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IDENTIFYING KNOWLEDGE IN DECISION-MAKING PROCESSES: A CASE STUDY

A. R. V. Jensen and S. Ahmed-Kristensen

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1. Introduction

Innovation is considered a key competition parameter in product development on the global market and therefore innovation performance is a key issue in many companies. According to Tidd and Bessant (2009), the innovative capacity of a company is reflected in their ability to manage knowledge in innovation processes. In a literature review on innovation performance measurement, Adams *et al.* (2006) classify knowledge management as one of the key metrics for innovation performance. Furthermore, it is generally agreed that knowledge is, and increasingly will be, a key competition parameter in industrial countries, being knowledge economies and management of knowledge in innovation processes is an area that can be significantly improved in many companies and hence lead to increase in their innovation capability.

The value of knowledge management is reflected in the ability to make better decisions [Davenport and Prusak 1998], e.g. decisions made in the early phases of product development is recognised as having a great impact on committed costs [Ullman 1997] in the later phases of the product life cycle, hence support of decision-making in front-end innovation processes by managing knowledge can have a positive influence on the innovation capability of a company.

There exists extensive research on knowledge management and decision-making in engineering processes but the current understanding of how knowledge is linked to decision-making processes is limited. Mapping decision-making processes and identifying knowledge in decision-making processes can be a way to learn more about knowledge management in decision-making and form a basis for structuring knowledge in innovation processes to support critical decision-making and company strategy. Hence, this forms the basis of the paper.

1.1 Aims and objectives

The research aims to identify knowledge in decision-making processes by:

- Mapping the decision-making process
- Identifying knowledge types and sources in the decision-making process
- Exploring the influence of the knowledge process on the decision-making process

The research is based upon an empirical study of meetings at a development department of a medium sized company, and uses well-established theory.

2. Theoretical frame

As a theoretical reference frame for the case study, knowledge management and decision-making literature has been reviewed. This literature mostly stems from research in engineering management.

2.1 Decision-making process

To map the decision-making process the rational decision-making model (RDMM) [Rasmussen *et al.* 1991; Badke-Schaub and Gehrlicher 2003] has been used as a reference frame. The decision-making process is defined as a rational step-by-step model where the decision is a single step (Figure 1):

Figure 1. Rational decision-making model [Badke-Schaub and Gehrlicher 2003]

The model is a simplified expression of reality and falls short because decision makers acts in unpredictable and complex environment with limited access to information and limited cognitive abilities [Rasmussen *et al.* 1991]. Even though, the (RDMM) can work as a frame of reference that can reveal an impression of the decision-making process (decision process) in the decision meetings. In an empirical study, Badke-Schaub and Gehrlicher (2003) identified five different patterns based upon the RDMM, described as a problem-solving process. The patterns reveal different characteristics of the RDMM and their impact on the success of the decisions made in design teams. These patterns are called *Leaps*, *Loops*, *Cycles*, *Sequences* and *Meta-processes* and are summarised here:

- Leaps describes a fragmented decision process with jumps back and forth in the RDMM resulting in unfinished and failed decisions, characterised by being fast processes.
- Loops are iterations of sequences of steps in the RDMM with *same* content resulting in stagnating information accumulation and vague, long, and failed decision processes.
- Cycles are similar to loops but consist of sequences of steps in the RDMM with *different* content resulting in accumulated information but long decision processes.
- Sequences are decision processes that follow the RDMM with structured iterations resulting in fast processes and progress in the problem-solving process.
- Meta-processes are guided by an individual as a moderator, guiding the decision process along the RDMM resulting in both long and fast decision processes and problem-solving.

Several decision-making models have been suggested in literature and a simplified generalisation can be elicited characterised as a problem-solving process. Mintzberg *et al.* (1976) [Rasmussen *et al.* 1991] proposes a three phase model based on 25 identified decision processes: *Identification* of issues and goals, *Development* of alternative solutions and *Selection* of alternative. In parallel, the decision process is supported by three underlying processes adding complexity to the three phase decision-making model: *Decision-making control processes*, *Communication processes* and *Political processes*. Furthermore, the decision process is influenced by dynamic factors like interruptions, delays and feedback loops. The decision process is build upon *Comprehension cycles* where the decision-makers gradually understands complex issues and *Failure cycles* where the decision-makers starts over again. Another study (Heller *et al.*, 1988 in Rasmussen *et al.*, 1991) showed decision-making consisting of small underlying decisions with the phases *Solution search*, *Evaluation* and *Selection.*

2.2 Knowledge types and sources

Knowledge has been traditionally classified into two categories as *tacit* and *explicit* knowledge. Tacit knowledge is typically subconscious or bodily and difficult and time consuming to transfer. On the other end of the scale, explicit knowledge can be expressed orally or in writing. It is generally relatively fast to transfer explicit knowledge because it can be uttered rather precisely. For the identification of *Knowledge sources* in the decision process in the case study, an objectified view of knowledge based upon its content has been adopted. By viewing knowledge determined by its content, we have categorised knowledge into five different sources. These sources stem from both literature [Qui et al. 2006] and from the empirical data itself and are summarised here:

- *Product* knowledge is knowledge about technical features and structures.
- *Process* knowledge is about development procedures and how to reach a development goal.
- *Person* knowledge is knowledge about which individuals poses which kind of competencies.

- *Market* knowledge is about distribution network, service, customers and competitors.
- *Strategy* knowledge is of corporate goals, strategy and interaction with external environment.

The analytical use of the knowledge source categorisation has identified decision types by simply relating decisions made in the case study decision meetings to knowledge sources.
Another way knowledge has been identified is through viewing knowledge as different types. Blackler's (1995) five types of knowledge described in relation to engineering practices have been used: *Embodied*, *Embrained*, *Encultured*, *Embedded* and *Encoded*. These five types of knowledge have different characteristics and relates to individual and communicative dependencies, shedding a more subjective light on the understanding of knowledge. These five types of knowledge can be illustrated on a scale between tacit and explicit knowledge as they all more or less consists of both tacit and explicit knowledge (Figure 2):

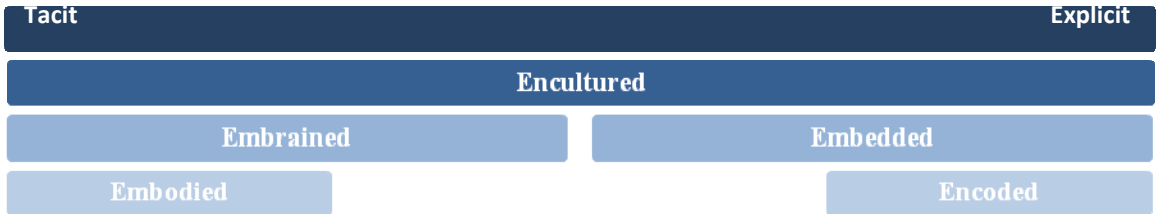

Figure 2. Knowledge types [Blackler 1995]

- Embodied knowledge is physical, relating to practical experience and interaction between individuals. It is primarily tacit and demands a social process to be transferred, e.g. a master-apprentice relationship transferring knowledge through observation and social interaction.
- Embrained knowledge is based upon a person's ability to understand abstract knowledge and is often based on experience. New knowledge is obtained from abstract thinking, understanding complex causations, e.g. ability to propose specific requirements on the basis of insights. The transferral is dependent on the sender's ability to understand own resources and cognitive ability and on the receiver's reference frame and intellectual abilities.
- Encultured knowledge is socially constructed, relating to both explicit and tacit shared understandings between individuals. It can be analysed from social structures and describes cultural understandings, effecting social interactions in and between groups of individuals, e.g. a team developing a certain language while creating knowledge regarding a specific area.
- Embedded knowledge is closely related to encultured knowledge but can be easily analysed from formal routines and procedures. An example is the knowledge about product development procedures in interaction with other individuals, technologies and routines.
- Encoded knowledge is documented as text, numbers, symbols and illustrations, thus encoded knowledge is primarily explicit.

2.3 Knowledge transformation

Nonaka's (1991) SECI model has been used to link the decision process to knowledge types and processes in the case study of the decision meetings (Figure 3). The cyclical SECI model is comprised of four steps and has a social view of the knowledge creating process, regarding knowledge creation as synthesising interaction between individuals, transforming knowledge from tacit to explicit and back to tacit. The steps are summarised here:

- Through *Socialisation* designers obtain tacit user knowledge in a master-apprentice relationship, transforming the user's tacit knowledge into new tacit knowledge of the designer.
- Through *Externalisation* designers express and share tacit knowledge in a development team context, transforming tacit knowledge into explicit knowledge.
- Through *Combination* designers combine knowledge through synthesis and incorporation of explicit knowledge into a structure, transforming it into new explicit knowledge.
- Through *Internalisation* new explicit knowledge is incorporated into the existing organisational tacit knowledge pool which is thereby extended.

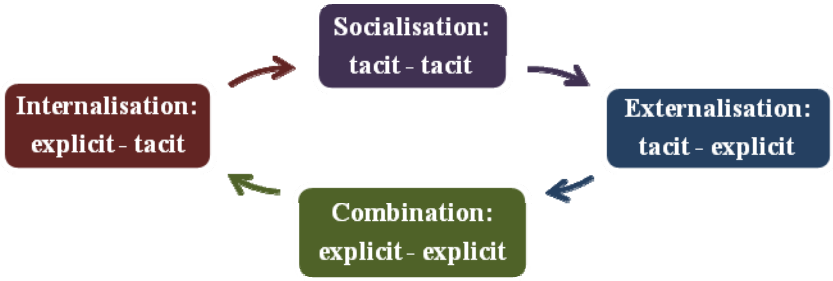

Figure 3. The SECI model [Nonaka 1991]

In this case study of decision meetings, it is not possible to observe the Socialisation process step of the SECI model, hence there are no instances of socialisation identified. The SECI knowledge process and the decision process will be compared in the case study analysis and identify points of intersections in an attempt to reveal how knowledge processes impact the decision process.

3. Methodology

3.1 Empirical company case study

The study has been conducted in a medium-sized company developing advanced underwater acoustics. The company was at the time of the case study going through extensive procedural and human resources restructuring due to financial difficulties. The company has been the market leader for over thirty years but was now struggling with immature products and an unstructured development processes. This situation created a strong pressure on the development department demanding fast responses to product errors and development of customised products to create instant revenue. As an answer to this immediate pressure, the Scrum development concept was introduced and along with this a structured implementation of so-called *decision meetings* where decisions of prioritising project activities was taken. Two following decision meetings supplies data for the case study. A first meeting of 4 hours and 10 min. with 6 participants and a second meeting of 1 hour and 40 min. with one individual replacement of the same participants. The two meetings will be considered as one long meeting in the analysis, as the second meeting has both the intention and characteristics of continuing the first meeting. The participants were project managers from the development department and the department's director, who acted as a supervisor during both decision meetings. The project managers was of different ages, different time wise and domain wise experience, and has been either long or short time in the company. Data has been collected through audio-recording participants' speech while observing the meetings. The recording of meetings is interesting in this study because it shows knowledge processes, -needs and -sharing, and decision processes in real-time compared to an interview where it is told retrospectively. On the other hand, the observer cannot guide nor structure the process according to the objectives of the study.

3.2 Analytical method

The recorded data was transcribed in respect to each individual participant of the decision meetings. As method, a coding scheme [e.g. Chi 1997] has been developed to conduct qualified and quantified analysis of the transcribed data. Coding is a way to categorise data in a qualitative analysis and on this basis draw out quantitative results. In this study, the coding scheme is constructed in an iterative process using both theory from literature on knowledge management and decision-making and using the collected data itself where categories emerge. The coding scheme consists of categories with codes and transcribed data. The data is transcribed speech, segmented according to themes or individual meeting participant. The transcribed speech segments were placed vertically and the categories with codes was placed horizontally creating a matrix structure where correlations between data and codes could be made in the qualitative analysis. Approximately 1700 data segments were analysed, giving approximately 7000 instances of correlation between empirical data and 11 categories with 67 codes. Four of the categories with 22 codes are the primary focus of the paper (Table 1):

Table 1. Coding scheme categories, codes and correlation instances with transcribed data

Category	Codes	Total
Knowledge source	Process, Product, Person, Market, Strategy	923
Knowledge type	Tacit, Embodied, Embrained, Encultured, Embedded, Encoded, Explicit	742
Knowledge process	Socialisation, Externalisation, Combination, Internalisation	742
Decision-making process	Goal clarification, Solution search, Solution analysis, Solution evaluation, Decision, Control	493
Total		2900

Inter-rater agreement was quantified using Cohen's kappa: $\kappa = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(e)} = \frac{0{,}484 - 0{,}008}{1 - 0{,}008} = 0{,}480$, where κ is Cohen's kappa coefficient, Pr(a) is the relative observed agreement among the raters, and Pr(e) is the hypothetical probability of chance agreement. A kappa coefficient of 0,48 is 'moderate' agreement. The theory which the codes are based upon is describing dynamic and sometimes intangible processes and the theoretical categorisations are overlapping either in definitions or in reality (e.g. the knowledge types and the RDMM). This is expected when trying to quantify human cognition and social processes in a qualitative analysis of this type of data and causes a certain amount of inaccuracy when testing inter-rater agreement.

The qualitative analysis formed the basis for the quantified analysis in the case study, creating tables and figures which have formed the basis for discussion. While primarily analysing and discussing the quantitative results, impressions from the observations will be considered and contribute to a more qualitative angle. The following sections is structured by first analysing the decision process followed by relating the decision process with knowledge and knowledge processes.

4. Analysis results and discussion

4.1 Decision-making process pattern

The mapping of the decision-making process (decision process) has been conducted through several steps. The time wise length (horizontal axis in Figure 4) of a certain step in the rational decision-making model (RDMM) was decided by the length of the transcribed speech segment correlated to the specific step (code) of the RDMM. Hence, by colouring the length of the speech segments, one can obtain a view of the time spent on any step of the RDMM (Figure 4):

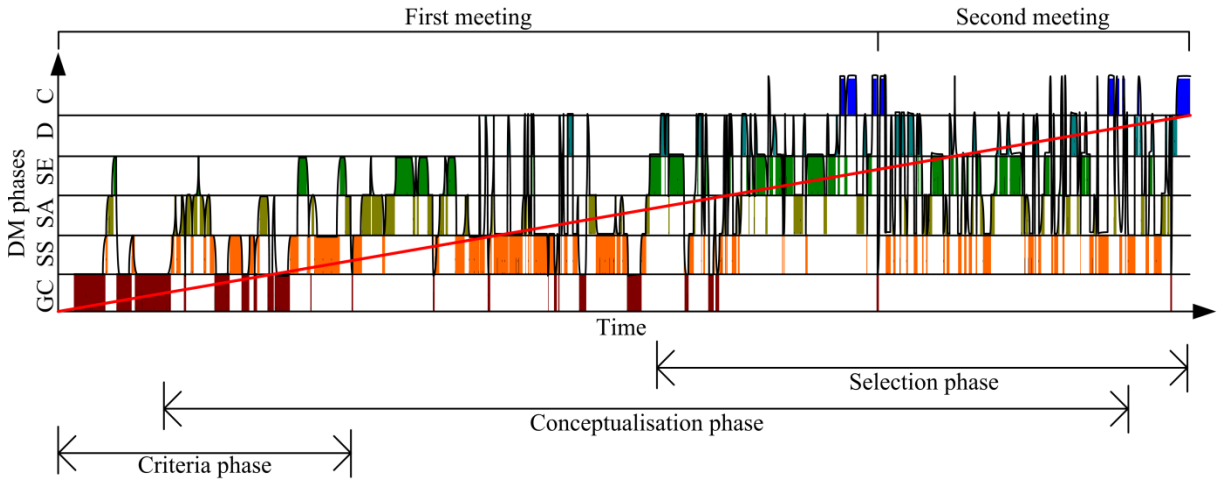

Figure 4. Iterations between and time spent on the phases of the RDMM (DM phases) during the first and second decision meeting; Goal Clarification (GC), Solution Search (SS), Solution Analysis (SA), Solution Evaluation (SE), Decision (D), Control (C). The diagram is also divided horizontal into overlapping problem-solving phases: Criteria phase, Conceptualisation phase, and Selection phase

Mapping the decision process as described, reveals both a micro level pattern and a macro level pattern. The micro level pattern is revealed through a primarily vertical view of the pattern and the macro level pattern is revealed through a primarily horizontal view of the pattern.

4.1.1 Micro level pattern

In Figure 4, the micro level pattern shows examples of a very iterative problem-solving process with arbitrary jumps between the steps of the RDMM. The chronology of the rational decision process is interfered by inputs of knowledge needs, ideas and suggestions, uncertain information about company goals and strategy, formal and informal procedures, person bound needed competencies and information etc. Every new input drags the process in a certain direction and makes the decision process jump between steps in the rational model. These interferences can be compared with the parallel supporting processes suggested by Mintzberg *et al.* (1976) [Rasmussen *et al.* 1991] but in this case the interference of the rational decision process is both supporting the progress but also hinders it. The iterative and jumping process shows and confirms examples of the decision-making patterns identified by Badke-Schaub and Gehrlicher (2003). All the patterns were found to be present but with a dominance of Leaps, Loops and Cycles. According to Badke-Schaub and Gehrlicher (2003) these patterns gives a both stagnating and progressing decision process resulting in both successful and unsuccessful decisions. There are a few examples of a mixture between the Meta-processes and Sequences decision-making patterns, where Meta-processes facilitate Sequences patterns. In this case, a specific individual at the meetings functions as a moderator and facilitator, guiding the decision process. This only takes place when it is obvious that the process is on a wrong track or at a halt. The Meta-processes observed at the decision meetings were often accompanied by the illustrating of issues, stakeholders and relations on a whiteboard. Mintzberg et al. (2001) has suggested supplements to the rational decision process. The rational decision process is a *Think first* decision process but two others a suggested; a *See first* and *Do first* decision process. The above mentioned Meta-process pattern from the observations in the case study accompanied by schematising is an example of a *See first* process. It is important to note that illustrating problems, relations and goals supports the decision process at the case company, as they can be used more consciously and can structure the decision meetings to strengthen the decision process.

4.1.2 Macro level pattern

The macro level pattern of the decision meeting in Figure 4 shows a messy but persistent process through a problem-solving decision-making structure. The problem-solving process is illustrated by the diagonal drawn in Figure 4. One can see that Goal Clarification (the first horizontal level in Figure 4) is primarily conducted in the beginning of the decision meeting. The instances of Goal Clarification in the later phases of the decision meeting are reminders of the goals of the decisions being made in the decision meeting. Solution Search and Solution Analysis (the second and third level in Figure 4) takes place throughout the decision meetings but with different intensity and more clustered in the middle of the decision meetings. The synthesising characteristics of Solution Search and Solution Analysis seem to be an integrated part of all the phases in the decision process. Synthesising are not only related to searching for solutions to decisions but also to the understanding and agreement of goals, in evaluating the proposed solutions and in discussing how to implement the decisions. Solution Evaluation, Decision and Control (the fourth, fifth and sixth level in Figure 4) is primarily conducted in the end of the decision meetings where solutions best fitted with goals are chosen and roughly planned for implementation. The macro level pattern can be defined by roughly three phases:

- Criteria where problems and goals are understood and defined.
- Conceptualisation where solutions are sought and analysed.
- Selection where suggested solutions are evaluated and chosen.

This pattern of three main phases is similar to the generalisation of decision processes in literature [Rasmussen et al. 1991, Badke-Schaub and Gehrlicher 2003, Rolland 2004]. Although these three phases are proposed, they are still overlapping one another and leave questions of how the knowledge processes impacts the decision process, which is discussed in later sections.

4.2 Knowledge sources in the decision-making process

In developing the coding scheme, the categorisation of knowledge sources led to a set of codes, further specifying the knowledge content in the decision process (Table). Table shows the type of knowledge referred to during the different phases of the decision process. In the Criteria phase, results show that knowledge about strategy, especially company goals are important. In the Conceptualisation phase, knowledge about current and future project activities and development procedures are dominant, however there is a great occurrence of knowledge about strategic prioritising. Also of interest during the Conceptualisation phase, is the occurrence of product knowledge or technical knowledge considering the strategic focus of the decision meeting. During the Selection phase, knowledge about activities and priorities in strategy are dominant with a focus on procedural knowledge during considerations on implementation of the decisions made.

Table 2. Number of instances of decision-making process related to knowledge sources

	Decision-making process		
Knowledge source	Criteria	Conceptualisation	Selection
Product (Design, Test, Specifications)	2	17 (10, 1, 2)	12 (4, 0, 2)
Process (Activities, Procedures, Documentation)	10 (1, 0, 0)	52 (86, 8, 8)	36 (70, 0, 7)
Person	0	4	6
Market (Customers, Marketing)	0	5 (1, 2)	0 (0, 1)
Strategy (Goals, Priorities, Budgeting)	3 (37, 8, 0)	10 (1, 28, 2)	1 (5, 51, 0)

Three types of decisions were identified during the meetings with respect to the knowledge source; decisions about the development procedures, about activities and about priorities. The aim of the decision meetings is to prioritise (decisions about priorities) between different projects in terms of fulfilling the strategic goals of the company but the decision meeting is equally focused on determining specific activities (decisions about activities) that fulfil these priorities and how to perform these activities (decisions about the process). The decision process phases rely on different knowledge sources and the results show that few individuals posses the majority of knowledge and specific knowledge sources were embedded in specific individuals. Hence, specific knowledge and individuals are needed for certain types of decisions and during certain steps of the decision process. An important lack of a knowledge source in the decision process identified was the absence of person knowledge. This is knowledge about who has a specific needed knowledge and was a recurrent issue during the meetings. The identification of individual knowledge resources in the company and inviting these individuals to decision meetings could support the decision process.

4.3 Knowledge types in the decision-making process

Looking at the results in Table 3, embrained knowledge that is dependent on the individual's abstract comprehension and intelligence was found to be dominant in the Criteria phase of the decision process in the case study. This is where understanding of corporate goals is translated into criteria relevant for managing project activities in the development department, keeping in mind that understanding of corporate goals and its effect on project prioritising is dependent on explicit knowledge supplied by top management [Rolland 2004]. The Conceptualisation phase was found to be dominated by both embrained knowledge and explicit knowledge (Table 3). Embrained knowledge is used when developing solutions and the explicit knowledge are facts influencing the suggestions when analysing solutions. In the Selection phase of the decision process, explicit knowledge is primarily dominant when reconsidering criteria and goals in terms of selecting the appropriate decision but the process also employs embrained knowledge when evaluating solutions against criteria and selecting solutions (Table 3). Explicit knowledge was also used in this phase when planning how to deploy the decisions made by using knowledge about development and documentation procedures.

A four-year study in 92 companies about knowledge management impact on strategic decision-making [Rolland 2004] shows similar results (Figure 5). The results from the study illustrated in Figure 5, show how tacit knowledge dominates the Intelligence phase (similar to Criteria phase) with a small

emphasis on explicit knowledge. The Conception phase (similar to Conceptualisation phase) is influenced by both tacit and explicit knowledge, and the Selection phase (similar to Selection phase) is dominated by explicit knowledge with a small emphasis on tacit knowledge. The difference in the occurrence of tacit knowledge in the Selection phase between the case study results (Table 3) and the results of Rolland (2004) can be explained. Rolland (2004) describes a jump back to tacit knowledge use in the Conception phase (indicated by circled number 8 in Figure 5) when synthesising in the Selection phase.

Table 3. Number of instances of decision-making process related to knowledge types

	Decision-making process		
Knowledge type	Criteria	Conceptualisation	Selection
Embrained	33	78	71
Encultured	6	19	21
Embedded	2	20	4
Explicit	11	98	97

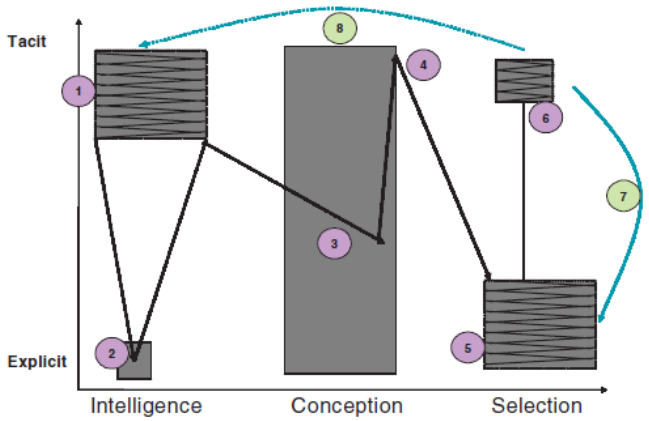

Figure 5. Decision-making process in complex situation [Rolland 2004]

Occurrences of tacit knowledge use with synthesis characteristics in the Selection phase in the case study presented in this paper, only appear in the Selection phase even though the process have synthesis characteristics. In the next section, the role of synthesis processes in phases other than the Conceptualisation/Development [Mintzberg *et al.* 1976]/Conception [Rolland 2004] phase of the decision process is described.

4.4 Knowledge transformation in the decision-making process

The SECI process describes knowledge transformation as a social process on a macro level, where designers obtain tacit knowledge from users through socialisation, meet in the design team and externalise this obtained knowledge, structuring knowledge through combination into product structure, creating new knowledge and extending organisational knowledge resources when internalising newly created knowledge. This macro level process with problem-solving characteristics can be compared to the generalised three step decision process found in both extensive literature and in this case study. Looking at the results in Table can be confusing when expecting strong correlations between Conceptualisation phase in the decision process and Combination phase in the knowledge transformation process, considering their shared synthesising characteristics. The Conceptualisation phase was dominated by Externalisation. This is surprising, when one expects Combination processes considering the synthesising characteristics of this phase. This could indicate that the Combination phase is much more than synthesising or synthesising is central in both Conceptualisation and Selection phases. The high number of Internalisation in the Selection phase is the evaluation of solutions. The evaluation is about considering the explicit suggestions by drawing on experience and knowledge about consequences in choosing different solutions. Internalising knowledge transforms

explicit knowledge into tacit knowledge. The internalisation process is observable because it activates a new output in form of an externalisation process. This indicates an internal process where only the input and output is observable.

Table 4. Number of instances of decision-making process related to knowledge creation process

	Decision-making process		
Knowledge transformation	Criteria	Conceptualisation	Selection
Socialisation	0	0	0
Externalisation	19	115	50
Combination	4	33	52
Internalisation	29	67	91

4.4.1 Knowledge transformation processes impact on the decision-making process

The results in Table do not reveal any clear explanation, pattern or analytical value. In this analysis the processes of the processes of the SECI model could be more explanatory on a micro level. The high amount of iteration in the decision process, disturbing the steps of rational decision-making model, can be explained by the impact of the SECI knowledge processes on the decision process. Every bit of knowledge is externalised and further transformed through discussion in the combination phase creating new knowledge, which are individually internalised to tacit knowledge, remaking tacit knowledge, which are extending participant's knowledge with new tacit knowledge, creating new questions and answers, which are externalised, starting the SECI knowledge process all over again. The process can be illustrated by adjusting the original SECI model with the findings of the case study (Figure 6**Error! Reference source not found.**):

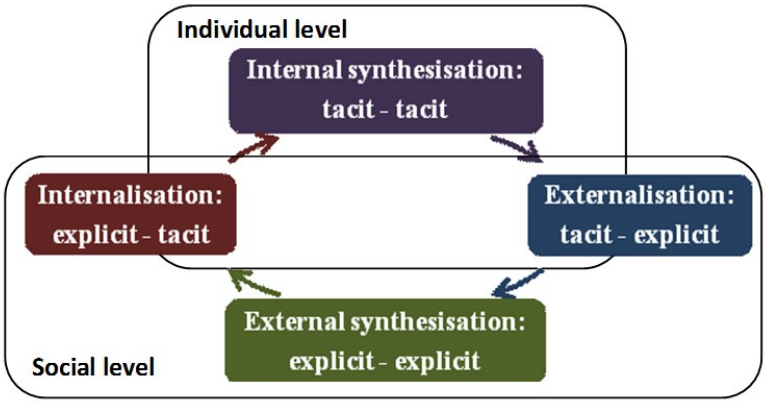

Figure 6. Knowledge transformation process on individual and social levels in the decision-making process during the two decision meetings of the case company

The knowledge transformation process shifts from an individual level to a social level, where knowledge is transferred between the levels (Externalisation and Internalisation), going through a synthesising process on the way (Internal synthesisation and External synthesisation) (**Error! Reference source not found.**). The decision process is build around and is dependent on the knowledge transferring- and transformation process. The knowledge transforming process could be the activator and accelerator of the very iterative pattern of the decision process. This analytical result is a possible explanation and would need further investigation to determine its potential supporting value to decision-making processes. Thus, a development of the understanding of decision processes based on a further investigation of knowledge processes and their impact on the decision process could be relevant.

5. Limitations

This paper presents a descriptive industrial study of decision-making intensions followed by minor planning activities in two meetings of six hours in total. The success or failure of the decisions made

during the meetings is not followed. The study is a single case study where the empirical data is supplied from observations and recordings of two decision meetings and the results should therefore be considered as such. General value can be ascribed in relation to other case studies if specific company characteristics are corresponding and theory and approach are similar. However, the results are supported by literature suggesting the possibility to generalise results.

6. Conclusion

The case study documented in this paper shows an example of how to trace knowledge in decision-making processes using well-established theory from literature. The results show a dependency of the decision process on specific knowledge sources related to specific individuals. The results can leverage the awareness among employees of the case company of how knowledge influences the decision-making and could form a basis for structuring knowledge in the decision meetings to support decision processes. The paper shows a way to map the decision-making process pattern, and suggests how the knowledge process impacts the decision process on a micro level by interfering with the chronology of the rational decision-making model. Furthermore, it is possible to identify a three phase problem-solving process in the decision process on a macro level as proposed in literature, also indicating parallel processes in the form of knowledge processes impacting the decision process. It is suggested that a knowledge creating process, showed by the SECI model, can impact the decision process and a modification of the SECI model is proposed with a specific focus on the synthesising processes during knowledge creation, distinguishing between individual and social levels of the knowledge process. The results in the paper supplies a basis for understanding how knowledge processes impacts decision-making processes and the results of the case study can work as a springboard for further investigation with the aim of structuring knowledge to support decision-making in innovation processes and thereby increasing innovation capability.

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Anna Rose Vagn Jensen, M.Sc.
PhD Student
Department of Management Engineering, Technical University of Denmark
Section of Engineering Design and Product Development, EKM Group
Building 426, Produktionstorvet, DK-2800 Kgs. Lyngby, Denmark
Telephone: 0045 4525 6250
Telefax: 0045 4593 1577
Email: anrvj@man.dtu.dk
URL: http://www.kp.man.dtu.dk/English/Research/areas/EKM.aspx