in Industrial Hose

<sup>175</sup> Christian Caleca, President of Industrial Hose, telephone interview 19-04-2005

<sup>176</sup> Internal material, Industrial Hose, Trelleborg AB

When the portfolio of R&D was discussed in the interviews and coupled to time horizons a quite clear picture was made. There is a very clear focus on the existing markets and products. The reason for this is most often lack of resources to do pure research. Olivier Libes, product manager of PA Construction and Environment, puts it this way:

*“It would be great, but... ..in our daily business we don’t have time to do pure research a part from [development of] direct customer requirements.”<sup>177</sup>*

A couple of the respondents think that they would need more manpower to be able to spot and follow through the potential products and solutions of the future.<sup>178</sup> This is also the view of Jacques Cognard, product manager of Oil & Marine.

*“Today we have about 49% percent of the resource is dedicated on the first horizon.....Roughly 49 % is dedicated to the near future; let’s say 2-3 years. And finally very little, I would say 2%, is dedicated to the visions, to the future. In the list of projects, we have some activity that would be interesting in a development of ten years. At the moment we don’t put to much activity on horizon 3, but that will change till the end of the year [when we employ one more person].”<sup>179</sup>*

One problem that was put forward, concerning the need for manpower, is that one extra person in a PA would mean a jump in personnel cost of roughly 12% in the PA. That kind of commitment to the third horizon, the most visionary, can be hard to support because of the uncertainties in long projects as well as the demands to immediate results from Trelleborg Group.<sup>180</sup>

Others have their centre of attention on the present by choice. There is a strong consensus among those people that it is most important to prioritise the current customer needs when resources are limited. For the plant in Trelleborg, Mr Hoboh sees it very clear:

*“It is perfectly clear that, at the current state (to survive); it’s all about adjustment to customer, development of products in the direction the customers require and quick delivery.”<sup>181</sup>*

Three of the respondents put forward that the waiting for other players in the business unit within a development project makes it harder to pull through projects that are positioned towards the future. The uncertainty became too high.<sup>182</sup> Most of the respondents saw a direct connection between the development of new products and organic growth as well as the penetration of new markets with existing products.<sup>183</sup>

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<sup>177</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>178</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>179</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>180</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>181</sup> Interview V, Ingemar Hoboh, Hose Factory Manager of the plant in Trelleborg, 16-05-2005

<sup>182</sup> Interview V, Ingemar Hoboh, Hose Factory Manager of the plant in Trelleborg, 16-05-2005

<sup>183</sup> Interview II, Christine Diersat, Marketing Director, Food, Chemical and Petrochemical, 11-05-2005

As have been put forward many saw the importance in the third horizon but did not have the resources to look far ahead today. When asking the sales manager about the three horizons he spontaneously talked about the problems many experience, in finding room for the visions. It seems that this is a burning platform at Industrial Hose. First of all he explained that the product area organisation is quite new, only two and a half years since the design have gone by. He also found a reason in the fact that Industrial Hose previously was divided in only two market segments that made long term possibilities disappear in the crowd of products in each segment. Mr Pieret thinks that this will improve with the PA organisation in time as he clarifies.

*“What has been improved with PA is more segment focus being more selective in what we want to develop and maintain or, in a second step, invest in. Month after month we have a better grip of what we want to do, when and why. At first we were 8 product areas, we are now 4. In the mean time [as the change is carried out] we make sure that we have priorities that we want to promote. We are less thinking products and more and more thinking market.”<sup>184</sup>*

Mr Pieret explains why he thinks the costumer/product focused way sometimes is more short-sighted than a market focus.

*“This company is a merge of a Swedish and a French company. The French part was very much a company of engineers, driving the production but also the product very much. [They were] too focused on the costumer in fact, in the sense that they let the product and costumer need command everything. [Too focused] due to that the development was based on costumer requirements of today more than market surveys and market analysis [of tomorrow].”<sup>185</sup>*

The product area of Oil & Marine has grown organically 625% in ten years.<sup>186</sup> PA manager Mr Cognard gives his thoughts about why this has been possible, giving us four reasons.

*“Why? Number one is Luck; the oil price, the global trend, to be on the right market. Number two is hard work; increase sails in standard products, through good products, service and low prices. Number three is innovation 40-50% of our turnover is new products [<10y]. The fourth, but not least important, is selectiveness; Choice of costumers that are good for us in a long term relation. Not only price sensitive, but also interested in innovation and technology. We give the best service to them... ... The others will follow. The [arrowhead] competence improves our image.”<sup>187</sup>*

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<sup>184</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>185</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>186</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>187</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

## 4.3.2 The R&D process from idea to prototyping

### 4.3.2.1 Idea creation

The path from an idea to a sold product varies in Industrial Hose but there are some general ways. The idea is generally generated in the contact with the customer. Often an existing customer needs new features on the hoses because of a change in their process.

A change in one of the customers' processes is not only seen as a great opportunity to develop the relationship but also a chance to penetrate new markets. When Industrial Hose tried to enter the market of wine producers the breakthrough first came when the process technology changed within the industry, meeting up with new EU-standards for the food industry. The wine industry had been seen as a potential market for a long time since the products that could be used there are identical to the products used in the dairy industry but until that point they had used cheaper plastic hoses. The marketing manager of PA food, chemical & petrochemical, Christine Diersat, thinks that the change of process made it worth while for the customers to use the more expensive rubber solution.

*“The price difference is so large that they didn't want to give rubber hoses a chance... ... (But) a change of process and quality requirements was the starting point for the end users changing their minds. At that time we introduced a new coupling feature normally used in hydraulic hoses that isn't applicable on plastic which gave big benefits to the user. The benefits using rubber when dealing with temperature change and the hesitance towards plastic concerning cancer risks gave our solution the final push”<sup>188</sup>*

The process described above; to develop the market with existing products is generally seen among the interviewees as one of the ways to grow organically. A process change at the customers can also lead to ideas to develop and replacing existing products. Many of the respondents testify that this is the most common kind of product development within the company. The change could often involve new diameters or a new pressure demand, but sometimes the new demands require a research in a new compound for the hoses. The idea itself should ideally be picked up by the sales people, close to the customer.<sup>189</sup> One example of this is a hose produced by the Trelleborg plant that will be used in fire extinguishing, shooting a mixture of sand and water through a wall into the fire. The producer of the hose had special demands as plant director Ingemar Hobroh explains.

*“They buy one of our products, a Treljet hose that is normally used for high pressure cleaning, because they find it the best one. In the discussion with the technician a need for making the hose visible in the dark was discovered. At the moment we have two types, one with a fluorescent line and one in a bright colour. Both [colours] are incorporated within the material of the hose. The fluorescent colour is expensive but might add a great value to the customer.*

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<sup>188</sup> Interview II, Christine Diersat, Marketing Director, Food, Chemical and Petrochemical, 11-05-2005

<sup>189</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005



*The contact was made through a sales person who met with the costumer and saw the opportunity.”<sup>190</sup>*

Mr Hobroh feels that it is important to be able to send a production technician to the costumer quickly to be able to explore ideas involving costumer adjustments. In this case the PA was not involved. In the occurrence of more innovative developments of the products the idea is still often a part of the discussion with a costumer. Industrial Hose has three main types of costumers; distributors, original equipment manufacturers (OEM) and end users.

In the development of the hose called Sirocco PA manager Olivier Libes got the suggestion from a visit at a costumer. The concept of the hose is to transport powdered materials at for instance a concrete factory instead of using carts or conveyor belts.<sup>191</sup> This can be done using a system of air channels and a felt causing the powder to behave like liquid. The advantage with the hose is an 80% decline of energy usage and the ability to use a closed process.<sup>192</sup> The costumer, a specialised distributor had in that case a concept idea that could be brought back to the R&D department of Industrial Hose for development.<sup>193</sup> Sometimes a totally new product area is introduced by a costumer. This was the case in the development of an underwater cable protection system for remote operated vehicles used at the bottom of the sea to measure the state of oil drilling holes. Due to the immense pressure change an enclosed system filled with silicon oil is used to protect the cables. This is done to be able to vary the internal pressure depending on the depth which of course puts special demands on the materials used. Sales manager Kenneth Mårtensson explains how the innovation project was initiated.

*“We solved a difficulty for a Norwegian technical engineering company, a supplier to the oil industry... ..They came to us presenting the problem and the solution was worked out in Trelleborg by a project team, not without difficulties though.”<sup>194</sup>*

Today Industrial Hose supplies three out the five big producers of these extreme machines. Other sources of innovation are the claims from the end users. If a product works improperly the claim can in fact lead to improvements or a completely new solution as Olivier Libes, the PA manager of Construction and Environment tells us.

*“The end user knows the best how to use and how to destroy our products, so the best discussion we can have is with them, either to develop new products or to improve the ones we have.”<sup>195</sup>*

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<sup>190</sup> Interview V, Ingemar Hoboh, Hose Factory Manager of the plant in Trelleborg, 16-05-2005

<sup>191</sup> Interview III, Kenneth Mårtensson, Overseas Sales manager, 11-05-2005

<sup>192</sup> Interview V, Ingemar Hoboh, Hose Factory Manager of the plant in Trelleborg, 16-05-2005

<sup>193</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>194</sup> Interview III, Kenneth Mårtensson, Overseas Sales manager, 11-05-2005

<sup>195</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

Mr Libes uses an example of a hose that the costumers complained about, always having the same problem. Analyses led to the usage of a new coupling that solved the problem and improved the product. When it comes to the issue of intrapreneurship the views differ. The technical director Robert Colley tells us that true innovation is often initiated from within.

*“We don’t do a lot of real innovation because we are not so good in analysing the costumer and market need and how we could use this. There are some idea generation from within, for instance, the material research is active in finding new solutions. Quite often it is from within the idea for true innovation comes. The costumer demands are quite often comparable with existing standard products from competitors that the sellers want to match and not really innovation”<sup>196</sup>*

Kenneth Mårtensson, sales manager of the SA Overseas has different view.

*“Absolutely the majority of the impulses come from a costumer need. Some improvements come from the PAs and development department, but it is seldom products that you never heard about.”<sup>197</sup>*

#### **4.3.2.2 The project**

When the idea has hatched it need to find its way to the PA in charge of the segment. It is the PA that owns the project from that point on.<sup>198</sup> If it’s a costumer request it often origins from the sales organisation. When the sales person has identified a candidate he or she can launch an official request as Kenneth Mårtensson tells us.

*“We can use the request form according to the ISO standard but that it depends on the situation. I personally speak to people at first hand. Before I initiate a request the product manager and I agree that we have to do that specific development. We use the standard to get the follow-up on where we spend both time and money.”<sup>199</sup>*

If the technical request according to the ISO 9001 procedure is launched there is a meeting where people from the PA, like the product manager, the research engineer and maybe one of the technicians, discuss, sometimes with people from production and the technical director, what they could solve together, the potential and what everybody should do.<sup>200</sup> The Technical director also works as something like a coach for the developers in the PA during the process. Mr Libes informs us about what is discussed on the meetings.

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<sup>196</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>197</sup> Interview III, Kenneth Mårtensson, Overseas Sales manager, 11-05-2005

<sup>198</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>199</sup> Interview III, Kenneth Mårtensson, Overseas Sales manager, 11-05-2005

<sup>200</sup> Interview II, Christine Diersat and interview I, Olivier Libes

*“If it’s a market development we have something, not exactly a check list, but we know that we have to check the potential sales, costs, goals and customer technical requirements... ..When it’s a direct customer development the technical requirements are often clear and the communication is more direct.”<sup>201</sup>*

The Technical Request is a document that clearly defines the project, the persons involved, what needs to be done and what has been done in the project. The front page with index can be seen in appendix 4. If it is a complicated matter there can be a need for meetings between the PA engineer or the Pa manager and the customer which can be set up by the sales people.<sup>202</sup> Continuously there are a lot of contacts between the different people involved, within the PA, but also to the technical director and the sales manager as Mr Colley tells us.

*“We have frequent contact with the PAs. Apart from the near daily contacts we have more formal meetings with the sales and marketing director [every second month]. We go through all the projects and make a sort of ranking.”<sup>203</sup>*

The criteria for the choice of prioritised projects are the potential business and gross profit as well as the difficulties concerning production capability or technology. The evaluation is done on each PA and they get their own priority list.<sup>204</sup> The evaluations of the potential projects are often done in the form of a discussion about a proposal from the PA. Mr Cognard feels that the product areas often lack the resources to do a proper analysis

*“The autonomy is great but we are at PA-level so small that we can’t do appropriate analyses for the future. The risks and potentials are mainly intuitive. Regarding the risk for example we have a discussion with the management about financial, market development, the technical risk and then decide; this one is ok, this one is too risky. There is no formal way to do that evaluation because that would take too much resource on a PA level.”<sup>205</sup>*

Mr Cognard thinks that it might be a good idea for the Trelleborg group to support the divisions in the work with project analysis. There is, according to him, a juridical department in the group that works very well in those few occasions you need the support. Maybe the same thing can be done in the area of investment analyses.<sup>206</sup> When a project is deemed as doable and important the project is carried out according to the ISO9001 protocol, including numerous meetings and reviews as Mr Colley informs us.

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<sup>201</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>202</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>203</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>204</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>205</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>206</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

*“We work according to the ISO 9001 plan so there are a lot of reviews and check-ups. A development plan and intermediate reviews before going to prototyping and are used. There is an organisation procedure how to handle costumer demand in the whole of the organisation; the Design Procedure... ...in some development projects we have over eighty meetings also including production personnel.”<sup>207</sup>*

There are some development projects that concern more than one product area, for example improvements in a production line. Those projects and those concerning new couplings are run by the technical department.<sup>208</sup>

#### **4.3.2.3 Compound research**

Often when a product development or innovation is carried out there is a need for new compounds. In Industrial Hose there is laboratory under the technical department that can be used in the research. Technical director Mr Colley puts it this way.

*“Most of the times we need to develop one or two compounds to be able to create a new product; therefore it comes through my department. I don’t have a direct responsibility for the technical people but I work as sort of a coach for them...//...The engineer often physically follows the project in to the lab and work together with the central development.”<sup>209</sup>*

There are some question marks about the current way to perform compound research in the organisation. The time issue and that it is sometimes hard to get research prioritised or done are the main issues. The Swedish plant doesn’t use the business unit’s research lab very much as Mr Hoboh tells us.

*“All the development work on the hoses produced here is made here. We get the requirements from France in those occasions. When we want to use the material research lab it has taken to much time for the trial materials going back and fourth for example. We are very fast here... ...Normally we can have a first answer on a costumer request within hours or days”<sup>210</sup>*

Christine Diersat is new marketing director in the PA food, chemical and petrochemical and found, when she began that there were cases of product development that were pending since quite some time because of that the material research was taking time.

*“If we need a new compound it takes way to long”<sup>211</sup>*

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<sup>207</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>208</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>209</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>210</sup> Interview V, Ingemar Hoboh, Hose Factory Manager of the plant in Trelleborg, 16-05-2005

<sup>211</sup> Interview II, Christine Diersat, Marketing Director, Food, Chemical and Petrochemical, 11-05-2005

The PA Oil and marine has just started a project concerning the fatigue of the rubber material in extensive usage. That research will be done in cooperation with the technical department. Normally the PA, which has a rather different product portfolio, does its research outside Industrial Hose as Mr Cognard tells us.

*“The PA is small... ..we externalise the research/innovation... Today we are working with for example the University of Clermont Ferrand and the knowledge produced is owned by the university. The contact in Industrial Hose has the information, but if he leaves it is lost, we have nothing. We are losing competence and knowledge by externalising it.”<sup>212</sup>*

In the case of the fatigue studies the PA of Oil and marine found that the program was necessary in a discussion with a customer. After that they concluded that there was a need for one person to work on the research together with the technical department as Mr Cognard clarifies.

*“The fatigue is done with Roberts’s gang or in the lab. Otherwise we don’t use the laboratory. The new fatigue studies are done under the control of the PA. It is not complete delegation. It is delegation of the work, not the monitoring.”<sup>213</sup>*

Jacques Cognard thinks that it might be helpful to have a central unit in the group that could support the divisions, much like the juridical help that exists today, both concerning the market analysis and some technical research. There are at least some common interests concerning research in the group as Mr Cognard tells.

*“Central group level works fantastic for communication, juridical and economical support... ..The customers don’t understand why we don’t have a central support... ..We cooperate with BA automotive in Nante [concerning] fatigue; we share result/information with each other because we have the same interest. It is Integration of knowledge, but not formalised, [it is] just because the people, they know each other.”<sup>214</sup>*

When talking to the product area managers we got the impression that they have been losing a bit of the control of the development projects when there has been a need for a compound research. This was confirmed by sales manager Patrick Pieret, but he also said that certain changes will make a difference.

*“The technician is losing control, even if the project is of great importance, when the material research takes place. Officially they can’t impact that procedure. Today the priority list in the development department is not of the control of the PA. There is a waiting list and it might take time, but it is a very complex issue...//...we try to solve this problem. The Technical Director is*

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<sup>212</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>213</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>214</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

*coaching the engineers together with me. A new strategy is to have a technical day, when the Technical director and I go to each PA a couple of hours discussing, than all will meet, discussing what could be done. This will be held 3-4 times a year.*<sup>215</sup>

#### **4.3.2.4 Prototyping**

When a product is ready to be tested there is a face of prototyping and testing both by Industrial Hose and by the costumer to see if it works satisfactory. When the prototype is made it is done on the same production line as the hoses that are in normal production. This causes a stop in the production but also tests the industrialisation part of the project. The hose must be possible to make in the line without having to rebuild a lot since many hoses are made in the same line.<sup>216</sup> There are of course some troubles connected to this practise as Mr Libes reflects.

*“We need more availability in the production... ..sometimes the development can take very long time. Since it is batch production we need to make a certain amount of hose which is way beyond what is needed for a prototype... ..Many years ago, I know that we had a prototype line, but I don’t know if it could be done today. It could be interesting.”*<sup>217</sup>

### **4.4 Knowledge management in Industrial Hose**

#### **4.4.1 Culture**

When Oil & Marine have an idea for a product they usually try to set together a development team including people from the costumer, in this case the oil companies. The reason is that when the buyer has resources locked in the process they are committed to the project and every thing runs smother. To initiate such a team can sometimes be hard though as Mr Cognard reflects.

*“There is a problem finding the right people at the costumer to work with. It can take Three month if it works well or two years if it doesn’t. There is normally no special department at the costumer to develop products with the supplier, except in Statoil. We mostly work with operational people and process people.”*<sup>218</sup>

The time issue is the management aware of which is evident by listening to Patrick Pieret talking about what has do be done in the future.

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<sup>215</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>216</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>217</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>218</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil &Marine, 18-05-2005

*“What hasn’t improved is what I would call the sense of emergency. We are slow. When we are slow we are because we want to do things too well, instead of getting things done, being creative, trying. We want to do things perfectly from day one, and that makes us loose time in many issues”*<sup>219</sup>

Patrick Pieret feels that Industrial Hose was slow in answering the technical demands and requests before but that it has gotten better in the last years.

*“The main reason was that all questions were treated the same, with no sense of priority because they [the technicians] didn’t know very much about the market side. We decided that the majority of the questions should be handled directly by fax, phone or email and only focus on important question in the work flow system. We have a goal that 80% of the important requests will be answered within two weeks, which we have reached”*<sup>220</sup>

Mr Pieret feels that some of the lack of innovation could be something of a mentality issue. He thinks that if they are creative or even present them selves as innovative, costumers will be willing to pay more.

*“We are too slow. We are in the rubber Industrial Hose, low pressure industry. We are not in the telecom but still, it has an impact on our price. It is a mentality issue. We are not able to create innovation, real or virtual. Technically we can create solid innovation. But even if we can’t, the sales people can talk about innovation, but we don’t do that. We have certain problems but it is also an issue of the mind-set.”*<sup>221</sup>

The incentive system is based on the Trelleborg group policy. Roughly one third of the bonus is based on the result of the business unit, one third is based on the result of the smaller team, which could be the product area, sales area or production plant and the last third is based on the personal goals that are set up between the closest manager and the benefited.<sup>222</sup> The third that is personal could be very different as Mr Libes explains.

*“For me it can be matters like reaching a certain sales level on a product or succeeding with a market introduction, while it might be reaching a certain face in the product development for the engineer”*<sup>223</sup>

When dealing with innovation Mr Cognard thinks that there are more important incentives than bonuses. He gives an example. If they are working on a project that will mean 10 million Euros in sales if they succeed, it is vary hard to set the bonus in proportion to the gains. Instead other things are important as he declares.

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<sup>219</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>220</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>221</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>222</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>223</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

*“The bonus is not the most important for the innovation. The bonus is for me a way to show that a project or a change is important for the company and the group, a formalised way that is. Not the most important, though...//...You have to give the people autonomy to find new solutions. You have to create a territory for people where they are free to create, and of course you have to find the right people. This and the work motivating them in the day to day management, working with the people is the most important...//...If you don’t have fun or find pleasure in what you do and if you have no autonomy you won’t push very far. Bonus is far too insufficient. It’s just communication.”<sup>224</sup>*

While making the interviews we found that there was some frustration about the demands to grow organically since the history of the unit defers a bit from other parts of Trelleborg. Mr Pieret explained why.

*“Telleborg group is sending the same message to every unit: We have grown by acquisition, now grow organically! But Industrial Hose is a merger between two loosing companies that after a lot of work and rationalising has reached black figures. It gets frustrating for the people in the PA. We have been changing the workload on their shoulders. We are working with minimized staff now.”<sup>225</sup>*

#### **4.4.2 Infrastructure**

The Organisation in Industrial Hose is normally referred to as the PA organisation and is an attempt to create close inter-functional teams that will be in charge of several aspects of the products. The teams are working together very close and quite close to the management, according to the interviewees.<sup>226</sup> The PA organisation is about two years old and sales manager Patrick Pieret thinks that a lot has already, for example the interface between the product development and the market, but there are still issues, for example the interface to the production.

*“There is something missing. There is a direct contact in a technical sense, but there is also a step in between. We are still not very good in teaming up market with production. Before there were many interfaces and steps and therefore it was easier to work formalised. In the PA organisation the last interface is between PA and production, when finalising a key project we need to make a review between PA and production.”<sup>227</sup>*

He also feels that the concept is appreciated and the people understand what and why it is done. There is according to his reading some frustration based on he fact that they haven’t had the technical parts as close to the market as they wanted. The reason for that,

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<sup>224</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>225</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>226</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>227</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005



he said was, that they have been cutting costs, reducing staff, changing quality systems and logistics at the same time. It is killing the dream, was his exact words.

There are meetings within the group where the different PAs meet to discuss the current situation, R&D and so on. In at least one occasion there has been a transfer of ideas leading to a new product as Mr Libes tells us.

*“In one of these occasions the engineers spoke informally about technical solution the other PA (food, chemical, & petrochemical) used. We now have a product with that inner line for the pharmaceutical industry.”*<sup>228</sup>

The People in the business unit are very seldom or never cooperating with other parts of Trelleborg group. The feeling is that it is probably fairly different products, but that they don't know if they could benefit from such cooperation.<sup>229</sup> There are no group meetings except for the presentation of the annual report. There is no convention for the engineers or others.<sup>230</sup> According to Mr Pieret there was an attempt of starting a research centre in Trelleborg but my feeling is that, there are synergies in the Automotive part but that the in rest of the group the business is too fragmented. About the business area Engineered Systems Mr Pieret makes the statement that the BA is more a conglomerate of different companies than one. When asked about the core competence that Trelleborg group is proud of and how the core competence can be seen in the group, he says.

*“The consolidation of knowledge is not so great. There is some strength in finance, IT, purchasing, but in R&D (except for Automotive) there is very little, even if people and managers are encouraging dialogue and cooperation, there is nothing formalised...//...[and about the actual contacts being made between business areas] Yes, entrepreneurs are interested in doing that!”*<sup>231</sup>

The plant in Trelleborg is somewhat parallel to the rest of the organisation in some ways. The reason for it to not be totally incorporated in the PA-organisation was that the plant had its own research personnel and they were doing work for all the different PAs. They also manufacture special hoses that in certain ways lay outside the segmentation of the PAs.<sup>232</sup> The plant is sometimes working as a subcontractor, and that is supported by the management of the business unit.<sup>233</sup> Mr Hoboh feels that the location in Trelleborg gives the plant some advantages.

*“The closeness to the market also has great importance. We have a lot of business with Norway due to the close contact we can have.”*<sup>234</sup>

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<sup>228</sup> Interview I, Olivier Libes, Product Area Manager, Construction & Environment, 10-05-2005

<sup>229</sup> Interview II, Christine Diersat, Marketing Director, Food, Chemical and Petrochemical, 11-05-2005

<sup>230</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>231</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>232</sup> Interview V, Ingemar Hoboh, Hose Factory Manager of the plant in Trelleborg, 16-05-2005

<sup>233</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>234</sup> Interview V, Ingemar Hoboh, Hose Factory Manager of the plant in Trelleborg, 16-05-2005

### 4.4.3 Technology

Industrial Hose have a couple of different ways to communicate and spread knowledge by the use of technology at the moment. Telephone, email (Lotus notes), the intranet as well as written material and reports are all used in various ways in the process. There is also a video conference system which is seldom used. The intranet in Trelleborg group is called Trelleborgnet and is, according to the interviewees, used primarily to know what is going on inside the group, to find telephone numbers, internal job appliances and to see what products there are in the group. The sales people also use it to find information about the product features. There is a system on the intranet for communicating within a project group, but other means are often used as Kenneth Mårtensson put it.<sup>235</sup>

*“E-mail is the prime tool for daily communication. It depends on the person and situation if you can get hold of them. If it doesn’t work I call them. But we use e-mail a lot!”<sup>236</sup>*

All the reports that are produced in the different projects, for instance the reports within the ISO9001 standardised development process are saved in files, paper files. They are not digitalised.<sup>237</sup> After a project, if it’s done correctly, there is a review and the result is filed as a paper file.<sup>238</sup> Also papers produced by external sources are saved, but it is not easy to use, according to Mr Cognard, due to the level of the knowledge.

*“We have thousands of sheets of paper with this knowledge. But it’s not easy to use. We are very depending on one person. A lot of the knowledge is silent [tacit] knowledge and can not be shared. The knowledge in the papers is on high level and today only one engineer can use it. We are very depending on him and the external organisations he use.”<sup>239</sup>*

The interviewees are fairly agreed about what kind of information that could be of use in the whole group. It is important that the information isn’t too detailed, both because of security reasons and of work load reasons.<sup>240</sup> Mr Cognard knows what would be of use for him.

*“What we would want to do today is a list of the work that has been done, at least for the company to know what type of knowledge we have. There is no information about what people know and work on and their results. It might help to have that kind of system on a group level, but it is a huge work... ...At least so you can get hold of the right people.”<sup>241</sup>*

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<sup>235</sup> Interview III, Kenneth Mårtensson, Overseas Sales manager, 11-05-2005

<sup>236</sup> Interview III, Kenneth Mårtensson, Overseas Sales manager, 11-05-2005

<sup>237</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>238</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

<sup>239</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>240</sup> Interview IV, Robert Colley, Technical Director, Industrial Hose, 13-05-2005

<sup>241</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

When asked if there are any meetings on group level that discusses research and innovation

*“It would be a good idea, you know at universities they issue papers. We don’t at Trelleborg, regarding the development, but it is a question of time. We could issue a four page paper to summarise what we have done. To make it available at group level for example using the intranet could be interesting. If not a paper we could imagine a form with questions, one page; to see what, who and where. It must be done at group level and it has to be done all over, at the same time.”<sup>242</sup>*

The structural knowledge seems to be locked in the processes at Industrial Hose. When discussing the codifying of the personal tacit knowledge Mr Pieret responds like this.

*“What I realized in this company is what is needed within this organisation to do things correctly without mistakes is well incorporated within the procedures and is well specified in the systems. Our know-how is kept. The company knows what and how to do things. What is not good enough is some satellites that are<sup>243</sup> needed to keep the knowledge. The knowledge of the individuals, a sales person or an engineer is not codified”<sup>244</sup>*

A database which stores all the product material features is available to the people in the business unit. The program is run by the technical department. There seems to be some problems to get the information to all people in the organisation that might need it, as Christine, who is a marketing director, states.

*“I haven’t seen the files about the old projects, because I have been busy finding new ones. There is a system though; a database, but I don’t have access to that one.”<sup>245</sup>*

One current knowledge system that is on its way is a mathematical program that can be used to simulate the new products, thus making the development a bit faster, Robert Colley says.

There is an education program apart the normal information packaged you find at companies for the newly employed. It is called the TOP-program, and is build by Mr Caleca. All recently employed personnel have to go through sessions including several modules. There are group presentation and BU strategy modules as well as PA, logistics and so on. One module is to visit different parts of the company experiencing the system. Mr Pieret tells us why it was created.

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<sup>242</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>243</sup> Interview VI, Jacques Cognard, Product Area Manager, Oil & Marine, 18-05-2005

<sup>244</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

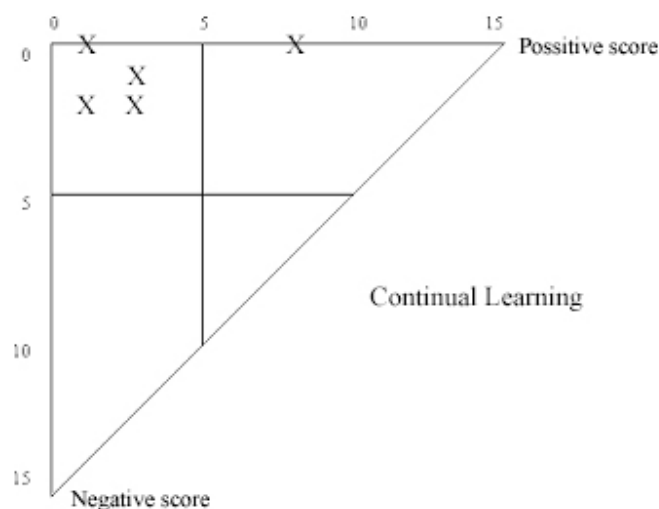
<sup>245</sup> Interview II, Christine Diersat, Marketing Director, Food, Chemical and Petrochemical, 11-05-2005

*“We have to make the new people to stay, giving them a certain feeling of ownership. Young people move and it is good, but we have to make them want to stay and contribute for a while.”<sup>246</sup>*

## 4.5 The inquiry

The answers from the inquiry are presented in two figures according to the theory presented in chapter 3.7. The specifics of the test presentation can be seen in figure 3.7. The score in the inquiry which corresponds to a mark in the figures is the calculated score from one person. Since positive and negative scores are counted separately the four parts of the diagram could all come into play. The inquiry can be seen in appendix 3.

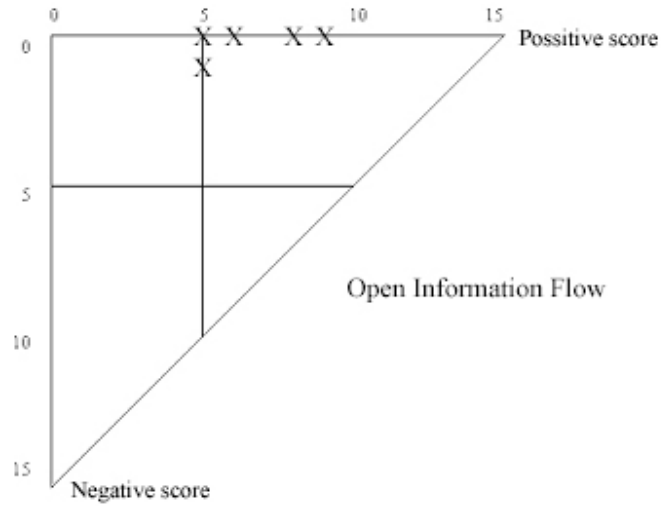
The first of the inquiry question reflects upon the concept of continual learning in the organisation. The respondents were asked to think of the ways of the whole business unit when answering. As can be seen in figure 4.4 the respondents answers are all except one ending up in the uncommitted segment of the matrix. The one respondent that ended up in the smart section wrote that his answers were focused on his part of the organisation.



*Figure 4.4 Continual Learning Assessment Profile*

<sup>246</sup> Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, 19-05-2005

The answers regarding the principle Open Information Flow got a different pattern. The answers are clustered in the smart section or on the border between uncommitted and smart. There were less negative answers in this question as can be seen in figure 4.5.



*Figure 4.5 Open Information Flow Assessment Program*

## 5 Analysis

*This chapter is subdivided according to the purpose of the thesis using the theories included in the paper. The starting point is to analyse the empirical material using the theories presented in chapter three. We also use the empirical material to analyse the theories of knowledge management and investigate how different theories within this area that can be connected in a theoretical and practical way to an illustration including our contributions. The model is meant to couple the different Knowledge Management theories to each other and to smart Research and Development by Matheson & Matheson. While doing so we discuss the practises in Industrial Hose, showing how all these aspects can support a company's R&D process and thereby contribute to organic growth of the organisation.*

### 5.1.1 Culture

From the interviews it is clear that the Industrial Hose organisation has knowledge management on the agenda and that management is aware that it is important. Nevertheless there seems to be problems with the knowledge transfer process. The focus is sometimes too internal and people have difficulties in agreeing from where the organisation gets its information. It is therefore important to clarify the role of knowledge distribution in order to make it more effective.<sup>247</sup> In the interviews the view was put forward that the current systems of knowledge transfer were quite enough at the same time as the inefficiencies in the actual spreading of knowledge was discussed. One example was the difficulty for the knowledge about the production possibilities to find its way to the sales organisation. The ambivalent views expressed in the interviews could refer to a fear of getting slowed down by formalised procedures and paper work. This accentuates the importance of finding the right level of involvement required from the members in the organisation. The ones putting in efforts in the knowledge system must feel that they are getting at least as much back. It also highlights that the management need to work with the support to the members when initiating a change and deepening the knowledge transfer.

The business culture in Industrial Hose is customer oriented, engineering focused, and short sighted. The reasons for that can be found in the history and the current situation, coming from a financially pressed situation into black figures through focus on cost, efficiency and sales. There is an ongoing change towards more market focus and longer term view within the organisation. The point here is not to discard the current culture, there are clear values in it to be used, rather to point out that any dominant culture/behaviour has impact on the knowledge conversation and thereby the research and development.

The customer orientation is a great opportunity for creating different Ba, primarily originating and dialoguing Ba through the dialogue between sales peoples and engineers in Industrial Hose with the buyers and users at the customers. The tacit knowledge in the

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<sup>247</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

two organisations together create new knowledge that through externalisation can influence knowledge in Industrial Hose and lead to new innovation through the SECI-process. The contacts with the customer are really indulged by the management in Industrial Hose and it is understood that this is the prime source of nourishment for the knowledge. In many cases there are joint development processes with the customers including numerous meetings and virtual contacts. It is an outspoken fact that the knowledge created and externalised in the products from the joint programs will later be sold to the more price oriented customers.

The engineering focus of the company can be used to add value in the company's products by actually selling the expertise together with the products. To be able to add more of a consulting edge to the products Industrial Hose needs to externalise the great tacit knowledge of the people in the organisation regardless if they are engineers, salespeople or on the shop floor. It is understood within the company that this is of great value and the externalisation is supported by management, for example through the choice of team members in production line development which truly is cross functional and includes different levels of the hierarchy. There are dialoguing Ba created in the product development processes and the knowledge is externalised in the products and their properties which are filed. We found that the problems in this area are mainly connected to the used technology which is discussed below.

The short-sightedness in the dominant behaviour in the organisation does carry some complications regarding the knowledge conversation and thereby the innovation ability in Industrial Hose. Many of the interviewees expressed a wish for looking ahead and a frustration towards the short sighted financial demands from the corporate management preventing them to do so. Ergo, the culture is in many situations more long term than the practise. This is most probably nothing unique for Trelleborg and Industrial Hose. The conflicting interests between long term and short term goals have very likely always been an issue in businesses, but there is a twist. Trelleborg group is communicating organic growth rather heavily in the organisation at the moment. As is pointed out by Fridh et al (2004) the resources must support the communicated strategy.<sup>248</sup> How Trelleborg group should solve the dilemma of autonomy contra financial demands is however well outside the subject for the thesis but one idea could be to corporately sponsor certain projects creating a communicative effect of urgency at the same time. The theoretical impact from short sightedness is that the long time planning per se is knowledge management. While creating visions for the future people are supported and encouraged to think outside the box, creating a mental Ba, them selves and together with others using virtually every quadrant in the SECI-process. Knowledge created when the future is envisioned can fertilise other processes creating new knowledge conversation and development in the shorter term as well.

The incentive bonus system on Industrial Hose is, as mentioned, divided into three parts. Two of these parts are connected to the results of the business unit and the result of the team in which an individual acts. These two have therefore no directly visible link to knowledge management. The last part is set on an individual level and the decision is

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<sup>248</sup> Fridh, Jeanette; Reuter, Helene: *Verktyg för organisk tillväxt i koncerner*, 2004

made by the employee's nearest supervisor. Some of the managers say that the employee's knowledge distribution is a component of this part. Since this part is not formalised there is a risk of the concept becoming fuzzy. We can however conclude that knowledge management is represented in the incentive system on Industrial Hose. How much is determined in the discussions between the manager and employee.

Rewards have an impact on what is considered as important within an organisation.<sup>249</sup> That Industrial Hose have reward systems which relates to knowledge distribution can therefore stimulate the spread of knowledge. This takes place when the employees feel stimulated to initiate contact with other people and when they get a positive response in the form of knowledge sharing. In the interviews the importance of the incentive system was somewhat subdued. Instead, the great autonomy the product areas and individuals feel was accentuated as a reward propelling innovation and interaction. The interaction can take place both on individual level and as contacts between different teams. If interaction takes place it results in the creation of Ba which stimulate transformation between and within tacit and explicit knowledge.<sup>250</sup> The fact that many of the respondents give fairly high grades to the knowledge related principles in the inquiry confirm this. Two examples of interactions that show that the culture of Industrial Hose accepts and supports the creation of Ba are the informal contacts between engineers within two product areas with engineers in other Business Units (and even other Business Areas). Both started like Originating Ba despite the lack of formal contact surfaces because the persons knew and liked each other. The contacts were both subsidised by management and led, in one of the cases, to externalisation of the knowledge through a development project of a new hose. In that case the creation of a dialoguing Ba made sure that the organisation benefited from the interaction. In the other case the contact led to the sharing of research results concerning the fatigue of the materials used. This could actually seen as whole turn in the SECI- process starting with the socialisation in the dialoguing Ba between the two colleagues changing to a Exercising Ba in the virtual contacts between the individuals, due to the physical distance, where the Internalisation of knowledge from the test results leading to externalisation trough products and database creation. In the end, the knowledge is spread in Industrial Hoses Systemising Ba, for example the intranet.

The incentive bonus system at Industrial Hose is mostly dependant on financial measures. This is particularly true for the parts which refer to business unit and team level bonus. The bonus is mostly formula based except for the individual part which sometimes contains subjectivity. It is paid once a year. This corresponds to a hold strategy in the incentive system.<sup>251</sup>

Hold strategies are in contrast to organic growth since they are normally connected to the decline stage of the life cycle. There is therefore a mismatch between the intended strategy and what gets rewarded in the business unit. If organic growth is the target the

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<sup>249</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>250</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>251</sup> Anthony, Robert N.; Govindarajan, Vijay: *Management Control Systems*, 2004



incentive system should be based on a build strategy. This means that the system should reward long term commitment. Long term commitment and build strategies are normally related to relatively high bonuses which are paid less frequently.<sup>252</sup> The goals and determination of the bonuses are a generally also more subjective. The bonus system is designed at a corporate level in Trelleborg which leaves the individual part of the bonus for such action.

To rearrange the bonus system in accordance to a build strategy would accomplish the first purpose of the demands on an incentive system. The second demand which relates to the alignment of goals for the organisation and its members then comes gradually when people discovers the benefits.<sup>253</sup>

### 5.1.2 Infrastructure

The enabler infrastructure is closely connected to the physical Ba and the tools are at first hand the physical placement of the different parts of the firm and the hierarchy of the organisation. Most of the Industrial Hose organisation is located in the same place. This has a positive influence on knowledge distribution since it makes face to face knowledge possible.<sup>254</sup> This opens up to the two forms of Ba which demands face to face contact.<sup>255</sup> These are originating Ba and dialoguing Ba. Since the different kinds of Ba are connected to the knowledge conversation matrix there are also a direct link to socialisation were tacit knowledge becomes new tacit knowledge and externalisation were tacit knowledge becomes codified and therefore explicit.<sup>256</sup> This can be seen practically at Industrial Hose were discussions around databases to store former tacit knowledge are beginning to form. Little or none of this is taking place between business units since they lack the face to face or any other formal channel for knowledge distribution.

The hierarchal organisation on Industrial Hose is fairly flat since the PAs report in one step to business unit president.<sup>257</sup> This also means advantages in Ba. The main advantage lies in the dialoguing Ba quadrant since the people in the organisation more easily can share ideas face to face. This in turn support externalisation were tacit knowledge becomes explicit.<sup>258</sup> Systematisation in this form can only take place during discussions face to face.<sup>259</sup> Since the organisation is concentrated it is also easier to create exercising Ba where the explicit knowledge is transferred to the individual. That can be done by experience the systems, using the machines and reading stored material at the sight. There is a view in Industrial Hose that a lot of the valuable knowledge is stored within

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<sup>252</sup> Anthony, Robert N.; Govindarajan, Vijay: *Management Control Systems*, 2004

<sup>253</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>254</sup> Armbrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>255</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>256</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>257</sup> Internal material, Industrial Hose, Trelleborg AB

<sup>258</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>259</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

the system and the way they do things. That kind of knowledge is internalised through living the process. In the educational program that every new white-collar employee goes through, there is, apart from written educational material, also time spent in every part of the organisation. Such action is highly recommendable in a knowledge perspective since it not only leads to internalisation but also creates a ground for future Ba because knowing some one personally closes the perceived gap.

The unit which is located in Sweden doesn't have the same opportunities to create originating and dialoguing Ba since the main part of the company is located elsewhere. This means that the unit has lesser potential to transform tacit knowledge into new tacit or explicit knowledge.<sup>260</sup> This is reflected in the interviews where members in the unit sometimes feel out of the loop in the organisational information flow. One of the prime reasons for that is that they feel that when they engage the research team in France it takes too much time getting answers and test results. The time issue seems to be a problem in the whole of the organisation though independent of the distance. Time delays generate distance and hinder the creation of Ba. The infrastructure however favours the Swedish plant in some ways since it puts the plant close to the northern market. The plant has its own development personnel and is free to find and follow through projects to engage its production means as it pleases. There are efforts taken to reduce the distance between the plant in Trelleborg and the product and sales areas. The technicians visit the plant in Trelleborg in order to get a personal view internalising the explicit knowledge of the plant. In order to lessen the gap created by distance it is possible to use virtual means like video conferences, which is discussed in the next section; technology.

The team structure in the PAs bears resemblance to both integrated and completing teams but most of our data shows that the organisation is that of the integrated structure. This comes from the fact that the work tasks are often parallel and specialised. The resemblance with the completing team structure is that some of the team members can perform each others work tasks if this should be necessary. This mostly takes place with the technicians. The sales areas are also cooperating in teams even though not as closely. There is one problem with having close inter-functional teams. The interface between the people inside the team is virtually erased while you risk making the distance to functions outside of the team greater, because the team members turn inwards. In Industrial Hose the management is aware of this problem and they try to lessen the borders by incorporating for instance sales people in the processes, when needed. There is still an interface between the PA and the production that needs attention though.

In the structure proposed by Wheelwright and Clark (1992) the team is a mix of the heavyweight project team and the autonomous team. The team is autonomous since the members are part of the project organisation but they are not completely disengaged from the other functions within the company. The PA manager who leads the team must be considered as a heavyweight within the organisation.<sup>261</sup> This follows from that most of them have been with the company for a long time and that their knowledge about the

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<sup>260</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>261</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

business is extensive. For a new member of the organisation it is a great source of knowledge to be able to cooperate in a team. By being subjected to how things are done by the experienced players a Ba of internalisation is created and knowledge is internalised in the individual.

Working in a team gives more opportunities to face to face interaction. This is even truer for the integrated and completing team structures.<sup>262</sup> The team is normally a workplace for more than two people.<sup>263</sup> This means that the type of interaction is collective. Working in teams is thereby a support in the process of creating dialoguing Ba which means that it support externalisation.<sup>264</sup> This follows from that articulation of tacit knowledge becomes possible in the discussions which are created in a team setting.

There is also indirect support for other forms of Ba in an integrated team context. This follows from that people within a team have other forms of interaction than the collective face to face form. Individuals also have face to face interaction which leads to socialisation.<sup>265</sup> This form of knowledge conversation should however be more effective in a differentiated team due to the sequential work tasks associated with this structure. There is also an increased level of virtual interaction between team members both in individual and collective form. Team work thereby supports the two forms of virtual Ba with internalisation and combination as well. The support for originating, exercising and systemising Ba are not as strong as for dialoguing. The other three can also be more easily strengthened by other means.

### 5.1.3 Technology

The technology used in an organisation is closely connected to the idea of a virtual Ba. The technology can act as a connecting point not only over space but also time. Instead of talking with an expert in a certain subject we can read an article written years ago and probably get an understanding in the subject. In Industrial Hose there are five different ways to support the creation of Ba and knowledge conversation by the use of technology at the moment. Telephone, email (Lotus notes), the intranet as well as written material and reports are all used in various ways in the processes. There is also a video conference system which is seldom used because the users have not experienced any great gains with the system.

When a report is made it is saved as a paper copy in Industrial Hose. Even though it is saved it is not very likely that it will be used again. The knowledge has been made explicit through the dialoguing Ba created in the project and is transformed to virtual knowledge when it is written down. In fact the report is a combination of the knowledge that has been made explicit during the project and when it is saved a systemising Ba is

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<sup>262</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>263</sup> Lind, Jan-Inge; Skärvad Per-Hugo: *Nya Team i organisationernas värld*, 1998

<sup>264</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>265</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

created. The people that read the report will probably learn something and the explicit knowledge is transformed to personal tacit knowledge. An internalising Ba is created, thus closing a whole spiral turn in the SECI-process in the end of the project. To have the files in paper set enormous demands on the way the information is filed and catalogued. The information stored in this way is seldom reused in Industrial Hose or in other parts of Trelleborg group. It is an enormous loss. At for instance universities or at consulting companies where the organisation's and the people's knowledge constitutes almost all the value, the reuse of former produced knowledge is everything. To be able to find this knowledge, libraries with highly educated people have been initialised and nowadays enormous databases with full text articles or project material in the consulting firm's case are stored and easily searchable. Doing so creates potential Ba in the future.

The use of email and other communication channels can make up for some of the shortages in infrastructure in an organisation. It is possible to create, for instance, dialoguing Ba even though people are physically separated if the channel is good enough. One system that is rarely used in Industrial Hose is the video conference system. Used in a correct way this could close the gap a bit between the people in Sweden and in France. In the physically created teams of the Product Areas there is no need for many scheduled meetings since the interface is natural. When using a tool like video conference this is not the case. To have the team in Sweden present in scheduled discussions could mean a lot to the cooperation.

When we study our results from the inquiry and compare them to the interviews we find a difference in regard to the IT-systems. The principle open information flow has gotten good grades overall but people still talk about many of the IT tools as difficult to use. IT-tools are not specifically mentioned in the inquiry which leads us to the conclusion that the respondents have graded other means of knowledge distribution like direct contact and phones. There are also statements in the interviews that point out e-mail as the main way of communicating over distance.

The empirical material clearly shows that the lack of up to date technology or better, the ability to create virtual Ba is very costly in the long term because of lost opportunity, work done several times and personal tacit knowledge that is lost when people quit. Modern technology is not the prime issue. The focus has to be to create a system that takes care of and spreads the enormous knowledge that is present, a system that is used, not to have, for example an expensive video system that no one uses. This reasoning shows that the enablers used as tools can be empty of value if the management don't know what to aim for. It shows that the concept of Ba could in fact help the management to know what the enablers should enable.

We think that improving the technological knowledge system would help the R&D processes in Industrial Hose and Trelleborg group as a whole. It would also show that the value of core competence could be something real and not only talk to boost the stock value. The paper files of the past should be digitalised and made searchable. There are numerous of systems that would work. To use a system where you can perform searches of the full text would be recommendable (a search spider). Instead of filing things

correctly you use the correct question searching the material. It method is usually called knowledge mining and opens possibilities in the future that one might not think of today.

Speaking of the virtual Ba that one could create with the enabler technology, one could easily think of the virtual places or communities on the Internet. In a community people have their own place, a home, and lots of different meeting grounds depending on what they want to do. People spend a lot of time improving and contributing to these communities without pay. To be able to create a successful intranet Trelleborg should listen to the users every need and the goal has to be that the intranet is easier and more fun to use than not to use it. In the communities people are rewarded with points when they contribute to the sight. A similar system would be possible to create in commercial companies as well. The focus would then be to reward knowledge contribution.

The insight that many of the IT tools function in an unsatisfactory way have implications on the knowledge conversation from explicit knowledge since virtual tools is the key to effectiveness there.<sup>266</sup> Ineffective virtual tools lower the quality on exercising and systemising Ba which in turn makes internalisation and combination more difficult.<sup>267</sup> This creates problems when explicit knowledge shall be transformed to tacit and when different pieces of explicit knowledge shall be combined to new explicit knowledge.<sup>268</sup> Examples of this are that competence can be lost when people quit their jobs and that development work sometimes are made twice because lack of knowledge around other projects.

## **5.2 Research and Development**

The Industrial Hose division conducts development in all practical respects.<sup>269</sup> This follows from the fact that all projects aim towards the creation of new products often together with the customer. On the few occasions that research is conducted it is exclusively done as applied research with the aim to produce new rubber compounds. The product development is conducted at a decentralised level in the organisation which should be considered as a strength since it is closer to the customer.<sup>270</sup> The few research projects are more centralised. This also follows the theory since research should be placed more centralised in order to have the greatest effect.<sup>271</sup>

This has implications on the company's development portfolio. Many of the products have a low margin and some level of price sensitivity. The success level is on the other hand high so the projects involve a limited risk. This means that most projects are placed in the bread and butter quadrant in the project portfolio matrix.<sup>272</sup> This implies that the

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<sup>266</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>267</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>268</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

<sup>269</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>270</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>271</sup> Dodgson, Mark: *The Management of Technological Innovation*, 2000

<sup>272</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

business unit is following a hold or a harvest strategy.<sup>273</sup> One of the strategic goals of the Trelleborg group is organic growth.<sup>274</sup> To obtain this a project portfolio matrix must contain many oysters with a potential to become stars.<sup>275</sup> There is thus a significant difference between the intended and actually performed strategy at Industrial Hose.

### **5.3 Nine Principles enabled by knowledge conversation**

In this section we show how the different aspects of knowledge management and knowledge distribution can affect factors that are critical to R&D performance. We present this in the nine principles for smart organisation framework because of its ability to affect practices within R&D.<sup>276</sup>

#### **5.3.1 Value Creating Culture**

Knowledge management affects this principle since the value creating culture must be spread within the organisation in some way. Culture is per definition tacit. The spread of culture must therefore take place from tacit knowledge to new tacit or explicit knowledge. This means that the relevant quadrants in the conversational matrix are socialisation and externalisation.<sup>277</sup> The conclusion from this is that originating and dialoguing Ba are needed. The originating Ba can be stimulated by using softer values within an incentive system to create more autonomous space for the individual to grow contacts within the organisation. The dialoguing part is most easily supported by working in teams because this, as we have mentioned, creates face to face knowledge transfer in a collective context.

There are some systems at work at Industrial Hose which counteract a value creating culture. The incentive system which is more concentrated on a hold strategy is one of them. Another is the project portfolio which is unbalanced for the intended growth strategy. To conquer this, the incentives system must be remade to reward behaviour which is related to the organisations strategy. The project portfolio must also be rebalanced and get a more long term focus. This can be done by creating more oysters in the project portfolio matrix which means that resources with a research focus must be created and be put to use.<sup>278</sup>

The positive aspect is that the unit has a direct focus on value creation with a customer focus. This can result in short time organic growth as a result of better more customised products and growing markets. To achieve long term organic growth the organisation must be ready to meet the market and create solutions to problems which are not necessarily known by the customer. Since the development today is done in collaboration

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<sup>273</sup> Anthony, Robert N.; Govindarajan, Vijay: *Management Control Systems*, 2004

<sup>274</sup> Trelleborg AB Annual Report 2004

<sup>275</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>276</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>277</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>278</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

with the customer there are opportunities to create knowledge about future needs that can result in new products.

### **5.3.2 Creating Alternatives**

If alternatives are to be created they have to be explicit. Otherwise the members in an organisation will have difficulties with evaluation and choice between them. In order to create more alternatives and thereby creating the opportunities for choice it therefore follows that tacit knowledge has to be made explicit. This means that dialoguing Ba has to be created in order to support externalisation. Dialoguing Ba is effectively created when people work in teams in which the members can articulate different alternatives through discussion and systematisation. Alternatives can also be created by transforming explicit knowledge into new explicit knowledge. Then the relevant conversational mode is combination which is connected to systemising Ba. In systemising Ba reports and other forms of virtual media like IT tools are the most important.

The organisation in Industrial Hose is already concentrated around different teams. That means that the infrastructure for the principle is already in place. The lack of sufficient IT tools is however a problem. The conclusion is that the strength is greater in dialoguing than in systemising Ba.

Alternatives are already created within the teams on Industrial Hose. One of the areas that are covered is the priority list over research and development projects that exist in every PA. From this list the PAs can choose which projects that will be performed under different circumstances. The list is from time to time updated with new projects as the organisation creates new knowledge that should be incorporated. The list represents dialoguing Ba and therefore externalisation since ideas for projects are discussed in the team before the knowledge is codified on the list.

### **5.3.3 Continual Learning**

Learning is mostly related to internalisation and combination. This is because of the relation to learning as being something that comes from an explicit source. The internalisation and combination modes of knowledge conversation are related to exercising and systemising Ba. The key is thereby in an organisation's virtual systems. IT tools in the form of easily accessible databases can support systemising Ba if they are available to enough people. The systemising Ba then affects combination. Exercising Ba is more easily effected by educational programs since the process of knowledge transfer there creates an embodying of information. The embodying results in internalisation of knowledge.

The results from the inquiry show that the company is uncommitted to this principle. At the same time there are channels for information flow and the organisation has on many occasions shown the ability to get good perspectives on itself and its environment. The interviews give hints to where the lack of effectiveness comes from. The abilities of the IT system in the company are not satisfactory. This results in a lower level of exercising

and systemising Ba than would have been possible.<sup>279</sup> The abilities within internalisation and combination are therefore also lower.<sup>280</sup> These are the conversation modes that transform explicit knowledge into tacit or new explicit knowledge.

The need for satisfactory IT support can be critical for Industrial Hose. This is due to the organisational structure with small teams with a lot of specialised knowledge. If employees with critical competences decide to leave the company their competence will be lost since the organisation lacks a system which embodies their knowledge.

### 5.3.4 Embracing Uncertainty

In order for an organisation to embrace or embody a skill or knowledge it has to be made tacit. Some knowledge related to uncertainty might already be tacit and makes both socialisation and internalisation valid. The corresponding types of Ba are originating and exercising. The originating form can be created by workplaces' layouts and how the interaction takes place in the organisational hierarchy. Exercising Ba can be produced through educational training and reflection.<sup>281</sup> The organisation then has to create possibilities for the individual to reflect over the uncertain aspects in his or her work tasks.

There are some systems which use uncertainty at Industrial Hose. They are however not tools for making knowledge tacit. In the priority list over potential projects the risk involved in a project is one of the factors considered. This list is however a tool for dialoguing Ba since it creates projects, which are explicit, through discussion of tacit knowledge. The conclusion is that uncertainty is recognised by Industrial Hose but there are no systems for embracing it and making it a part of the organisational framework.

### 5.3.5 Outside- In Strategic Perspective

To create an outside- in perspective a company has to create all four types of Ba. This is related to the complex nature of a company's environment where knowledge can be both tacit and explicit. The need to transform it can also be of both tacit and explicit nature ranging from embodied know how in the business to specific demands related to certain customer categories. This complexity makes the purpose of the knowledge more important since that control the means of its transfer.<sup>282</sup> One example can be formalisation of tacit business know how for educational reasons. It is a form of externalisation since it transforms tacit knowledge to explicit and it is thereby related to the dialoguing Ba. The solution can therefore be found in discussion groups in a face to

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<sup>279</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>280</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>281</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>282</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000



face setting. Another example can be the effects on a company because of macroeconomic changes in the society. This could be interpreted from different kinds of reports from which facts must be collected. The conversational mode will therefore be combination since several forms of explicit knowledge is put together to become new explicit knowledge.

There are many things that imply that Industrial Hose have an outside- in perspective. One of the most important is the close cooperation with the customers when new products are developed. Another is the aspect that potential markets are monitored to find windows of opportunity. There are however some problems in the distribution of the collected knowledge. Confirmation of this is that people feel out of the loop on abilities which can be used to meet customer demand and that most development projects are initiated by customers.

In the interviews some respondents talk about limited resources for market analysis. This is mostly concerning the longer time horizons where new product should meet a latent demand. It is therefore connected to the research rather than development. This follows the trend with a gap between intended and realised strategy which have been discussed before. The intended strategy is organic growth but the organisational systems point more towards a short sighted hold strategy. The conclusion is that Industrial Hose has an outside- in perspective but that the time horizon is to short sighted.

### **5.3.6 Systems Thinking**

This principle is connected to cause and effect relationship and to think from a whole business perspective. Cause and effect relationships can with advantage be analysed explicitly. To think from a whole business perspective is more of a tacit knowledge which should take place to avoid suboptimisations in the organisation. The cause and effect dimension is thus connected to combination and therefore systemising Ba which could be obtained by freely accessible reports and databases. The whole business perspective follows when knowledge around the implications become internalised. It is therefore a question about creating exercising Ba. This can be done by creating educational opportunities and time for the employees to reflect on the implications of the material.

New employees at Industrial Hose go through an education program at the start of their employment. This is done to show how the unit is being run and to help the new employees to get to know people within the organisation. This corresponds to internalisation and is therefore a form of exercising Ba. The education program can be seen as the virtual medium where formalised explicit knowledge becomes tacit and thereby embodied in the new employees and therefore in the organisation.

### **5.3.7 Open Information Flow**

As with the principle outside- in strategic perspective all kinds of Ba are represented in the support of this principle. This is due to the general application of the principle.

Instead an organisation should work with the inputs to the Ba creating process in order to create opportunities for the appearance of Ba. One way to achieve this is to arrange meetings or conferences which support the face to face Ba creating processes both on an individual and collective level. Another is to invest in and encourage the use of virtual media in different forms. This can be media both in the form of IT tools and as virtual processes in the form of education.

The results from the inquiry show that the organisation values free information and that it is easy to get knowledge within the company. The interviews give a somewhat different picture of the information flow. This is mostly related to the parts of the company that are not located in Clermont Ferrand in France. There is also a correlation between difficulties in knowledge distribution and the available IT tools in the company. The questions in the inquiry do not specify the tools used to transfer the information.<sup>283</sup> We therefore conclude that other mediums than the company's intranet has been graded in the inquiry.

The abilities of a company's IT tools have effect on the creation of certain types of Ba which we have shown above. One way to improve in the ability of open information in Industrial Hose is consequently to work with the enabler technology to get better IT tools which are easier for the employees to use and which they feel brings value to them and the organisation. This would also align with the interviews in which the IT tools have been criticised for being unsatisfactory while the face to face interaction has been complemented.

### 5.3.8 Alignment and Empowerment

The incentive system in an organisation is not only the monetary bonuses but also softer values as autonomy and self satisfaction. These softer parts could be used as rewards for successful forms of knowledge distribution. A more autonomous structure supports empowerment which also can be considered as a reward. Autonomous team structures also support knowledge conversation since it opens up for more face to face interaction within the team.<sup>284</sup> It is thus a tool to create more originating and dialoguing Ba and therefore additional abilities within socialisation and externalisation.<sup>285</sup>

The organisation within Industrial Hose is relatively flat with the product areas that report to the business area manager in one step. Most decisions are also made in the PAs. This is an important part in their autonomous structure and the empowerment is connected to the fact that the PA team is led by an organisational heavyweight. The coordination of the alignment is mostly controlled by culture. The most important aspect in this is that the organisation has a very strong customer focus.

The alignment aspect could be made much clearer if the operational parts of the company were more in phase with the intended strategy. If the company can succeed in this it will

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<sup>283</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>284</sup> Wheelwright, Steven C.; Clark, Kim B.: *Revolutionizing Product Development*, 1992

<sup>285</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

become possible with even more decentralisation to the teams.<sup>286</sup> Such decentralisations are good if the company wish to ad more soft rewards in the incentive system.

### **5.3.9 Disciplined Decision Making**

To make disciplined decisions an organisation needs to make knowledge explicit so it can be evaluated. This can be done by making tacit knowledge explicit or by connecting different pieces of explicit knowledge to each other. It is thus associated with the conversational modes externalisation and combination.<sup>287</sup> This implies that dialoguing and systemising Ba should be created. The dialoguing part can take place in teams which supports the articulation that is needed for externalisation. Systemising Ba can be achieved by mass spreading of information via IT tools.

The development work at Industrial Hose is standardised in accordance to ISO 9001. This means that every project follows the same course. As such it is a tool for creating systemising Ba since different pieces of explicit knowledge are put together to form new explicit knowledge in the form of a project. The priority list used by the PAs is a tool for dialoguing Ba and therefore externalisation. This is because extensive discussion precedes a project being put on the list. The conclusion is that there are tools for disciplined decision making at Industrial Hose.

## **5.4 Enablers for knowledge conversation**

While performing the theoretical research and conducting the interviews we found that the different models were lacking certain attributes that could be found in the other models. By making a combination of the theories and models we found a way to analyse the empirical material. It has been clear that there are possibilities for creating Ba and thereby more knowledge conversation by using all of the enablers for knowledge management. During the analysis of the interviews we found that the enablers used by them self could easily be misguiding. Having a compensation system or an intranet doesn't mean that there is good knowledge management per se.

This has theoretical as well as practical consequences. The theoretical conclusion is that the frameworks can be used together and that they support each other. The practical aspects are more concerned with the usefulness of the frameworks in support to other functions like for example R&D. The models that were the most useful in our analyses proved to be the ones shown in figure 5.1 for remembrance.

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<sup>286</sup> Matheson, David; Matheson, Jim: *The Smart Organization*, 1998

<sup>287</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

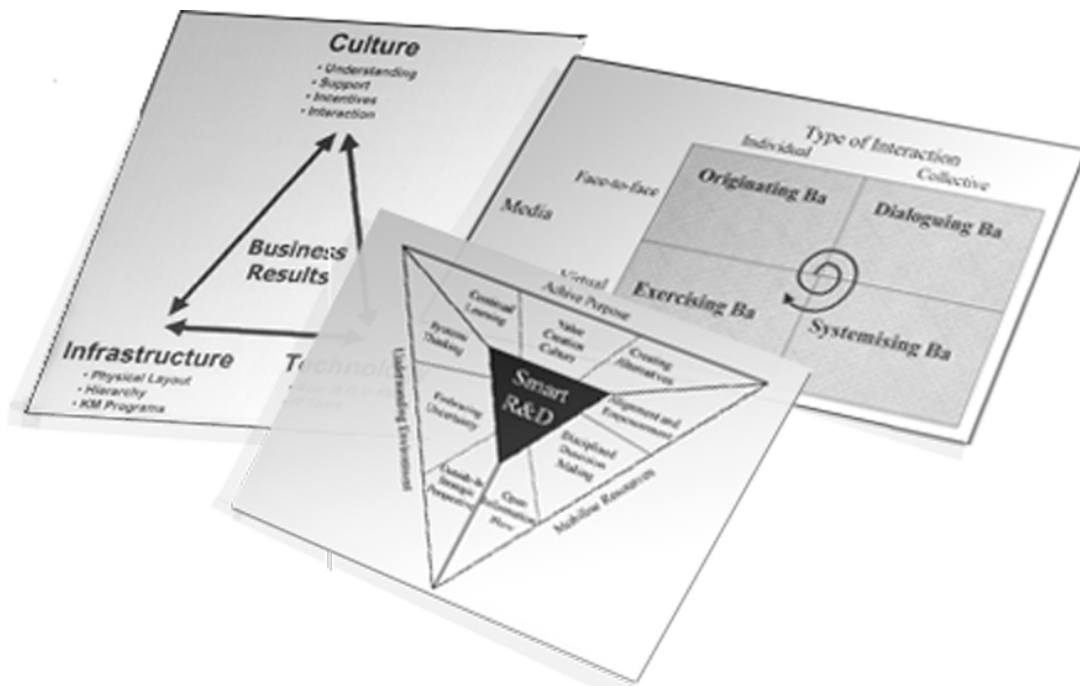


Figure 5.1 The three underlying models

The two frameworks we use in Knowledge Management claim to do the same thing, namely support the transfer of knowledge. In Nonaka's framework it is called knowledge conversation.<sup>288</sup> In the article by Armbrrecht, et al (2001) the term knowledge flow is used instead. In the conversation matrix the focus is on the knowledge and its two forms as tacit and explicit. The three enablers instead focus at the aim of knowledge management for companies which is coupled to the creation of new products and processes and thereby economic value.<sup>289</sup> We chose to present how the three enablers can help to create the different Ba which in extension supports the transfer between tacit and explicit knowledge. The reason to why we chose to couple the models in this way, and not the other way around is twofold. The first reason is that Nonaka's framework is one of the most established models for knowledge transfer and it is therefore natural to place the enablers in the context of the conversation matrix.<sup>290</sup> The Second one is that the enablers have a more practical approach which is easier to communicate and apply in a corporate environment. The knowledge conversation matrix can then be thought of as the explanatory model to why the enablers work as well as a goal. When the Enablers are used they should support the creation of Ba otherwise the actions could be both ineffective and expensive in the knowledge conversation sense.

Looking at the concept of Ba, which means a place; mental, physical or virtual in a certain time, where knowledge is created and transformed, there is a connection to the

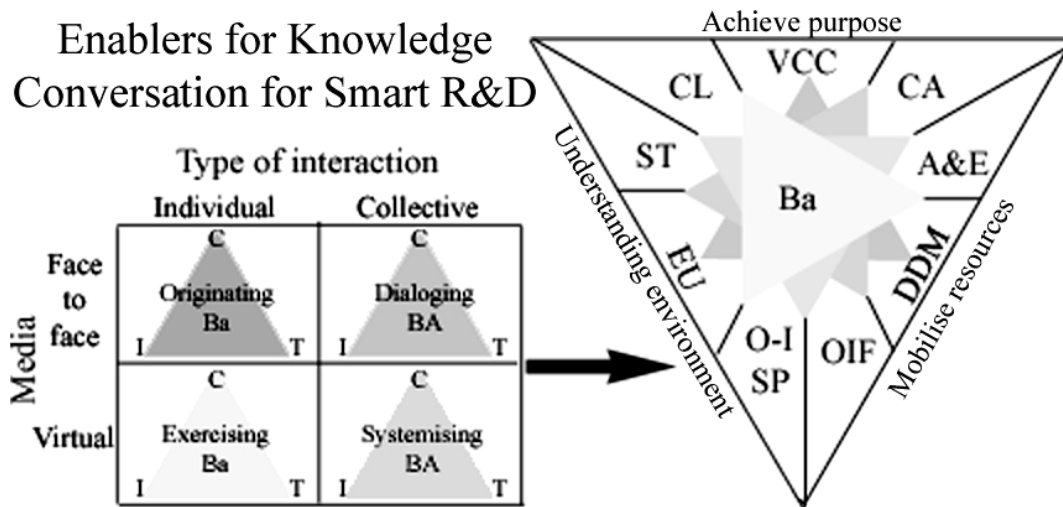
<sup>288</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

<sup>289</sup> Armbrrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

<sup>290</sup> Grant, Robert M.: *Contemporary Strategy Analysis*, 2002

enablers that one first might not think of. Culture is the ways, attitudes and the mind-set of the organisation, thus very much connected to the mental Ba. Infrastructure is the physical placement and the hierarchy of the organisation which is closely linked to the physical side of the Ba concept. The last enabler technology is the ways to connect to people in another place or even time, using telephone, internet or written material, hence creating a virtual meeting ground, a virtual Ba. In the interviews it was very clear that when an enabler was used in a good way, the strongest contribution was made to the creation of Ba in one of the different concepts, for example the organisation structure gave opportunities primarily for the four different physical BA possible.

The illustration we have made of how the different models can be connected is called Enablers for Knowledge Conversation in Smart R&D and is thought of as an alloy of the explanatory/ideal model, the practical tool and the test system. The full version of the test of organisational IQ can be seen in appendix 2. In the left of figure 5.2 we recognise Nonaka's Conversation matrix with the four different Ba. By using the different enablers for knowledge transfer, we believe, organisations can support the creation of Ba and thereby sustain the knowledge conversation stepping upwards in knowledge level. Having the Conversation matrix in mind the management can easier direct the enablers towards good knowledge management and smart R&D.



*Figure 5.2 Enablers for Knowledge Conversation for Smart R&D*

We think that well managed knowledge leads to better and smarter R&D which is supported by the fact that many of the Knowledge Management theories were derived from an innovation context.<sup>291</sup> This is clearly supported by the findings in the thesis. The product development and innovation is all about combining knowledge in the first turn.

<sup>291</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

We have used the model of Smart Organisation by Matheson & Matheson to define a well working organisation in the R&D sense. It is possible to test the organisations current state in the framework of the nine principles. In the right of figure 5.2 the Ba have taken the form and colour of the enablers all including the tools of infrastructure, culture and technology. The triangular Ba are placed in a spiralled staircase symbolising the constant moving spiral and the steps taken in knowledge creation from the original model of Nonaka.<sup>292</sup> While climbing upwards the Knowledge Management system influences each and every one of the nine principles making the organisation smarter.

The enablers are, as mentioned, a framework which is easier to use in a corporate setting. They have a direct link to practical issues like IT tools and the hierarchal organisation of a company.<sup>293</sup> They are also just three in number, which make them usable in the planning of the activities of the organisation. The nine principles on their own may show if a firm is well organised in respect to R&D activities, but they are many, probably too many in the day to day business. The disadvantage with using the enablers without the concept of Ba, and thereby not knowing what kind of knowledge is created, would be the lack of effectiveness. When the enablers are connected to a larger system it is easier to understand why they are used and they can thereby be used to support the knowledge building in a more precise way. When performing the analyses we found that the nine principals are supported by the creation of Ba in a direct way. There were also clear indications that the enablers can be used to create Ba and that the enablers in fact benefits of being used in this way since the practise would give the tools a sense of direction and priority. The models can thereby be reformed to one model showing how knowledge management aimed at research and development processes can be used and how the theoretical fields can be connected.

The theoretical gain of creating the model is that the connection between knowledge management and research and development is illustrated and the combination of the three models gives the enablers direction and explanation, the concept of Ba practices and the tool of measuring smart R&D gets a tool for improvement.

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<sup>292</sup> Nonaka, Ikujiro; Toyama, Ryoko; Konno, Noboru: *SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation*, 2000

<sup>293</sup> Armbrrecht, Ross F.M.; et al: *Knowledge Management in Research and Development*, 2001

## 6 Conclusion

Here we present the results from the analysis chapter. The chapter has been divided in a theoretical part and a part containing practical advice for the business unit Industrial Hose. In the theoretical part we present our model for knowledge management support of best practices within R&D. In the part containing advice for Industrial Hose we present some potential improvement factors which were discovered during the research process.

### 6.1 Theoretical conclusion

In this thesis we have created a model which shows how the three enablers for knowledge flow (i.e. culture, infrastructure and technology) can act as a practical tool to create Ba. Ba is where knowledge conversation takes place and it is therefore a necessity for the successful transformation between and within tacit and explicit knowledge. Ba can be a mental, physical or virtual place. We also show how the transformation of knowledge can help to achieve better performance within the nine principles for smart research and development and thereby be a tool for organic growth. The model is presented in figure 6.1 below.

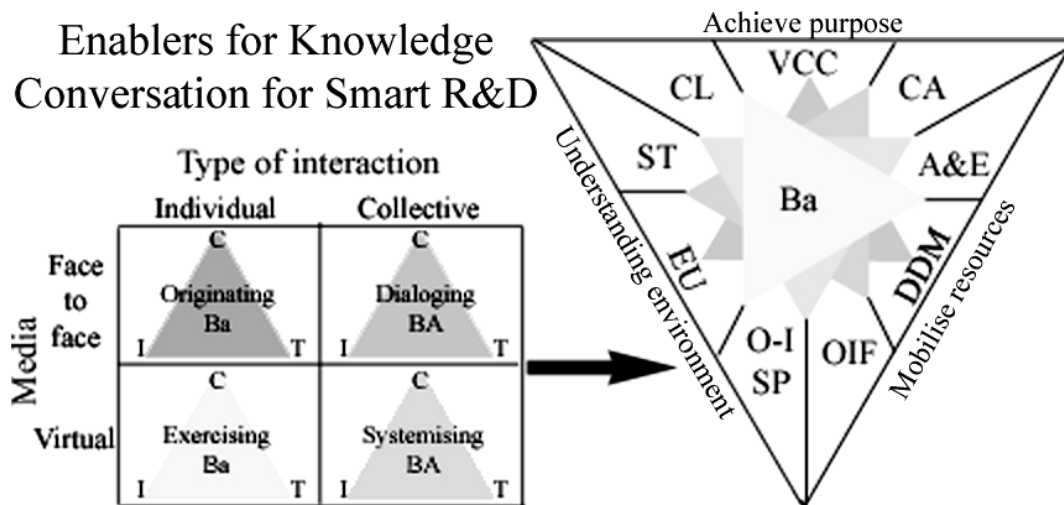


Figure 6.1 Enablers for Knowledge Conversation for Smart R&D

The model is called Enablers for Knowledge Conversation for Smart R&D and is thought of as an alloy of the explanatory/ideal model, the practical tools and the test system. By using the different enablers for knowledge transfer, organisations can support the creation of Ba and thereby sustain the knowledge conversation stepping upwards in knowledge level. That in turn leads to better and smarter R&D. The triangular Ba, including the enablers, are placed in a spiralled staircase symbolising the constant moving in a spiral

between Ba and the steps taken in knowledge. While climbing upwards, the Knowledge Management system influences each and every one of the nine principles making the organisation smarter.

### **6.1.1 Generalisations**

The model has been constructed with the use of general terminology with as few direct references to Trelleborg as possible. The process has however been abductive so empirical material from Industrial Hose have helped us to identify key components. We believe that the material isn't unique to Industrial Hose. A fair part is probably common problems and the solutions that are found could be of help in many companies. The implication from this is that some generalisations can be made. We believe that the model can be of help when studying Knowledge Management in the aspect of Research and Development, of course strengthened by the fact that we are standing on the shoulders of three giants, our mere part being to connect them together.

The model has only been used to analyse the Industrial Hose organisation. To draw to generalised conclusions from it would therefore not be excused. The model should be applied to a larger number of companies, preferably in other lines of business before such a statement can be made with accuracy. The line of business is also a critical part since Trelleborg's industry contains a reasonably large amount of technical knowledge that can be codified. This is related to the discussion of knowledge as an asset which, more or less, is an assumption in the knowledge conversation matrix. The models applicability on companies where knowledge is treated more as a process is therefore doubtful.

Our conclusions are that the model has general applicability on companies which have extensive amounts of knowledge that can be codified and transformed, i.e. the knowledge can be treated as an asset. If knowledge is considered as a process there can be no generalisations since the assumptions in parts of the model are not fulfilled. A generalisation in this area demands more research.

### **6.1.2 Future studies**

Our model where enablers create Ba which support knowledge conversation to achieve better performance within R&D is quite broad. More research should be conducted to verify the different links between the models. This could be done with more in depth studies of the links and how the interaction takes place.

In Nonaka's framework knowledge is thought of as an asset. This has also been our main view when investigating how it can support the nine principles. An interesting situation occurs if this assumption is discarded and knowledge is thought of as a process instead. A study with our model as a base but with a process view on knowledge could therefore be performed to see if all the nine principles receive support with the new assumption.



## **6.2 Practical advice to Trelleborg group and Industrial Hose**

Industrial Hose has today no program for knowledge management. A start could be to see what could be done in the different areas of culture, infrastructure and technology to make sure that knowledge is created, saved and shared in the business unit. The point where Industrial Hose is weakest today is the technical support system. The obvious first step would be to digitalise the report system and make old as well as new files searchable. Efforts should also be made to make the tacit knowledge of the individuals at least spread to the colleagues within the BU for instance through seminars where lectures can be held by the within the persons expertise.

The incentive system on Trelleborg rewards behaviour which relates to hold market strategies. This should be reformed to reward build strategies which support organic growth. Systems which reward build strategies reward long term objectives. This is done by bonus payments that are paid less frequently and based on what the employee has tried to accomplish within growth, not just the actual result.

The ways that are used today in Industrial Hose to support R&D are in many ways good. It is important to look at the current ways and see where the strong points are, and to use them. For example can the engineer culture be an enormous strength if it is possible to add some more creativity into the process. Another thing is the autonomy, which is great, but if people are responsible for a certain area they need to be able to control the things that have a direct impact on it.

The project portfolio matrix at Industrial Hose should be rebalanced with a focus on new products with future market potential. This should be done by investing more in research that can produce more oysters. The oysters in the product portfolio matrix are the projects which have potential to make a large impact in the future.

Many of our proposals have a financial dimension which demands investments. The funding for this can be hard to find in the business unit. The funding may instead come from the Trelleborg group. Liquid funds which before were used for acquisitions can now be used to achieve growth organically instead. Trelleborg group needs to find a way to support projects with a certain risk at the same time as they keep a sound pressure on the divisions. To do this would also have a symbolical value since it shows that the intended growth strategy has support in the group's headquarter.

Today there is very little knowledge sharing between business units and even less between business areas. This is especially true for technical expertise and research results. The starting point should be a common framework for sharing of knowledge within the entire group. A suitable solution is a database over different rubber compounds and their areas of use. If Trelleborg can not use their technical competences better they are more of a conglomerate with rubber as a common feature instead of a focused group with rubber as core competence.

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Interview IV, Robert Colley, Technical Director, Industrial Hose, telephone interview, 13-05-2005

Interview V, Ingemar Hoboh, Hose Factory Manager of the plant in Trelleborg, Industrial Hose, telephone interview, 16-05-2005

Interview VI, Jacques Cognard, product area manager, Oil & Marine, Industrial Hose, telephone interview, 18-05-2005

Interview VII, Patrick Pieret, Marketing & Sales Director, Industrial Hose, telephone interview, 19-05-2005

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## Appendix 1. Interview plans

### **Interview plan, Mr Caleca 19-04-2005 duration 90 minutes**

1. Could you please present your role in the organisation?
2. Now, what are your expectations concerning this project? Our expectations?
3. Your views about the former thesis in Industrial Hose, please?
4. How does one create organic growth, according to you?
5. How do you feel about us doing a thesis about the development towards an entrepreneurial organisation?
6. Could you please tell us about the research and development system of today?
7. What are the R&D expenses in Industrial Hose? In percentage?
8. We need all written information about Industrial Hose there is.
9. What do you believe would be the best way to do the research at Industrial Hose?
10. Could you please describe Industrial Hose?
11. Are your division effected by the start up of research centres?
12. Thank You , Monsieur Caleca.

### **Interview plan, Olivier Libes, 10-05-2005**

#### Introductory questions

1. Clarifying the purpose of the interview. (short)
2. Time frame and number of questions.
3. The respondent introduces him/her self and his/her position shortly

#### Explanatory questions

4. How is the product development performed in the PA
  - a. *Initiation*
  - b. *Check point system*
  - c. *Communication systems*
  - d. *Team*
  - e. *Research/Corporate entrepreneurship?*
  - f. *Financing of projects?*
5. Are the ways of the product development cycle standardised in the BU?
6. How is market development performed in the PA
  - a. *Initiation*
  - b. *Communication systems*
7. How do you achieve information flow between Marketing, production, development and management?
  - a. *IT-systems*
  - b. *Meetings*
8. How is the information flow to other PAs /BUs organised
  - a. *Any joint projects, ventures or research programs?*
9. Do you have any incentive programs within the PA.
  - a. *Communication*
  - b. *Entrepreneurial ventures*
  - c. *Ideas that lead to improvements in general*

#### Specific questions

10. Do you have any personal views about how to organise good communication and knowledge management to achieve an entrepreneurial environment?

#### Ending questions

11. Is it possible for us to send you an inquiry concerning information flow and learning? It will take you 10-15 minutes to complete it.
12. Thank you very much!

### **Interview plan, Christine Diersat, 11/5 2005**

#### Introductory questions

1. Clarifying the purpose of the interview. (short)
2. Time frame and number of questions.
3. The respondent introduces her self and her position shortly
4. What do the products within the PA have in common?

#### Explanatory questions

5. How is the product development performed in the PA
  - a. *Initiation*
  - b. *Check point system*
  - c. *Communication systems*
  - d. *Team*
  - e. *Research/Corporate entrepreneurship?*
  - f. *Financing and pull-through of projects?*
6. Are there any systems that store knowledge from previous projects?
  - a. *Databases*
  - b. *Tacit to explicit knowledge, human to structure capital*
  - c. *Costs, channels, technical data, people involved*
7. Are the ways of the product development cycle standardised in the BU?
8. How is market development performed in the PA
  - a. *Initiation*
  - b. *Communication systems*
9. How do you achieve information flow between Marketing, production, development and management?
  - a. *IT-systems*
  - b. *Meetings*
10. How is the information flow to other PAs /BUs organised
  - a. *Any joint projects, ventures or research programs?*
  - b. *Is it important to have this kind of flow*
11. Do you have any incentive programs within the PA.
  - a. *Communication*
  - b. *Entrepreneurial ventures*
  - c. *Ideas that lead to improvements in general*

#### Specific questions

12. Could you tell us about any success story concerning corporate entrepreneurship in your PA and the information flow that took place during the process?
13. Do you have any personal views about how to organise good communication and knowledge management to achieve an entrepreneurial environment?

#### Ending questions

14. Is it possible for us to send you an inquiry concerning information flow and learning? It will take you 10-15 minutes to complete it.
15. Thank you very much!



### **Interview plan, Kenneth Mårtensson 11-05-2005**

#### Introductory questions

1. Clarifying the purpose of the interview. (short)
2. Time frame and number of questions.
3. The respondent introduces him/her self and his/her position shortly

#### Explanatory questions

4. Which information channels and knowledge systems exist in Industrial Hose
  - a. *Culture (supporting individuals)*
  - b. *Infrastructure (organisational features, physical place)*
  - c. *Technology (databases, intranet, mail systems) Trellnet*
5. Are you (the Market Area) participating in the entrepreneurial process? How?
6. *IT-systems*
7. *Meetings/teams*
8. How is market development performed within the MA?
  - a. *Initiation*
  - b. *Communication systems*
9. How is the information flow to other MAs /BUs organised
  - a. *Any joint projects, ventures or research programs?*
10. Do you have any incentive programs within the MA.
  - a. *Communication*
  - b. *Entrepreneurial ventures*
  - c. *Ideas that lead to improvements in general*
11. what are OEMs?

#### Specific questions

12. Please tell us some more about the development process concerning the innovation project on sub sea cable protection in the UK and US. How was that project organised? Other success stories?
13. Do you have any personal views/ideas about how to organise good communication and knowledge management to achieve an entrepreneurial environment?

#### Ending questions

14. Is it possible for us to send you an inquiry concerning information flow and learning? It will take you 10-15 minutes to complete it.
15. Thank you very much!

## Interview plan, Robert 13-05-2005

### Introductory questions

1. Clarifying the purpose of the interview. (short)
2. Time frame and number of questions.
3. The respondent introduces her self and her position shortly
4. What is the purpose of the technical department

### Explanatory questions

5. How is the product development/innovation performed in the BU
  - a. *Initiation*
  - b. *Check point system*
  - c. *Communication systems & IT systems*
  - d. *Team*
  - e. *Research/Corporate entrepreneurship?*
  - f. *Financing and pull-through of projects?*
  - g. *The choosing between projects ,*
6. Evaluation criteria for innovation requests.
  - a. *NPV*
  - b. *Probability*
  - c. *Politics*
7. Are there any systems that store knowledge from previous projects?
  - a. *Databases*
  - b. *Tacit to explicit knowledge, human to structure capital*
  - c. *Costs, channels, technical data, people involved*
  - d. *Knowledge management programs?*
  - e. *The retrieval of information.*
8. Are the ways of the product development cycle standardised in the BU?
9. How do you achieve information flow between marketing, production, development and management in the innovation process?
  - a. *IT-systems*
  - b. *Meetings, Ba ( Nonaka) physical, virtual,*
  - c. *Physical location of the different people*
10. How is the information flow to other BUs organised
  - a. *Any joint projects, ventures or research programs?*
  - b. *How do you cooperate with the cooperate R&D department.*
  - c. *Is it important to have this kind of knowledge flow*
11. Do you have any incentive programs within the technical department?
  - a. *Communication*
  - b. *Entrepreneurial ventures*
  - c. *Ideas that lead to improvements in general*
12. Is knowledge distribution prioritised?

### Specific questions

13. Could you tell us about any success story concerning corporate entrepreneurship in the BU and the information flow that took place during the process?
14. Do you have any personal views about how to organise good communication and knowledge management to achieve an entrepreneurial environment?

### Ending questions

15. Is it possible for us to send you an inquiry concerning information flow and learning? It will take you 10-15 minutes to complete it.
16. Thank you very much!

## Interview plan, Ingemar 16-05-2005

### Introductory questions

1. Clarifying the purpose of the interview. (short)
2. Time frame and number of questions.
3. The respondent introduces her self and her position shortly
4. What do the products at the plant have in common?

### Explanatory questions

5. How are you involved in the product development?
  - a. *Communication systems*
  - b. *Team*
  - c. *Research/Corporate entrepreneurship?*
  - d. *Innovation of processes*
6. Are you aware of any systems that store knowledge from previous projects?
  - a. *Databases*
  - b. *Tacit to explicit knowledge, human to structure capital*
  - c. *Costs, channels, technical data, people involved*
  - d. *Is there stored information about production abilities?*
7. If you are involved, how are the meetings organised.
  - a. *differential (often sequential), integrated, completing*
  - b. *Development: Functional departments, light weight matrix, heavy weight matrix. Autonomous (tiger) teams.*
  - c. *Who owns the projects? The hierarchy of the team*
8. How do you achieve information flow between Marketing, production, development and management?
  - a. *IT-systems*
  - b. *Meetings*
9. How is the information flow to other plants/BUs organised
  - a. *Any joint projects, ventures or research programs?*
  - b. *Is it important to have this kind of flow*
10. Do you have any incentive programs within the organisation
  - a. *Communication*
  - b. *Entrepreneurial ventures*
  - c. *Ideas that lead to improvements in general*

### Specific questions

11. Could you tell us about any success story concerning innovation in your plant and the information flow that took place during the process.
12. Do you have any personal views about how to organise good communication and knowledge management to achieve an entrepreneurial environment?

### Ending questions

13. Is it possible for us to send you an inquiry concerning information flow and learning? It will take you 10-15 minutes to complete it.
14. Thank you very much!

### **Interview plan, Jacques Cognard, 18/5 2005**

#### Introductory questions

1. Clarifying the purpose of the interview. (short)
2. Time frame and number of questions.
3. The respondent introduces her self and her position shortly
4. What do the products within the PA have in common?

#### Explanatory questions

5. How is the product development performed in the PA
  - a. *Initiation*
  - b. *Check point system*
  - c. *Communication systems*
  - d. *Team*
  - e. *Research/Corporate entrepreneurship?*
  - f. *Financing and pull-through of projects?*
6. Are there any systems that store knowledge from previous projects?
  - a. *Databases*
  - b. *Tacit to explicit knowledge, human to structure capital*
  - c. *Costs, channels, technical data, people involved*
7. Are the ways of the product development cycle standardised in the BU?
8. How is market development performed in the PA
  - a. *Initiation*
  - b. *Communication systems*
9. How do you achieve information flow between Marketing, production, development and management?
  - a. *IT-systems*
  - b. *Meetings*
10. How is the information flow to other PAs /BUs organised
  - a. *Any joint projects, ventures or research programs?*
  - b. *Is it important to have this kind of flow*
11. Do you have any incentive programs within the PA.
  - a. *Communication*
  - b. *Entrepreneurial ventures*
  - c. *Ideas that lead to improvements in general*

#### Specific questions

12. Could you tell us about any success story concerning corporate entrepreneurship in your PA and the information flow that took place during the process?
13. Do you have any personal views about how to organise good communication and knowledge management to achieve an entrepreneurial environment?

#### Ending questions

14. Is it possible for us to send you an inquiry concerning information flow and learning? It will take you 10-15 minutes to complete it.
15. Thank you very much!

## Interview plan, Patrick 19-05-2005

### Introductory questions

1. Clarifying the purpose of the interview. (short)
2. Time frame and number of questions.
3. The respondent introduces her self and her position shortly

### Explanatory questions

4. The three horizons?
  - a. *How much is research, how much is innovative product development and how much is product adjustment in the BU.*
  - b. *What is important?*
  - c. *What would be needed to be able to se forward?*
5. How do you achieve information flow between marketing, production, development and management in the innovation process?
  - a. *IT-systems*
  - b. *Meetings, Ba ( Nonaka) physical, virtual,*
  - c. *Physical location of the different people*
6. How is the information flow to other BUs organised
  - a. *Any joint projects, ventures or research programs?*
  - b. *How do you cooperate with the cooperate R&D department.*
  - c. *Is it important to have this kind of knowledge flow*
7. Are there any systems that store knowledge from previous projects?
  - a. *Databases*
  - b. *Tacit to explicit knowledge, human to structure capital*
  - c. *Communication systems & IT systems*
  - d. *Team*
  - e. *The infrastructure.*
  - f. *Costs, channels, technical data, people involved*
  - g. *Knowledge management programs?*
  - h. *The retrieval of information.*
8. How do you educate new people about the BUs tradition and knowledge.
8. The product development in the Trelleborg plant
  - a. *how to make the communication better?*
9. Do you have any incentive programs within the BU?
  - a. *Communication*
  - b. *Entrepreneurial ventures*
  - c. *Ideas that lead to improvements in general*
  - d. *What is important to encourage knowledge*

### Is knowledge distribution prioritised?

#### Specific questions

10. Could you tell us about any success story concerning corporate entrepreneurship in the BU and the information flow that took place during the process?
11. Do you have any personal views about how to organise good communication and knowledge management to achieve an entrepreneurial environment?

### Ending questions

12. Is it possible for us to send you an inquiry concerning information flow and learning? It will take you 10-15 minutes to complete it.
13. Thank you very much!

## **Appendix 2. Organisational IQ Test**

### **Organisational IQ Test**

This inquiry is based on test used by the consulting firm "Strategic Decision Group". The test is divided according to nine principles which each contain five questions. The principles represent nine dimensions for more efficient R&D. The results of the test identify areas where an organization works efficiently and areas that need improvement. The result also contains an overall score which can be used as a benchmark against other organizations.

Each of the questions in the test should be graded on a scale from -3 to +3 where +3 is the highest grade. If the organization behaves in a way corresponding to the middle column the grade should be set to -3. If the organization behaves in a way more like the right column the grade will be +3. If the organization is somewhere in between a grading must be performed. 0 is also part of the scale.

## Value Creating Culture

Ask people how the organization creates value.	People focus on their own jobs and lack understanding of how the organization ultimately creates and captures value.	People know who the customers of the organisation are and how the organization captures value by serving them.
Look for formal measures of value creation.	There are no measures of value creation, or there are so many that people do not know which ones are important.	There are a few common measures of value creation that are used as the basis of decision making and compensation.
Determine how conflicts are resolved.	Conflicts are resolved through organizational power or turf. Often the conflicts get personal, and people lose track of the larger picture.	Conflicts are resolved through appealing to a shared understanding of value creation and through examining what actions create the most value for customers and the organization.
Examine how decisions are evaluated.	Evaluations do not measure the ultimate value creation, or measures are used that are not translated into ultimate value (e.g., intuitive scoring systems).	Evaluations trace actions through to results measured by value creation, using either ultimate measures like NPV or translated measures (e.g., NPV loss per day of delay of launch).
Ask people if they feel empowered to question activities that they (or others) are doing that they think are not contributing to value.	People feel discouraged from questioning the value of a task. They fear (or have experienced) unresponsiveness or political backlash.	People provide examples of situations in which they have questioned activities. Inquiring into how the task creates value is a legitimate way to question activities. Tasks not creating value are modified or abandoned.

## ***Creating Alternatives***

Examine the number and range of alternatives considered in recent decisions.	Only one option is developed (perhaps with some minor variations), or there is no perception of a choice other than go or no go.	There is ample evidence of a wide range of good options that were carefully considered and rejected in favour of even better ones.
Examine the doability of the alternatives considered in recent decisions.	Alternatives either specify high-level goals without giving people guidance about what to do, or they are detailed plans of the only alternative under consideration.	All alternatives are developed enough to be doable, yet they are not overspecified. People understand the effort and resources involved for implementation, but detailed plans are developed only for the selected alternative.
Examine how disagreement is resolved.	Disagreement escalates to conflict that is resolved by power or politics. All ideas but one are suppressed.	When people have different ideas about what to do, the ideas are incorporated into separate alternatives and objectively evaluated.
Examine how alternatives are evaluated.	People use raw judgement to pick their preferred alternative and are often dominated by internal political considerations. The general emphasis is on developing a social and political consensus.	People use systems thinking to connect alternatives to measures of value creation. Alternatives are ranked and refined by their ability to create value.
Look for the use of alternative-generating technology.	Creative tools are perceived as flaky and are not used to develop better alternatives.	There is ample evidence of formal tools and creative know-how. People readily use strategic tables, brainstorming, and other creative techniques.



## ***Continual Learning***

<p>Ask people how change relates to the purpose of the organization.</p>	<p>People see that the purpose of the organization is to continue to do what it has always done. Change is viewed as necessary evolution forced on them by circumstance.</p>	<p>People see that the purpose of the organization is to continually learn how to create more value and make the required changes.</p>
<p>Listen to the stories about the organization's history.</p>	<p>Stories are either about relatively modest changes or about failed attempts to change. Some stories may convey pride in being unchanged (e.g., tradition); others may convey fundamental barriers to change.</p>	<p>There is ample evidence of successful changes, including several changes that required paradigm shifts.</p>
<p>Ask people how they feel about recent changes.</p>	<p>People view the changes as forced on them. People are motivated by avoiding negative consequences.</p>	<p>Change is viewed as positive and productive, even if it was painful at the time. Changes are generally motivated by opportunity.</p>
<p>Observe how people react to new ideas or criticisms.</p>	<p>People are inflexible. They are unable to understand the new idea, regard it as dangerous or threatening, and reject it with prejudice. There is little experimentation with new approaches or organizational structures. People tend to shot the messenger.</p>	<p>People are excited by the prospect of learning and growing. They explore ideas to find their value, possibly testing them out in small groups to discover their value and determine their applicability.</p>
<p>Look for formal or informal activities to search for new approaches, practices, and ideas.</p>	<p>The organization lacks such activities and inhibits people who try them.</p>	<p>People actively seek opportunities for improvement, such as benchmarking or performance measurement. Quality programs are an integral part of the company.</p>

## ***Embracing Uncertainty***

<p>Ask people to forecast an uncertain variable in which they have some degree of expertise.</p>	<p>People give a point estimate without acknowledgement of uncertainty. They have little awareness of factors that might upset their forecast. They may even view the forecast as a decision under their control.</p>	<p>People give you a range or a probability distribution. They might offer insights into the key influences or scenarios that would affect the result.</p>
<p>Review planning documents, how they are made, and how they are used.</p>	<p>Plans focus on a baseline set of assumptions. Forecasts are negotiated numbers or conservative estimates. Often, these numbers evolve to incorrect shared beliefs about the future.</p>	<p>Plans focus on major decisions and sources of uncertainty. Forecasts includes ranges and probability assessments that reflect all sources of uncertainty.</p>
<p>Observe the process of setting budgets and estimating costs.</p>	<p>Budgets are rigid, and people are expected to promise accomplishments on fixed budgets. The “corporate lying game” is prevalent (people ask for too much, and their superiors cut them back). Often projects with the greatest overpromising win.</p>	<p>People recognize that the costs of making major accomplishments cannot be predicted. The budgeting process has the flexibility to adapt as new information is gathered.</p>
<p>Observe how commitments are made and what people are held accountable for.</p>	<p>Information gathered for the purpose of communicating or understanding is used as the basis for commitments. This dual purpose biases communication of uncertainty.</p>	<p>Commitments are made based on achievable goals, and people are held accountable for things they can control. Assessments of uncertainty inform the organization of the risk it is undertaking.</p>
<p>Examine the assumptions in plans or decisions.</p>	<p>There are many assumptions, which may or may not be explicit. Often only one scenario is considered, usually implicitly.</p>	<p>The few assumptions are explicit and not crucial to the decisions at hand. Multiple scenarios representing the range of uncertainty are considered.</p>

## ***Outside- In Strategic Perspective***

<p>Ask people how the business environment is changing.</p>	<p>Answers are framed in terms of the organization's existing business and incremental trends- an inside-out perspective.</p>	<p>People have a broad view of the forces changing the industry and customers, the positions and strategies of the competition, and the implications for their organization.</p>
<p>Look for evidence of formal tools and processes to develop and communicate an outside- in perspective.</p>	<p>It is difficult to find staff, processes, or documents portraying an outside- in perspective. The focus is on pressing current issues, and outside information is in the form of undigested reports.</p>	<p>There are specialized staff, processes (e.g., global technology planning), and documents portraying an outside- in perspective.</p>
<p>Observe the assumptions people make when they plan or make a decision.</p>	<p>There are many assumptions based on extending current business success such as rates of growth or shares of markets will increase; we are technically ahead of the competition; with a better mousetrap, the world will beat a path to our door; and present markets and competition will change slowly.</p>	<p>The few assumptions are grounded in a solid understanding of industry change.</p>
<p>Examine peoples' experience and participation in perspective expanding activities outside the organization.</p>	<p>People focus on their existing jobs to the exclusion of building a broader perspective based on outside information. The company discourages this outside perspective.</p>	<p>Most people participate in activities that broaden their perspective (e.g., job rotation, professional and industry meetings). The organization supports and values this perspective.</p>
<p>Ask people to interpret or comment on some recent event that impacts their industry.</p>	<p>People have trouble interpreting the event. They are overwhelmed by detail and have trouble relating it to their industry or organization.</p>	<p>Peoples' interpretations reflect a broad understanding of the industry. They are able to explain the events significance to the industry and the organization.</p>

## ***Systems Thinking***

Examine a recent decision, the factors considered, how people knew what was important, and the ultimate recommendation.	Few factors are considered, or so many are considered that people are overwhelmed. Recommendations are based on implications for only a few aspects of the business.	Many factors are considered, then narrowed down to a list of important factors based on the implications for value creation. The recommendation is based on its full implications.
Ask people what factors they look at in making a decision.	There is no checklist and different people have substantially different lists of factors to consider.	People know immediately draw on a thorough checklist that covers all major aspects of the business system (e.g., technical, competitive, market, manufacturing and regulatory issues).
Observe how peoples' different perspectives, such as marketing and technical, are integrated into a decision.	Few perspectives are represented in decisions. People with different perspectives develop into camps, each thinking it has the only right view.	Different perspectives are represented in each decision, and an integrated view is developed. Peoples' different perspectives are respected and used to broaden understanding.
Look for formal models of important systems such as business models showing the pathway to commercial profits for projects, industry dynamics, and the portfolio pipeline.	System models are rare, and if they exist are used infrequently or only by closed specialized groups. The models often are too complex to be useful, perhaps taking days to run.	Many systems models exist and are routinely used to develop insight and conduct sensitivity analysis.
Ask people a complex question, and observe how they answer it. Ask them to articulate their thinking as they work.	People make snap judgements based on gut feelings or personal perspective, without acknowledging their limitations. Alternatively, they are overwhelmed and unable to make any progress without drawing on extensive resources.	The thought process represents a broad perspective on the question, and people can come up with a partial or rough answer. They are able to draw on the resources required to address the most important issues (e.g., other people, checklists, and model results) and extend their thinking.

## ***Open Information Flow***

Ask people about their ability to get information they need.	People must work hard to extract the needed information. They may need authorization to use various sources.	People get the organization's best information quickly (e.g., find the right person to talk to in two phone calls).
Ask people how they feel about secret information.	People feel they are out of the loop on critical issues. The competition may have better information about their organization than they do.	There are few secrets. Those that exist are regarded as properly secret in the minds of people from whom the information is withheld (e.g., for competitive, legal, or personal reasons).
Ask people how much information they have received from others lately.	People have trouble getting information from others and must work hard to get the most basic information. Information is used as a source of personal power.	People have plenty of information – perhaps erring on the side of too much – and report that colleagues have been forthcoming and helpful.
Look for formal channels of communication and ask people how they use them.	The few channels that exist are viewed as not relevant to creating value. Informal channels are discouraged.	Channels are abundant and not restricted. People testify to their usefulness. Informal channels, such as networks, are fostered and encouraged.
Ask people about their contributions to communication channels or to helping others.	Contributions are limited, and opportunities to contribute are few.	People explain their recent contributions and feel they have been formally or informally rewarded for them.

## ***Alignment and Empowerment***

Examine the strategies at different levels (e.g., technology strategy to portfolio strategy to project strategy).	There may not be any strategies. If there are, they provide little guidance for decision making. They are viewed cynically, as corporate PR. The links among strategies are absent, unclear, or ambiguous.	There are clear strategies at all levels that provide useful guidance for decision making. Strategies at one level are clearly linked to strategies at the next. Lower-level strategies interpret and carry out the implementation of higher-level strategies.
Examine the value measures used to evaluate decisions at different levels (e.g., technology strategy to portfolio strategy to project strategy).	There may not be any value measures. If there are, each level sets its own values or decision criteria, with no special requirement that they be related to strategies at other levels.	There are clear measures of value at all levels. Value measures at one strategic level are clearly linked through the strategy to measure at the next level.
Examine the approvals required to make or carry out important decisions.	Decisions require many levels of approval. Review meetings are perceived as wasting time. Often meetings with upper management are feared because it may redirect efforts and change priorities without clear reasons. Upper management often feels overloaded with the need to check on subordinates.	Decisions require few approvals because people understand the strategy and are trusted to carry it out. Meetings with upper management are viewed as adding value.
Examine the roles of people in a recent important decision.	Either few people participated in the decision or so many did that the process bogged down. Typically, lower level employees make proposals to upper levels for approval or rejection.	Many people participated in the decision process, at multiple levels in the organization. A dialogue was carried out in the process that continually aligned and refined the vertical links. Management at different levels collaborated to build a high quality decision and achieved aligned commitment to action.
Examine a recent decision that was controversial.	The decision did not stick and was undone or remade over and over again.	People unified around the decision and carried it out with little intervention. They understood the reasons for the decision and believe the organization is carrying out a sensible strategy for creating value.

## ***Disciplined Decision Making***

Ask people how a recent strategic decision was made.	Decisions are often made without much conscious choice, the reasons for it are often unclear and underdocumented. Perhaps someone in authority simply “made the call”.	They explain that it was done by a conscious decision, and they show the documentation of its basis. They can also explain the process that led to the decision.
Ask people what the process is for making a decision.	People are either unable to identify the true decision maker(s) or they admit the real decision process is at variance with the nominal process.	They provide consistent explanations of a systematic decision process, which focuses on building a quality decision and incorporates many best practices.
Observe the types of decisions made.	These types of decisions are unclearly delineated, or whole categories are absent (e.g., the portfolio is simply the sum of individually considered project decisions, or the business strategy is redefined to pursue whatever new R&D results have been achieved.	People readily make distinctions among types of decisions such as project, portfolio, and technology strategy.
Ask people to critique the organization’s decision process.	People frequently believe that processes yield poor decisions, thereby wasting potential value creation and their personal time. Critiques are sometimes destructive or cynical and convey a sense of hopelessness.	People recognize the value added by the process and their criticisms will be couched as potential improvements.
Examine the formal tools used to support the process.	These tools will not be apparent, or if they can be found they will not often be used to support decisions. They may be used to justify decisions after they have been made.	You can find modern decision technology such as decision analysis, decision quality spider diagrams, portfolio grids, cumulative R&D productivity curves, and strategy tables.

## Scoresheet

<b>Principle</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>Total sum</b>	<b>Positive sum</b>	<b>Negative sum</b>
Value Creation Culture								
Creating Alternatives								
Continual Learning								
Embracing Uncertainty								
Outside- In Strategic Perspective								
Systems Thinking								
Open Information Flow								
Alignment and Empowerment								
Disciplined Decision Making								



## Appendix 3. Organisational Test

### Organisational Test

We are interested in knowing a bit more about how you see the situation in the whole of Industrial Hose. By asking all of the interviewees to fill in this form we will get a snapshot of the current situation. If you don't have an overview of the BU entirely, please let the answers reflect the parts of the organisation that you do know.

This inquiry is based on test used by the consulting firm "Strategic Decision Group". The test is normally divided into nine principles which each containing five questions. The principles normally represent nine dimensions for more efficient R&D. In this version we have extracted the principles that relates to learning and communication. The results of the test can identify areas where an organization works efficiently and areas that need improvement.

Please fill in the answers in the table on page 4 and send the document back to us. If you want, you can submit the answers in an ordinary email.

If you have any questions concerning the inquiry, do not hesitate to contact us via email: [johan.rosendahl@gmail.com](mailto:johan.rosendahl@gmail.com)

Each of the questions in the test should be graded on a scale from -3 to +3 where +3 is the highest grade. If the organization behaves in a way corresponding to the middle column the grade should be set to -3. If the organization behaves in a way more like the right column the grade will be +3. If the organization is somewhere in between a grading must be performed. 0 is also part of the scale.

## 1 Continual Learning

<p><b>A.</b> Ask people how change relates to the purpose of the organization.</p>	<p>People see that the purpose of the organization is to continue to do what it has always done. Change is viewed as necessary evolution forced on them by circumstance.</p>	<p>People see that the purpose of the organization is to continually learn how to create more value and make the required changes.</p>
<p><b>B.</b> Listen to the stories about the organization's history.</p>	<p>Stories are either about relatively modest changes or about failed attempts to change. Some stories may convey pride in being unchanged (e.g., tradition); others may convey fundamental barriers to change.</p>	<p>There is ample evidence of successful changes, including several changes that required paradigm shifts.</p>
<p><b>C.</b> Ask people how they feel about recent changes.</p>	<p>People view the changes as forced on them. People are motivated by avoiding negative consequences.</p>	<p>Change is viewed as positive and productive, even if it was painful at the time. Changes are generally motivated by opportunity.</p>
<p><b>D.</b> Observe how people react to new ideas or criticisms.</p>	<p>People are inflexible. They are unable to understand the new idea, regard it as dangerous or threatening, and reject it with prejudice. There is little experimentation with new approaches or organizational structures. People tend to shoot the messenger.</p>	<p>People are excited by the prospect of learning and growing. They explore ideas to find their value, possibly testing them out in small groups to discover their value and determine their applicability.</p>
<p><b>E.</b> Look for formal or informal activities to search for new approaches, practices, and ideas.</p>	<p>The organization lacks such activities and inhibits people who try them.</p>	<p>People actively seek opportunities for improvement, such as benchmarking or performance measurement. Quality programs are an integral part of the company.</p>

## 2 Open Information Flow

<p><b>A.</b> Ask people about their ability to get information they need.</p>	<p>People must work hard to extract the needed information. They may need authorization to use various sources.</p>	<p>People get the organization's best information quickly (e.g., find the right person to talk to in two phone calls).</p>
<p><b>B.</b> Ask people how they feel about secret information.</p>	<p>People feel they are out of the loop on critical issues. The competition may have better information about their organization than they do.</p>	<p>There are few secrets. Those that exist are regarded as properly secret in the minds of people from whom the information is withheld (e.g., for competitive, legal, or personal reasons).</p>
<p><b>C.</b> Ask people how much information they have received from others lately.</p>	<p>People have trouble getting information from others and must work hard to get the most basic information. Information is used as a source of personal power.</p>	<p>People have plenty of information – perhaps erring on the side of too much – and report that colleagues have been forthcoming and helpful.</p>
<p><b>D.</b> Look for formal channels of communication and ask people how they use them.</p>	<p>The few channels that exist are viewed as not relevant to creating value. Informal channels are discouraged.</p>	<p>Channels are abundant and not restricted. People testify to their usefulness. Informal channels, such as networks, are fostered and encouraged.</p>
<p><b>E.</b> Ask people about their contributions to communication channels or to helping others.</p>	<p>Contributions are limited, and opportunities to contribute are few.</p>	<p>People explain their recent contributions and feel they have been formally or informally rewarded for them.</p>

## Answers

<b>Principle</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
1. Continual Learning					
2. Open Information Flow					

## Appendix 4. Technical Request Standard

<b>Engineering department</b>  <b>Machine of Palport</b>	<b>PROCEDURE N° : 5000 D 006</b>																			
<b>SUBJECT :</b>  <b style="text-align: center;">FINISHED PRODUCT MATRIX DESIGN</b>			page : 109 / 14																	
<b>RECIPIENTS :</b>  <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Direction</td> <td>C. CALECA</td> </tr> <tr> <td>Logistics</td> <td>A. GUILLON</td> </tr> <tr> <td>Human Resources</td> <td>A. BEYRAND</td> </tr> <tr> <td>Technique</td> <td>G. DERROIRE</td> </tr> <tr> <td>Laboratory Tests</td> <td>G. FAYT</td> </tr> <tr> <td>Production</td> <td>J. RIVIERE</td> </tr> <tr> <td>Sales</td> <td>P. PIERET</td> </tr> <tr> <td>Quality Assurance</td> <td>JL. MERLE</td> </tr> </table>					Direction	C. CALECA	Logistics	A. GUILLON	Human Resources	A. BEYRAND	Technique	G. DERROIRE	Laboratory Tests	G. FAYT	Production	J. RIVIERE	Sales	P. PIERET	Quality Assurance	JL. MERLE
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<b><u>SYNOPSIS</u></b>  1/.OBJECT 2/.FIELD OF APPLICATION 3/.VOCABULARY 4/.HIERARCHISATION 5/ RELATED SERVICES 6/ GENERAL SYNOPTIC 7/ DETAILED DESCRIPTION OF THE DISPOSITION 7.1/ Data input and exit 7.2/ Stages of the design and industrialization 7.3/ Cases of a request of development of a qualified product 7.4/ Evolutions in the course of design industrialization 7.5/ Non conformities 7.6/ the card of characteristics produced 8/ LIST OF APPENDICES <u>Appendix 1</u> : <i>Technical management of studies PA</i> <u>Appendix 2</u> : <i>Technique Study Pa</i> <u>Appendix 3</u> : <i>Check list validation qualification</i> <u>Appendix 4</u> : <i>Product Characteristics</i>																				
F	04/10/04	R. COLLEY	JL. MERLE	JL. MERLE																
E	16/07/01	R. COLLEY	JL. MERLE	JL. MERLE																
D	29/06/99	R. COLLEY	J. DUBREUIL	J. DUBREUIL																
<b>Indices</b>	<b>Dates</b>	<b>Transmitter/ Visa</b>	<b>Approving / Visa</b>	<b>Administration / Visa</b>																

