Strategic Planning of Knowledge Management Systems
-
A Problem Exploration Approach

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Abstract

Knowledge management is an often cited strategy for business success; however, the outcome is often not satisfactory. Knowledge management (KM) as an academic area is focused on the problems and opportunities of using organizational knowledge as a resource. Information systems that are used to support KM processes are called knowledge management systems (KMS). A KMS is distinguished from any information system by the organizational processes that it supports, that is, creation, capture, storage and dissemination of competences and knowledge.

This research approaches the problem of failing KMS's by focusing on the planning phase. The research area can be summarized as:

"Perspectives and frameworks for the strategic planning of knowledge management systems, i.e. information systems for the support of organizational knowledge processes".

With regard to theory, KM/KMS has been discussed from very broad perspectives. We approach the problem area from a strategic point of view, assuming that the problems of the area are based on a socio-technical dimension and that a multiple-paradigm approach is necessary for dealing with the problems of the various KM areas.

The research strategy applied to achieve this is interpretative case studies. A number of case studies are used for exploring KM planning areas, developing a framework for planning and testing the resulting approach. The empirical material consists of three main case studies, together with a number of secondary cases by other writers in the KM field.

The outcome of the research is a planning approach, which is given the name: "The problem exploration approach". The approach is intended for the generation of ideas of possible systems, as a strategic part of knowledge management systems planning. The purpose of the planning approach is to support the creation of a portfolio of KMS. A KMS portfolio is a structured set of information systems that could be developed for an organizational unit. The approach consists of five planning frameworks, all targeting different aspects of an organization. Both the frameworks and the final approach are tested using interpretative case studies.

"The problem exploration approach" and its development process are then examined for more general insights into the subject of strategic KM planning. As an outcome of this examination a 12-point program for balancing a planning approach is presented.

The contributions include the need of a multiple-paradigm, a content-method balance and the pragmatic implementation of the socio-technical dimension of strategic planning.

The contributions of the thesis are intended for an audience of people researching, choosing, developing or using strategic planning models in general and especially for the planning of knowledge management systems.

Content

List of Figures

List of Tables

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Writing a doctoral thesis requires a number of factors to be in place and work properly. From the large context down to the personal level, all must fit in for results to emerge.

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Professor Bengt G. Lundberg (1946-2001) initiated the process but left this world, all too early. A big thanks to Sven Carlsson who picked up the torch, and has guided me from there on. The “Knowledge in Organization” network has been a constant source of inspiration and academic coaching, thanks to all hardworking people of KIO. And of course my colleagues and brothers in arms, Niclas Eberhagen and Håkan Sterner, whose companionship have helped me, throughout all these years.

SOCRATES: At the Egyptian city of Naucratis, there was a famous old god, whose name was Theuth; the bird which is called the Ibis is sacred to him, and he was the inventor of many arts, such as arithmetic and calculation and geometry and astronomy and draughts and dice, but his great discovery was the use of letters. Now in those days the god Thamus was the king of the whole country of Egypt; and he dwelt in that great city of Upper Egypt which the Hellenes call Egyptian Thebes, and the god himself is called by them Ammon. To him came Theuth and showed his inventions, desiring that the other Egyptians might be allowed to have the benefit of them; he enumerated them, and Thamus enquired about their several uses, and praised some of them and censured others, as he approved or disapproved of them. It would take a long time to repeat all that Thamus said to Theuth in praise or blame of the various arts. But when they came to letters, This said Theuth, will make the Egyptians wiser and give them better memories; it is a specific both for the memory and for the wit. Thamus replied: O most ingenious Theuth, the parent or inventor of an art is not always the best judge of the utility or inutility of his own inventions to the users of them. And in this instance, you who are the father of letters, from a paternal love of your own children have been led to attribute to them a quality which they cannot have; for this discovery of yours will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written characters and not remember of themselves. The specific which you have discovered is an aid not to memory, but to reminiscence, and you give your disciples not truth, but only the semblance of truth; they will be hearers of many things and will have learned nothing; they will appear to be omniscient and will generally know nothing; they will be tiresome company, having the show of wisdom without the reality.

Socrates’ dialogue on true rhetoric, on the subject of the superiority of the spoken over the written word. Phaedrus 274-275. (Plato, 1892, p. 484)

1 INTRODUCTION

Organizations that try to management their knowledge resources and processes are today common phenomena. As a general term, knowledge management (KM) is used to describe such efforts and the information systems that are used to support KM processes are called knowledge management systems (KMS).

The popularity of KM among top management is documented; Rigby (2001) reports a 21 % usage among surveyed US firms in 2001, and in a follow-up study in 2005 (Rigby and Bilodeau, 2005) this number has increased to 53 %. However, the outcome of these efforts is mixed. In both Rigby (2001) and Rigby and Bilodeau (2005) very low satisfaction with knowledge management as a management tool is reported. In 2001 KM came in last among the 25 most used management tools, and in 2005 it is still close to the bottom.

There is an uncertainty in the academic study of KM about how to understand what it really is about (Spender and Scherer, 2007). Spender and Scherer talk about foundations and epistemologies, i.e. that there are several ways of understanding KM. The situation seems very varied, because there is not one clear driving force that might explain how the KM area works. The problem situation is characterized by many interconnected KM approaches that together make up the area. This situation could be expected to be a partial explanation of the problems that have made an impact on KM, and embracing this diversity would be one way of approaching the problems.

This research approaches the problem of failing KM systems by focusing on the planning phase. We argue that it is in the planning phase, i.e. the process of generating ideas of information systems to develop, that the problems starts (Bostrom and Heinen, 1977a).

The research area targeted can be summarized as:

“Perspectives and frameworks for strategic planning of knowledge management systems, i.e. information systems for the support of organizational knowledge processes”.

A general assumption of the research is that different planning frameworks are needed when different organizational processes and activities are targeted. The frameworks, consisting of sets of models and methods, of this current research are directed towards the early stages of a KM systems planning process.

The goal is the support of a problem exploration phase that directs the further development process. This process is often identified as a strategic aspect of information systems planning (Lederer and Sethi, 1988). In focus are the problems of how to plan the integrated efforts to support knowledge creation and distribution processes in an organization.

The intended outcome of the planning process is a portfolio of support systems and other initiatives or activities. A KMS portfolio is a structured set of information

systems that could be developed for a planning unit (organization /department /work group/work process). A central part of the strategic planning process is the generation of ideas, in this case suggestions for possible systems, the goal being to arrive at a more effective and efficient handling of the knowledge-related work of that unit by suggesting the right set of systems.

Figure 1 presents an overview of the research situation (the squares are organizational activities or processes, and the lines indicate how they are interconnected). The figure presents the main elements of the research area. The central element is the planning process that produces a KMS portfolio, i.e. the focus of the current research. The aims of this thesis include a planning approach and a more general discussion of characteristics of such planning approaches. The function of the planning approach is to draw the planners' attention to central aspects useful for the initial formulation of

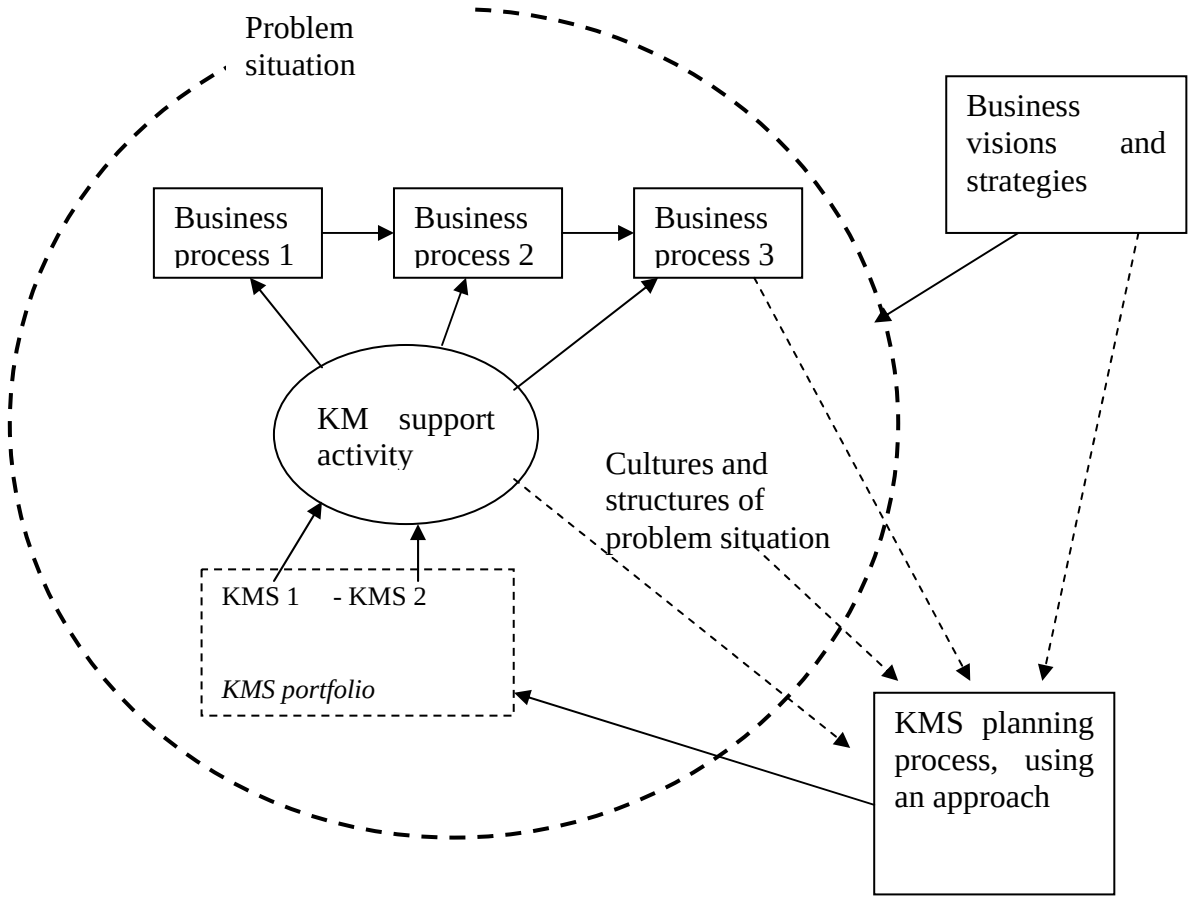


Figure 1. Overview of the research setting

KMS´s, together forming a portfolio of systems. The KMS portfolio should be understood as an integrated part of the KM support activity. A KMS is an information system, which is distinguished from any information system by the organizational processes that it supports, that is creation, capture, storage and dissemination of

expertise and knowledge. It should be noted that it is not a certain technology that defines a KMS, but it is the function that distinguishes it.

The objective of this research is to make investigations into the area of this class of planning methods and models. The scientific approach of this work falls within the area of hermeneutics and interpretative research. The hermeneutic approach builds on interpretations and understanding of social events as texts, by analysing their meanings to the human participants and their situation. The approach of this investigation is, in short, to develop a planning approach, test it in case studies, and then discuss the experiences made in the process in the context of relevant theory in the information systems area and related fields.

The result of the thesis is intended for an audience of people researching, developing or using strategic planning models in general, and especially for the planning of knowledge management systems.

1.1 Background

This section seeks to focus on some main problems of planning for information systems. The key problem is identified as the socio-technical dimension of information systems. The conclusion here is that a central problem of knowledge management systems planning is how to handle this dimension.

Information systems reside within the wider area of the design of organizations. The design of organizations is an activity including "the structural arrangement of resources (land, labour and capital) of an organization in order to achieve desired ends." (Van de Ven and Joyes, 1981, p. 3). The questions about the internal structure of the organization must be addressed together with questions about strategies, environment and culture. This requires multidisciplinary perspectives across many levels of analysis, transgressing artificial boundaries (e.g. micro/macro perspectives). This view is also found in Leavitt (1964), where a very basic model of the relationships between central perspectives of an organization is provided. Structures, tasks, technology and people are all completely interconnected in a web-like model. The consequence of this view is that one cannot change one aspect without an understanding of the other aspects.

1.1.1 Central Problems of the Information Systems Field

There are clear issues concerning what to include or exclude within the information system field. The problems include both the choices of study objects and which perspectives to apply. A recent upflair of this discussion can be found in a paper by Benbasat and Zmud, (2003). They (2003) see the exclusion of issues related to the "IT artefact" as a certain road to the disintegration of the information system subject. In this view, information systems are the practical application of IT on organizational problems. They argue for the study of 1) an "IT artefact", also including 2) the task

that is supported, 3) the structures of that task, and 4) the context where the task resides. This definition is not as such very new; on the contrary, it is very traditional, argue Ives et al. (2004), commenting on Benbasat and Zmud (2003).

The five information system points presented by Benbasat and Zmud (2003) could be applied on the research in this thesis, and an overview of the research can be concluded in the following four points.

1) Knowledge management system (the information system).

2) KMS support knowledge processes (task).

3) Knowledge management strategies and work processes supported by KMS (task structures).

4) Organizational culture and structures of the situation where the KMS is used (task context).

In the end, there is a need for a trade-off between not treating information systems / IT artefacts as black boxes and treating them like any general phenomena studied in the social sciences. The view of this debate is dual; one must both be able to keep the technical core in focus and deal with a flexible discipline. The flexibility is necessary in order to contribute to the multidisciplinary problems caused by knowledge management systems. This current research, with its focus on a class of information systems (knowledge management system), is naturally connected to and very much dependent on the organizational theme of knowledge management. Knowledge management is not a part of the information systems field, according to Benbasat and Zmud (2003), although it is a frequent theme in information systems conferences and journals. Other commentators on Benbasat and Zmud argue for a broader responsibility for investigations into the wider effects of IS/IT on society (Agarwal and Lucas, 2005). Agarwal and Lucas (2005) argue for a macro perspective on IS/IT, and for the impact of technology being studied by those that know it best.

1.1.2 The Socio-technical ‘Solution’

The general problems of choosing perspectives on the design process naturally exist in the information systems area. Lee (2004) has a bleak view of the information system area:

“The terms ‘information’, ‘systems’ and ‘information systems’ have fallen into such careless use that they seemingly no longer denote anything different from one another.”. (Lee, 2004, p. 10)

This problem has it roots in the duality of information systems, that is, the concept refers both to the technical system (information technology, IT) and the social system (people, social group or organization). The IT-oriented people accuse the social side of forgetting the core of the area, i.e. the technology, while the social side accuses the IT side of being unable to really solve problems (i.e. long-term organizational consequences).

Lee (2004) resolves this duality by conceptualizing information systems as an emergent phenomenon, the social system emerging under the pressure of the technology just as much as the technological system emerges under the pressure of the (social) activities of people. Lee expresses this relationship as follows:

"… information technology is indeed designed and implemented for the purpose of satisfying the organization's requirements and the organization is indeed designed and implemented for the purpose of satisfying the information technology's requirements.". (Lee, 2004, p. 11)

Lee (2004) describes these traditional development processes as incomplete:

"A conventional … view of information systems focuses on information requirements – which describes the information that an organization requires from an information technology so that it can function and achieves its goals … This view dominates the assorted waterfall models of systems design … This view is incomplete because it is blind to systems other than the technical systems as well as to the mutually transformational interactions that unfold between technical system and other systems." (Lee, 2004, p. 10-11)

This situation has been discussed for the good part of the IS field's existence. For example, the socio-technical systems perspective on information systems (Bostrom and Heinen, 1977a), b) a joint optimization as the guiding light for how information systems should be planned, developed and implemented. Information systems, however well supported technically, that are not in line with the organization and the people that are affected by it, all too often turn out to be useless.

1.1.3 Approaches to Understanding Organizational Needs

The socio-technical insight does not necessarily make the planning or development of information systems easier, but hopefully brings the subject closer to reality. There is no easy solution, but there are some well known possible approaches, (Hirschheim and Klein, 1989). For example, just going ahead and building the technical system that fits the problem in an objective sense (cf. functional paradigm in Hirschheim and Klein, 1989) and letting the organization deal with the consequences.

The poor record of information systems projects (Chaos report, Standish Group, 1994) suggests otherwise (16.2 % project successes). Although these numbers have improved, there still is a clear majority of projects that do not reach their goals when it comes to time (82%) or features (52%), (Press release, Standish Group, 2003).

Linberg (1999) expresses the situation with a rhetorical question: "How do software developers reconcile their high achievements needs in a profession with an advertised failure rate of 84%". Many of the explanations put forward by the Standish group move along the line of the trouble of understanding and communicating organizational preferences, including conflicting goals within the organization or the constant flux of things in general. In a short review of the "Chaos Report" two factors for failure are pointed out, the lack of top management support and user involvement

(Hayes, 2004). This points to the understanding and analysis of the organization as the major issue to be resolved in order to deal with IS failures. It should also be remembered that there has been some critique against some of the Chaos reports (Molokken and Jorgensen, 2003), but the general direction seems to be accepted.

The reasons for problems in information systems development are also found in early investigations into the strategic planning of such systems. Lederer and Sethi (1988) list a number of factors that affect these problems, and most of them include the connections between the IS perspective and the organization, for example the involvement of IS personnel in business planning and the relationship between IS personnel and top management. The scope and time horizon of the project also play a part, broader or longer projects having more problems.

A possible way of taking on these problems is to focus on the interaction between the social and the technical systems. A method or theory, for that matter, that includes everything does not seem very plausible and is not the aim of this research. A general structure for the process could be described as moving focuses between the types of systems, first on the social systems for requirements, then to the technical for solutions, back and forth throughout the planning, design and implementation cycles. The interaction or relation focus points towards a need to understand how a technical system introduced into a social system during mutual interaction produces a socio-technical (sub-)system understood as an information system and the other way around.

To approach this problem, an early problem investigation stage is often used, often framed as a strategic phase (Earl, 1989). A mix of different techniques for defining organization problems to be solved and the possible consequences are discussed. This is done in an attempt to anticipate the complex interplay described by Lee (2004). The outcome is an investigation of the initiating problem, leading to a collection of systems and implementation strategies that are hoped to solve the basic problem while avoiding difficulties. What is important here is to see the difference between a planning method and a development method, the first being about expanding the problem and capturing the complexity and the second about creating technical solutions and reducing complexity in order for exact specification to be created.

In general terms, there is a fundamental problem in the planning, development and implementation of information systems. Information systems projects fail, most being driven by technical methodologies. Interpretative or other more human- and organization-oriented models have been proposed as a remedy for these problems. However, this has not had any wider impact on the practice. Further, soft methods are all too often not devised for practical use, and when they are used (in research projects) they prove to be extremely time-consuming and come up with results that are not easy to apply (Alter, 2004). Looking at the schools that try to incorporate a variation of socio-technical perspectives (cf. the soft system methodology SSM, Checkland, 1981; Multiview, Avison and Wood-Harper, 1990; Ethics, Mumford, 1983), there is no silver bullet effect in the sole application of socio-technical

theories. Frameworks that are more socially oriented, are not so often used in practical development, due to time/money constraints, or to the models being too abstract or theoretical (Alter, 2004). On the other hand, the parts of development process that are more organizationally oriented are less explored or just taken over from other parts of organizational studies (typically from the strategic planning area) with a fundamental functionalist bias.

In conclusion, a number of aspects of systems are involved in information systems development, including different kinds of social and technical systems. When the final system is in use, some of its parts have been planned, while others have emerged in an interactive manner. This situation clearly puts many demands on a planning approach for guiding the development process.

1.1.4 Alternative Approaches to Strategic IS Planning

The question about the direction of a project is tackled in most development approaches. However, there are great differences in how important it is for the approach, and what means the approach provides.

In the area of software development, the question of strategic directions is approached in very general terms. For example in the unified process approach (Arlow and Neustadt, 2005) the first step is described as an analysis of the context. This process is also described as "requirement elicitation", which is a selective process, as it is impossible to record every aspect of the problem. Arlow and Neustadt (2005) put the problem like this:

"… we just don't have the cognitive equipment to capture every nuance and detail of the world in an infinitely detailed mental map, so we have to be selective." (Arlow and Neustadt, 2005, p. 61)

According to Arlow and Neustadt (2005), citing the linguistics professor of MIT, Noam Chomsky (Chomsky, 1975). this is a process of deletion, distortion and generalization, How then should this process be guided? The general approach is to provide more or less detailed questions and directions to persons or parties who are going to ask these questions. A number of areas are pointed out as important, including users, stakeholders, related software and hardware, business goals and legal constraints. As these are general topics, the real advice is to work with the future actors of the system, using interviews, questionnaires or workshops.

Another example of how the rather traditional and technical approach to information system development tries to deal with this can be found in the ARIS framework (Scheer, 2000) to business process modelling. The key concept here is "strategic business process analysis", which is supposed to help decide which new information technology should be deployed. The approach is a goal-oriented philosophy, expressed as:

"… structure follows process follows strategy" (Scheer, 2000. p. 7).

The main model suggested by Scheer (2000, p. 10) is the value chain (Porter, 1984) and critical success factors (Rockart, 1979). In an effort to derive business processes from strategic business plans a picture of the future organizations is developed.

In this research, we do not discard any of these approaches. The case is rather the opposite, because many of them are fundamental for the planning of KM systems. However, the approaches are common but all suffer from deficiencies. The approaches only provide us with tools to work with the information system from a single perspective. They do not work with the socio-technical dimension, neither in the tradition of strategic thinking. A more obvious problem is that these approaches assume that it is a general type of problem that the system is aimed at. The KM area has it special problems, and this must be reflected in the set of frameworks used in the initiating phase.

The central question, how the strategic planning of information systems is connected to other phases of information system development, is investigated by Karim (1988). In this paper, a framework is presented, detailing how different events of planning, modelling and design should be coordinated. According to Karim (1988, p. 5), the strategic planning of IS

“is a systematic process for developing a long-range plan for information systems on the basis of the organization’s overall strategic plan”.

The above mentioned framework contains a number of different work roles in the development process, from the early stages to the physical implementation.

* Conceptual planner. This role is concerned with organizational strategic planning and strategy for key technologies, especially regarding the competitive situation.

* Pragmatic planners. This role works with organizational structures, policies and investment strategies. Based on the findings from these efforts the more specific requirements for the system are developed.

* Pragmatic developers. This role works with the implementation of the requirements, the practical construction of the system.

* Conceptual developers. This role works with technology on a corporate level, making analyses of technology capabilities and planning possibilities for the strategic use of technology.

These roles must of course interact, for example the interaction between the conceptual planner and the pragmatic planners, which creates an alignment between the strategic objectives and the system requirements. This interaction is described as follows:

“The organizational strategies generated by the conceptual planner should flow to the pragmatic developer to provide a necessary foundation for the development of the information systems projects” (Karim, 1988, p. 15)

In this research, we work with tools for the conceptual planner, especially for a certain type of organizational strategy, i.e. knowledge management.

1.2 Research Area: Planning Knowledge Management Systems

Here we try to frame the research area of knowledge management and to focus in on the central issues of planning knowledge management systems.

Knowledge is becoming the key production factor of our society (Bell, 1976). Knowledge has always been important, but is now moving toward becoming the most important factor (Drucker, 1993; Castells, 1996). In connection with this development, the area of knowledge management has grown strong during the 1990s, presenting organizational and technical solutions for organizational knowledge processes. An additional problem in this development is the effort to meet economic crises with leaner organizations. Business process reengineering (BPR, Hammer, 1990) suggested a complete change of business processes and exchanging personnel for computers in large numbers. This was one central, rather extreme approach of this trend, and Hammer did tune down the revolutionary ideas later on, for example in an interview (Mahoney, 1997) where corporate values and understanding the totality of the organizations are described as important factors. Other management trends criticized the BPR approach, arguing that the process change was not enough for long-term success, while the development of the core competence and visions for the future was suggested by Hamel and Prahalad (1994) as key focuses for successful companies. However, making these knowledge management ambitions work together with BRP projects proved harder (Scarbrough, 1998). Rapid and dramatic personnel changes, in turn, depleted organizations of knowledge and made them 'lean and mean' (Castells, 1996). This is the pretext leading to the need for knowledge management. In its basic form, knowledge management was an effort to tap the knowledge of employees using IS/IT, and reuse this knowledge resource when needed.

Holsapple and Joshi (2003) see knowledge management as an episode in organizational life, from a point where a knowledge need is recognized until it is satisfied. Within this episode, many authors suggest a number of activities. Most of these activities include creation, processing and putting knowledge into use as broad categories of knowledge management activities. However, when it comes to the role of information systems, the connections are not as easy to understand or plan.

In Nonaka and Takeuchi (1995) knowledge is something personal and physical, not easily converted into structured and explicit ideas that can be represented and handled in information systems. In the Matsushita case that Nonaka and Takeuchi (1995) present information technology is rarely mentioned; people are the key implement for creating and transferring knowledge. Information and information systems are often key driving factors for changing society (Castells, 1996). However, whether these resources should or even could be central parts of a given knowledge management project is far from certain.

There are anyhow good examples of how to make knowledge support effective, by using information processes as the support of knowledge creation and distribution (Sieloff, 1999; Davenport et al., 1998). Examples of the difficulties and unexpected outcomes of projects where information systems have been central resources have also been presented (Newell et al., 2001).

Questions consequently arise whether information systems can be applied to assist this movement, and if there is a need for new ways of developing information systems for these purposes. This ambiguity of the knowledge management and information system connection makes a case for investigating traditional development methods in order to adapt or re-orientate them in order to be useful in knowledge management projects. This research is aimed at this "knowledge" perspective of the area of information system development.

The effort to support the organizational knowledge system, using information systems, creates a set of problems. In the case of supporting knowledge processes and work there are a number of human and organizational issues that should be tackled. How an information system is understood in its organizational context will be more important than the actual technologies that are used to implement them. There is a broad range of possible technical support systems, depending on what part of the knowledge management process is targeted (Alavi and Leidner, 2001). The nature and direction of knowledge management can be very varying and consisting of combinations of technical systems, initiatives, change programs or other organizational activities (Wiig, 1999; Binney, 2001). It should also be noted that there are good arguments for a connection between KM and IT (Holsapple, 2005).

This research resides in between areas, drawing on several areas of information systems research: information system planning, strategic information systems, organizational support systems and knowledge management.

The focus of the research project is on the planning of IS, with its application on organizational knowledge support. The field of IS planning is a broad one, many more or less general information systems methods or methodologies (Avison and Fitzgerald, 1995) having been presented. In this jungle of directions, this research follows in a strategic direction represented by McFarlan (1984), who developed strategic business models into models for planning information systems. To achieve both a depth and a width in an investigation compilations of strategic planning models can be used (e.g. Robson, 1997; Ward and Peppard, 2002).

A number of approaches to the understanding and development of organizational knowledge processes (for example Nonaka and Takeuchi, 1995; von Krogh et al., 2000; Davenport and Prusak, 1998) have been put forward.

The problem of knowledge support is that it seems hard to get results from investments in IS/IT products. The success stories give no conclusive evidence of the reasons and logic of success. Standard applications, based on database technologies, e.g. "knowledge bases", or communication technology, e.g. "video conferences", give advantages in knowledge work for example in problem solving. However,

failures with similar solutions for similar problems have pointed towards the organizational culture or context as the key factor (c.f. “Ba” Nonaka et al., 2000).

The multitude of planning approaches does not deliver what could be expected from them (Earl and Scott, 1998). In an investigation by Earl and Scott (1998) it was shown that KM frameworks all too often did not help the organization to formulate their KM intentions. The approaches were either too abstract or too limiting and did not provide support for action.

The problem is that the KM area is filled with contradictions that run down to the very basic assumption about knowledge, organization and IS (Schultze and Cox, 1998). The problem of knowledge management is that it both tries to control and is dependent on human actions and wishes. This is so in an even higher degree than other information system applications. Generally, KM has had a too technical leaning (McDermott, 1999), and a fear of KM becoming “the next fad to forget people” (Swan et al., 1999) has been expressed. These views are based on the assumption of a humanistic concept of knowledge (Blackler, 1995).

The development of information systems for knowledge problems in organizations is special, in contrast to other uses of IS. At the same time, this knowledge perspective could say something about the general problems of information systems development (ISD), at least when it comes to an ISD process that has a human focus. The general problems of making IS work well in organizations can thus be furthered by this specialized investigation.

This main question is approached by looking at the intersection of ISD and KM. The special problems of these KMS’s could be seen as a matrix between ordinary ISD problems and the special problems of human knowledge processes and their organizational implications. Interesting work has been done in this direction (Alavi and Leidner, 2001), but the problem here is the rather simple view of organizational knowledge, building on a positivistic knowledge view. This view should be complemented with ideas of a social knowledge organization (Holzner and Marx, 1979) to balance and frame a traditional cognitive view of knowledge.

1.3 Research Problems, Aims, Questions and Goals

Here the research problems of the thesis are disused, and how the problems discussed above are reflected in the aims of the thesis. In short, it can be seen as the “what” (is to be done) of the research.

1.3.1 Discussion of the Research Problem

The general object of this research is aimed at knowledge processes as a type of work processes, conducted in support of core processes. Earl (2001) calls for a two-track research, one that both investigates perspectives needed to understand the KM area further and how these perspectives could be made workable as planning instruments.

This research follows a view of organizations as knowledge systems (Tsoukas, 1996) and the idea that social epistemology (Pentland, 1995) should be used to understand

information systems in organizations. It is also important that these perspectives cannot stand alone; they must be balanced with other perspectives, for example with a functionalist or critical perspective. The success of a knowledge support project depends in part on how well different views of the situation are balanced. This does not exclude technology; it just provides a clear standpoint for the discussion of how technology should be used. The socio-technical nature of information systems is important from the knowledge management aspect. It is important, as knowledge is based in the individual person's situation and lifeworld.

In short: it is (at least) a two-faced problem situation. Knowledge management systems are referred to, on the one hand, as a database with a certain content, and knowledge (a knowledge base) and, on the other hand, a social system where technical solutions have little or no relevance. The KM area seeks both productivity effects by the application of IT and creativity and renewal effects based on personal abilities and commitment. Technically, the solutions seem to resemble what has already been explored in other fields: decision support, cooperative work, document handling, communication support, AI, databases, search technologies, and so on (Alvai and Leidner, 2001).

1.3.2 Research Problems and Aims

The socio-technical nature of information systems is seen as a central problematic issue in information systems planning. This is reflected both in how knowledge management is treated and in the methodological considerations that are made. The problem could be stated as follows:

"The problems are concerned with both the content and structure of frameworks that in an integrated way deal with the problems, grounded in the socio-technical dimension, within the area of planning knowledge management systems."

This problem statement points to the aim of this thesis:

"To develop a planning approach for knowledge support systems, providing a multi-perspective view that tackles the socio-technical dimension."

This aim includes the development of a number of planning frameworks and a discussion of how to work with them. However, it is also possible to gain more theoretical knowledge based on both the construction process and the outcome. A second aim can also be formulated:

"To discuss concepts, dimensions and perspectives which are central to understanding and handling the process of constructing a planning approach"

The forming of a general planning approach has practical values, but it is also possible to gain further knowledge from this process. It is possible both to further the theoretical knowledge about planning approaches and serve as a practical guide for the construction of them.

1.3.3 Research Questions and Goals

> *The proposed research aims, discussed above, should result in a contribution of knowledge to the information systems/knowledge management field. To make the aims operational we here detail the outcome of the study in a series of goals.*

The introducing discussion above points in a number of directions to how a planning approach could be designed. As a breakdown of the general research question a first research question can be formulated:

> *A) How can a strategic planning approach suitable for knowledge management systems, with a focus on socio-technical and multi-methodology aspects, be constructed?*

This general question is answered by the completion of some actionable goals:

1. *To develop a number of planning frameworks based on theories, models and concepts from different parts of the KM and the IS area or other relevant areas.*
2. *To construct a planning approach based on the planning frameworks.*
3. *To test the planning approach by applying the approach on practical cases.*

In Chapter 4 the frameworks are developed (A1), in Chapters 5 and 6 the frameworks are put together into an approach (A2), and in Chapter 5 the testing of cases is performed (A3). The construction of the approach is thus performed in two steps, first tentatively with case testing in Chapter 5, and then in Chapter 6 a more complete presentation of the approaches is presented.

The construction of a planning approach makes some practical and theoretical contributions. There is of course some practical value of the planning approach, even though the planned testing of the approach is limited. Nevertheless, the process of constructing the planning approach represents an important insight in it self.

The development of planning frameworks has some theoretical value as such. Therefore, we also propose that the insights gained during the development process should be possible to relate to some of the central parts of the background literature. A secondary question can be formulated as follows:

> *B) Based on the construction process and the result of it (as reported under question A), what more general knowledge can be gathered about the construction of KMS planning approaches?*

This question is answered by the completion of some actionable goals. In three goals we try to reconnect the results in research question “A” to the underlying theory areas. The three areas that we focus on include:

1. *socio-technical theories,*

2. *the strategic planning of information systems,*
3. *multimethodology theory.*

These questions are answered in Chapter 7 (B1-7.1, B2-7.2, B3-7.3). The outcome of these questions is then summarized in section 7.4 in the form of a checklist of central issues that should be considered when constructing a planning approach. In Chapter 8 some of the central issues are discussed further. Some of the issues discussed are generalized into propositions concerning the nature of a good planning approach for knowledge management systems.

1.3.4 Some Central Assumptions and Limitations

There are a number of assumptions surrounding these aims. They are discussed in several sections of this thesis, both in the introduction and in later chapters. They are deemed central for the reader to keep in mind and are therefore explicated in the list below.

- The intended purpose of the approach is problem exploration, which obviously leaves a number of important parts of an ISD process aside. This also points towards a need of integrating or at least relating the approach to other methodologies/approaches. However, this is not done in this work.
- The problem exploration part of systems development is often performed in the strategic phase of ISD. The problematic issues connected to these activities are rooted in the fact that the models and methods are almost exclusively taken from business administration, typically strategic planning models (e.g. Porters “Value chain model”). This has created a one-sided situation. The transformation process from business planning is part of the problem, just as it is part of the solution.
- The frameworks of the thesis are about supporting planning for the further information systems planning process.
- Planning approaches are assumed to be context- and purpose-dependent. Information systems supporting knowledge processes should be explored using frameworks developed for this particular problem situation.
- The frameworks are developed to incorporate diverse and sometimes contradictory perspectives. This is important in order to get the wider picture of the possible uses of information systems. Sometimes it is argued that one cannot combine theories that are based on opposite basic assumptions. While this is generally good advice, under certain conditions it might be necessary. When the technique of relating theories of opposing origin is used, it must be on condition of a clear understanding of this fact. This insight must subsequently influence how the result should be understood.
- The socio-technical dimension is generally understood as important, but the integration of the perspectives is hard to achieve, and the dominance of one

perspective over the other is often the result, whatever the good intentions. Models that work on the strategic level are even rarer.

- The focus is on KMS, but in addition to these we must include a broad set of systems, initiatives and other activities used for knowledge management support, and which might or might not include computer based information systems components.
- The assumption of this thesis is that there is no general, all-purpose framework. It is the other way around: each application area of information technology must have a set of frameworks of its own. The essential goal is, as pointed out by Bostrom and Heinen (1977a), that the package of changes suggested by the strategic planning process must include suggestions based on information technology as well as suggestions originating from more people-oriented organizational activities.

Based on the assumptions, a general direction of the research can be identified, guiding the following literature reviews and forming of initial drafts for planning frameworks.

1.4 Overview of the Thesis

Here follows a short orientation of the research process and the main papers that were written as intermediate working steps in the research process.

1.4.1 Overview

The thesis consists of a combination of traditional book chapters and included research papers. The thesis can be seen as consisting of three major parts:

1) The first three chapters provide an overview of research goals, research method and theory used in the thesis.

2) Chapters four and five consist of research papers previously published in conferences and journals. Here much detailed work of construction and empirical testing of the planning approach are presented.

3) Chapters six and seven present an overall conclusion of the whole thesis, after which Chapter eight sums up the thesis with a discussion of the results.

Here follows a somewhat more detailed presentation of the chapters following this current first chapter. In Figure 2 the connections between the major parts are outlined. In this figure the outlines of the research process are also described.

- *Chapter 2.* Background theory and summary of the theory used in papers. The theory chapter includes an overview of the different theoretical areas of the thesis. Some of the theory naturally appears in shorter theory parts of the included research papers (Chapters 4 and 5). In the papers, the theory is more detailed

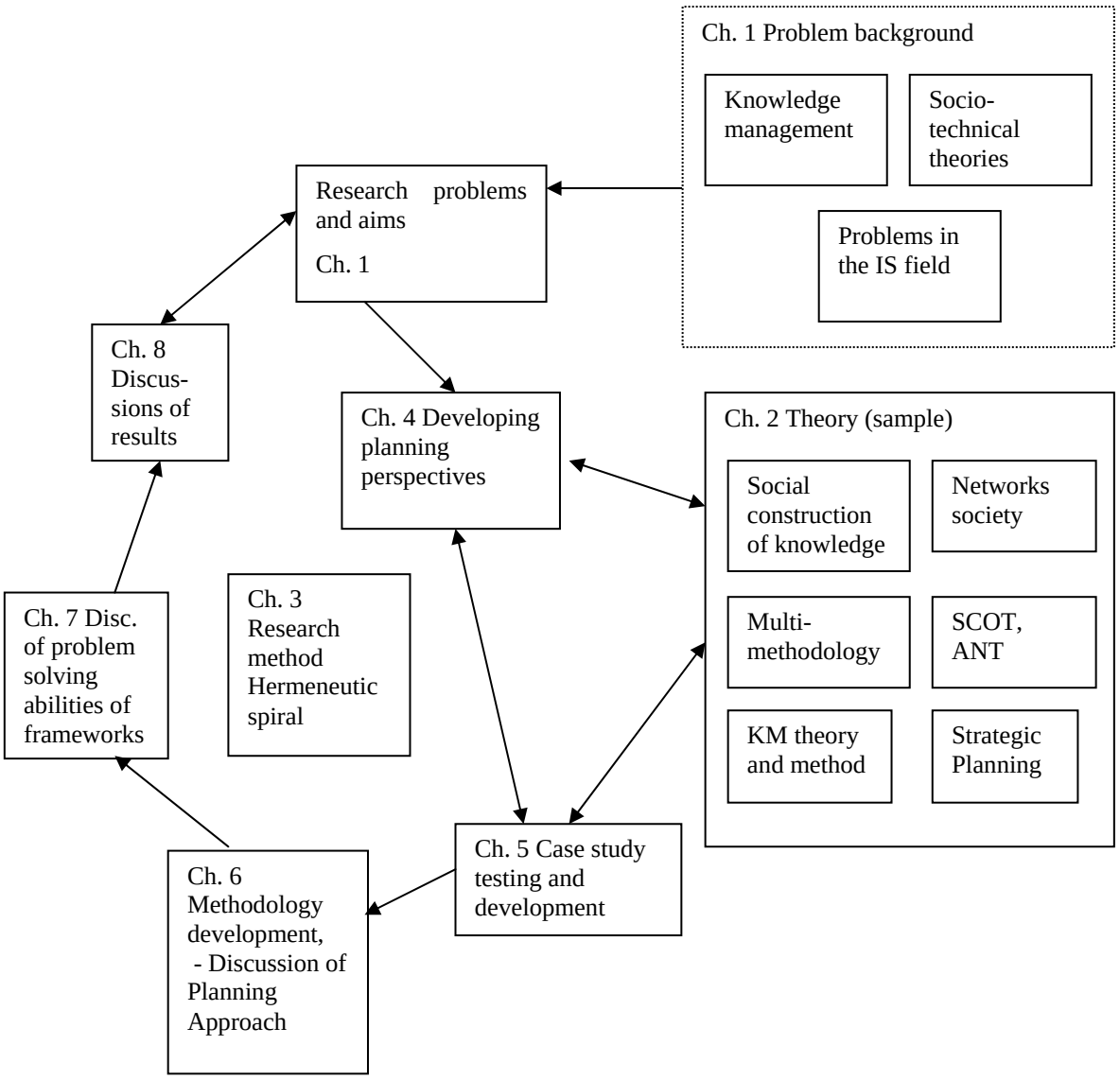


Figure 2. Research process and structure of the thesis

regarding the active construction of planning frameworks, when the theory chapter presents these theories in general.

- *Chapter 3.* Discussions on relevant research approaches and methods. The general outlines of how methods are applied throughout the thesis are presented.
- *Chapter 4.* Presentations of research papers focused on planning frameworks. The basic work of this thesis is the investigations into perspectives and the development of planning frameworks.
- *Chapter 5.* Presentations of research papers focused on testing of the planning approach and the included planning frameworks.

- *Chapter 6.* Presentation of the planning framework. This chapter sums up the findings in Chapters four and five.
- *Chapter 7.* Returning to the underlying assumptions, as presented in the problem background, and reconnecting to the results in previous chapters.
- *Chapter 8.* Discussion on validation and further implication of the results.

1.4.2 Presentation of Articles

This research is based on a series of publicized papers. From this list of papers, a number have been selected for inclusion in the thesis. The papers can be grouped into six groups (Fig. 3.), one for each of the perspectives of the planning framework of the thesis and a last one, focused on the testing and further development of the framework. The papers appended in this book are selected on the basis of 1) the

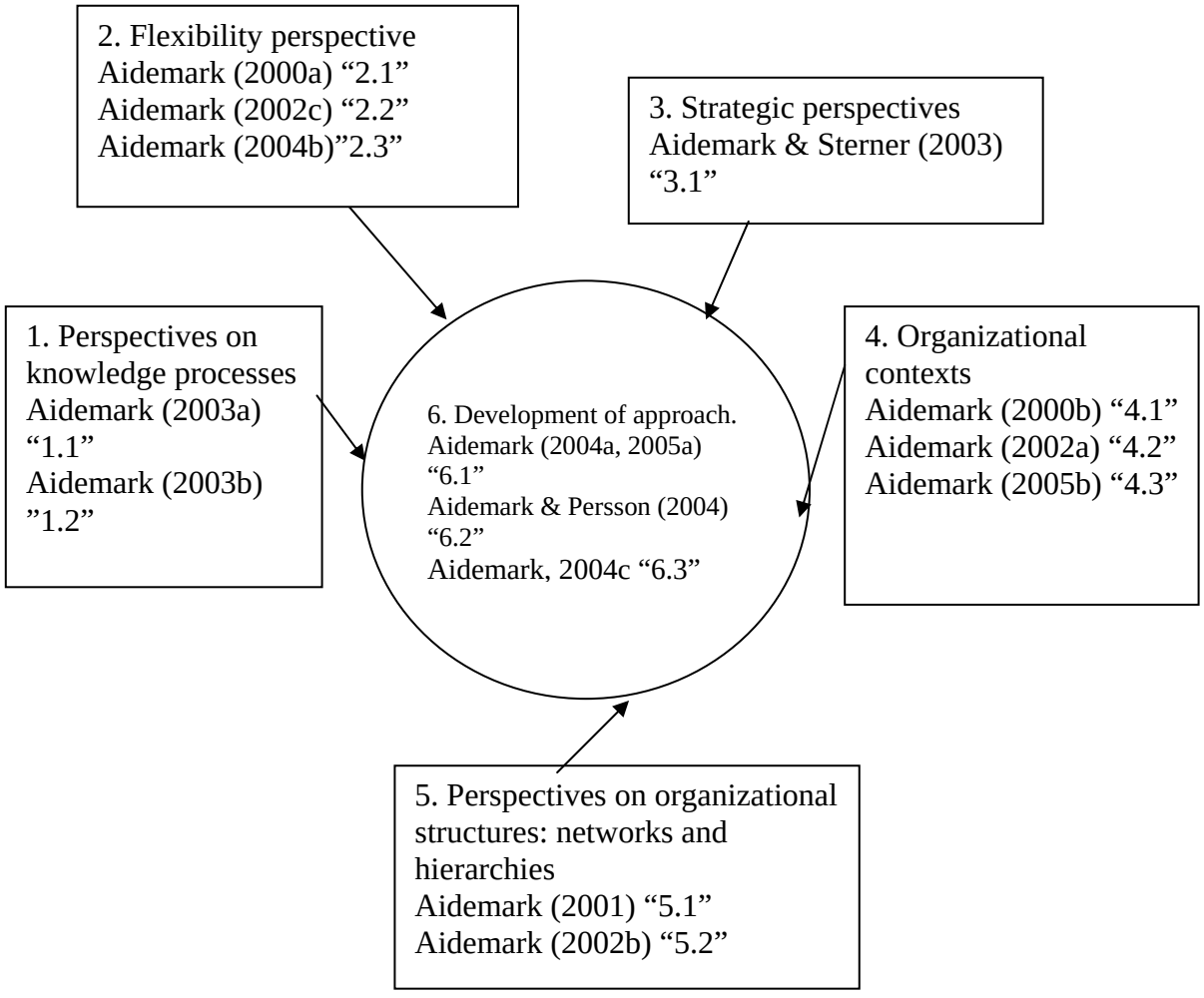


Figure 3. Overview of papers, structured after the problem exploration framework.

nature of publication and 2) their representativeness for the understanding of the framework.

Table 1. Overview of papers

Perspectives on organizational knowledge processes

1.1 A knowledge perspective on e-Democracy, (Aidemark, 2003a).

1.2 Cognitive, social and critical perspectives on planning a knowledge support portfolio, (Aidemark, 2003b). **Chapter 4.2**.

Flexibility perspectives on work processes and knowledge support

2.1 A Framework for Information Planning for Flexibility, (Aidemark, 2000a).

2.2 Information planning for knowledge work – the flexibility approach", (Aidemark, 2002c).

2.3 A flexibility approach to planning an Intranet in support of knowledge work (Aidemark, 2004b). **Chapter 4.3.**

Perspectives on strategic planning of knowledge management systems

3.1 A framework for strategic balancing of knowledge management initiatives, (Aidemark and Sterner, 2003). **Chapter 4.4**.

Organizational contexts and the planning and use of knowledge management systems

4.1 Support for decision making through the management of knowledge, (Aidemark, 2000b).

4.2 The management of knowledge in complex decision making environments, (Aidemark, 2002a).

4.3 A multiple perspectives view on knowledge support systems and their organizational contexts, (Aidemark, 2005b). **Chapter 4.5**.

Organizational knowledge support in a network world

5.1 Analysis of knowledge work – a case and some planning perspectives, (Aidemark, 2001).

5.2 Perspectives on the support of knowledge work, (Aidemark, 2002b). **Chapter 4.6**.

Application and development of a planning approach

6.1 Implementing Intranet for social and cognitive knowledge processes, (Aidemark 2004a). A refined version of this paper was also published in an international journal, *International Journal Healthcare Technology Management* (Aidemark, 2005a). **Chapter 5.1.**

6.2 Learning by Machine: A multiple perspective approach to knowledge work analysis, (Aidemark and Persson, 2004). **Chapter 5.2**.

6.3 A planning approach for knowledge support systems, (Aidemark, 2004c).

A number of intermediate papers, consisting mostly of literature reviews and reports on different stages of the framework, are not discussed here. However, elements of these have been incorporated into the text of the thesis when needed.

In Table 1 an overview of the papers is presented, the number, (for example "1.1") in Figure 3 being connected to Table 1. This table also indicates which of the papers are

appended to the thesis, and these are marked with the chapter where they appear. The number is provided as a means of keeping track of the frameworks, and does not represent any definite working order of the approach. However, there is logic in the order that is used, starting from the particular KM process towards a more general context.

The names of the frameworks might vary somewhat, especially in the papers, but the key themes: “Knowledge process”, “Flexibility”, “Strategy”, “Context” and “Network” are used rather consistently throughout the work. Some of the papers are included in the thesis; these are indicated with the chapter number where they appear.

2 THEORY

This theory chapter has seven sections. First, a section on socio-technical theories, which presents a number of ways of understanding the relationship between the social and the technical. In the next section the basic assumptions about knowledge are discussed. Section three presents a basic set of concepts in the area of planning followed by a discussion on a number of approaches to strategic planning. Section five contains a review of Castells' (1996) theories of the evolution of a network society and of how it is connected to knowledge in companies. After this, there is a lengthy overview of the central theoretical field of knowledge management. The last section is a discussion on multimethodologies, which is an attempt to penetrate the problems of using and balancing many perspectives in one planning approach.

2.1 The Socio-technical Perspective on Information Systems

> *This chapter focuses on the broad theory field of the social shaping of technology (SST), (Mackenzie and Wajcman, 1999). The discussion comprises both the general use of socio-technical theory in the IS field and the specific background of SST in the philosophy of science field, including the area of "sociology of scientific knowledge" (SSK), (Bloor, 1976). Following this, two current directions of SST that have caught the attention in the IS field are discussed: the social construction of technology (SCOT), (Pinch and Bijker, 1984), and the actor network theory (ANT), (Latour, 1992). As a concluding summary, a four-point program for balancing and directing the possible uses of a socio-technical perspective is presented.*

The socio-technical perspective on computer-based information systems has been discussed since the early 1960s, for examples by Mumford (Mumford, 1971), who provides a review of projects with a socio-technical perspective. This perspective has been more or less in use ever since, but more frequently in research than in practice.

Knowledge management has a view on organizational knowledge recognizing the unique position of the individual and sharing some positions with the socio-technical perspective. The individual worker might pose a problem to the organization, for example by not sharing his or her personal knowledge, being either unable or unwilling to codify what is known. This means that knowledge will not be used to its full potential and will follow wherever the person goes. In a more positive sense, individual creativity is understood as the creative centre of the organization, an engine for organizational development and success. When the use of information systems is discussed, it is discussed both as a possibility and as a threat. Technology might be seen as a threat to the personal control of knowledge and an inhibitor to creativity, or as a possibility for the codification and distribution of knowledge.

An overview of the assumptions of socio-technical perspectives seems as a good starting-point for understanding problems of the knowledge management systems area.

2.1.1 Basic Assumptions of Socio-technical Thinking

Bostrom and Heinen (1977a) provide an overview of the socio-technical perspective on information systems. In this account, the problems of failed information systems can be traced to different kinds of behavioural problems. This means anything from the active non-use by the users of computers to the inability to use computers due to lack of training. The problems stem from designers' inadequate frame of references concerning people in the organization and how information systems are supposed to function. The socio-technical perspective introduces a combined understanding of a social and a technical view of the organization. The social view includes attributes of people, attitudes, skills, values, relations, authority structures, reward structures, etc. The technical perspective deals with processes, tasks and transformations. The systems are described as jointly independent, but correlative interacting systems. In interaction, they form an organizational work system. The principle for finding the right mix or relation has sometime been a discussion of best match or a general idea of joint optimization (Trist, 1981) and of any one-sided optimization ending in suboptimization for the system as whole. Trist states, "The distinctive characteristics of each must be respected or else their contradictions will intrude and their complementarities will remain unrealized." (Trist, 1981, p. 37).

Bostrom and Heinen (1977a) discuss examples from management information systems (MIS), but comment that the findings that are presented are valid for any kind of computer-based information systems effort. It is also remarked that the socio-technical perspective is an organizational design technique, but that it is applicable to information systems problems.

A MIS project should be seen as an intervention strategy to change an organizational work system (Bostrom and Heinen, 1977a, p. 18.) where both the social and the technical system should be improved simultaneously. A more common view of computers in organizations assumes that computers are inflexible and that people have to adapt to the new conditions. It is about asking the right questions and making the right decisions, the outcome not being determined by the unchangeable characteristics of the technology. The frameworks of the designer are the pivotal issue for the success of the socio-technical system.

2.1.2 Designers' Frameworks and Users' Frameworks

The designer's frame of mind determines what is possible to explore in information systems planning processes. The socio-technical perspective argues that it is the focus on technical frames in combination with the lack of social frameworks that lies behind the behavioural problems causing information systems failures (Bostrom and Heinen, 1977a). It should be imperative for any information systems planning approach to provide balanced sets of frameworks from both perspectives (Bostrom and Heinen, 1977b).

Bostrom and Heinen (1977a) support the idea of a strategic design process that guides the IS development process. Here they refer back to Hedberg (1975), who talks about

designing a meta system, a system that guides the design of the computer system. The meta system is developed as a power play between people representing workers and the leaders of the organization. Hedberg sees this as a process of industrial democracy. This is a process where the goals of the intended system are formulated and guiding policies are laid out. This should be the responsibility of the organization including the users, thus providing a mechanism for user participation. The goal of this strategic design process should be to include values into the systems design process that are representative of a wider group than that of the professional systems analyst and programmers. Making values explicit and evaluating results in terms of these values can be thought of as the strategic function of systems design. These plans should be translated into technical specification by an administrative function, and operative personnel should in turn realize these specifications as technical solutions. The strategic function that is sought by Hedberg (1975) should be responsible for the initiation of change, requests of design proposals, and monitoring the outcome against the values of the organization. Frameworks must clarify the interactions and relationships between social and technical aspects.

2.1.3 Continued Use of the Socio-technical Perspective

The socio-technical perspective has been used during the years after the defining texts of the 1970s. Major frameworks like “Ethics” (Mumford, 1983) have some followers (for example, Adman and Warren, 2000; Hirschheim and Klein, 1994) that are trying to move the method forward. However, in a more general view a major impact on planning and design has not appeared yet (Mumford, 2000a). In 1987, Bansler (1987) contended that the development towards a deeper concern for social or organizational issues in practice had not been realized.

Mumford (2000a) detects a connection between the “rise and fall” of the socio-technical perspective and the economic macro trends. Mumford characterizes the 1970s as a time of a deficit of skilled workers, making the caretaking of workers more rational and the socio-technical perspectives attractive. The economic downturn during the eighties brought on a wave of rationalization, during which the safety of more traditional solutions seemed preferable. The socio-technical experiments were closed down and trends like business process reengineering or lean production emerged. Another experience that hampered the perspective was, according to Mumford (2000a), resistance from trade unions that defended positions that were challenged by socio-technical change programs. Mumford (2003, p. 27; 2000a) describes the socio-technical perspective today as a set of values, including: “varied and challenging work, good working conditions, learning opportunities, scope for making decisions, good training and supervision, and the potential for making progress in the future.” (Mumford, 2000a, p. 45).

During the 1990s, trends like globalization, flexibility, constant change, innovation, and so on, have put back the focus on the competence of the individual worker. Mumford (2000b) discusses these developments as part of larger trend towards a network society (c.f. Castells, 1996). These trends are also the pre-text for the

emerging knowledge management perspective on organizational development and prosperity.

However, the socio-technical perspective is important; a long line of examples testify to this. An understanding of the users' role in development is of course recognized in most development approaches. The user community may very well be handled effectively in many ways, and a number of approaches have been suggested.

* Participative design (Hirschheim, 1985).

* Technology acceptance models (Davis, 1989).

* Use case scenarios (Urquhart, 2001).

* Extreme programming including strong customer involvement based on system stories (Kivi et al., 2000).

A practical use of socio-technical ideas can be found in a number of projects where technically biased approaches have been complemented with socio-technical elements. Atkinson (2000) argues in general terms that traditional information requirements' engineering methods should be integrated with socio-technical approaches. Atkinson argues for the necessity to attempt to create a post-methodology era of contingency approaches. Ideas of "softer" approaches should be integrated into traditional harder, often data-driven, methods (Avison and Fitzgerald, 1995), for example SSADM (Goodland and Slater, 1995).

Manz and Stewart (1997) combine total quality management (TQM) with socio-technical methods, aiming at synergy effects. The socio-technical perspective provides flexibility by adapting solutions to users' situation, while the TQM aspect provides stability through the standardizations of the new operations. The integration is created by the simultaneous implementation of the two concepts, following the intention of the socio-technical ideas.

Taylor (1998) provides an empirical example of how a socio-technical perspective can be used to balance a business process reengineering (BPR) project. The reengineering of an order management process in a multi-national company was complemented with a participative process intended to create a better fit to local conditions. The technology used, a SAP system, contained a great number of possibilities and was assumed to be adjustable to local conditions. Cultural differences were detected, and plans were made accordingly. In this case, the equality of social and technical perspectives is not clearly enforced. It seems rather as a case were some socially oriented techniques have been used to smooth the way for a new system. Initial investigations on three test sites using socio-technical perspectives were performed. The result made the introduction of the system into the following 37 sites faster, enabling changes according to local conditions. The experience of this case ends on a rather positive note, since the socio-technical techniques not only provided alignment to the local situation, but also provoked a more general strategic discussion including both business and human values. A "simple" application area

like order management was expanded to include a system boundary discussion and a more general discussion on freedom/constrains that the system should work under.

These two examples of cases where the socio-technical approach has been used (more or less) provide a picture of a legacy of this approach, either as a value system or as a toolbox.

2.1.4 Social Science and Technology

From a sociological perspective the problem has been the opposite of the problem of information systems: how to incorporate technology into social theories. Technology has been managed indirectly by, for example, financial means and has not been a concern in itself (Sorensen, 2002). Some sociological directions have tried to change this by incorporating the content of the technology into the analysis. The theory of "the social shaping of technology" (SST), (Mackenzie and Wajcman, 1999) explores how a range of social and economic factors, as well as technical considerations, create a pattern for the design and implementation of technology. The SST approach has its roots in the area of "sociology of scientific knowledge" (SSK) and the "strong program" of sociology (Bloor, 1976). Before looking closer on the SST approach, we will take a brief look on the background as found in the SSK theory.

2.1.4.1 Sociology of Scientific Knowledge SSK

SSK is a sociologic perspective on how and why scientific knowledge is developed. Bloor (1976) attacks the view that sociology can only explain why science fails and not why it succeeds, calling this assumption the "strong program" of SSK. Four basic tenets and values are discussed as bases for the "strong program":

- A study of the causes or conditions that bring about beliefs or states of knowledge is necessary.
- Impartiality is required with respect to truth and falsity, rationality or irrationality, success or failure.
- Explanations should be symmetrical; the same types of cause can explain both success and failure.
- The study should be reflexive; the same explanation should apply to sociology as well as science. (Bloor, 1976, p. 5)

The SST approaches can be seen as extensions of the concepts of SSK into the area of technology studies. SSK focuses on how social factors contribute to the development of scientific knowledge. Given that two scientists perceive the same natural phenomenon, the contexts of the scientists can be used to explain how they reach different beliefs about the phenomenon (Bloor, 1999).

Bloor (1999, p. 90) sums up some of the basic assumptions of SSK. SSK concentrates on the history of scientific theories and focuses on decisive moments where the development of a theory has branched off into different directions. All studies start from the perspective of an actor in a situation. The SSK approach has sometimes

been accused of being idealistic, denying a natural world. However, at the centre of the study is an individual who perceives the world and gathers cognitive data through experience. It is what happens with these cognitive data when the person tries to make sense of them that is in focus. This is done using collectively shared conventions and institutionalized concepts. In this way, nature will always be in the centre, but always filtered, simplified, selectively sampled and interpreted into personal knowledge rooted in a collective tradition. Here the concept of interpretative flexibility is rooted; what something means depends on who you are, as well as how and why the meeting between man and nature occurs.

This does not answer the question of how nature is represented. Bloor (1999, p. 92) discusses this aspect, contending that the sociologist must have a grasp of what the agent is responding to. Bloor says the following:

"It doesn't matter greatly how we specify or describe what the agent experiences as long as we manage, somehow, to capture that experience in a way that is sufficiently neutral for our purposes." (Bloor, 1999, p. 92)

The description of the phenomena should be neutral amongst the range of likely theoretical alternatives. The aim of the study, as mentioned above, is to understand how the studies of the same object that produce the same data, give rise to different understandings. This difference is sought for in the frames of understanding and in the situations that the different investigators reside in. It is what is attributed to things that is interesting, not the things as such.

2.1.4.2 Social Shaping of Technology (SST)

The general problem of social studies of technology is the tradition of treating technology as a black box, looking just at the contextual variables. The box should be opened "to allow the socio-economic patterns embedded in both the content of technologies and the processes of innovation to be exposed and analyzed" (Williams and Edge, 1996, p.866). SST moves beyond both a narrow technological determinism and a simplistic form of social determinism. The social forces affect the choices between options provided by the technology. Social factors stemming from organization, economy, politics and cultural circumstances pattern the design and implementation of technology (Mackenzie and Wajcman, 1999).

Williams and Edge (1996) present SST as a research direction or as a "broad church", including a large number of ideas and concepts. There are differences both in details and in issues that are more fundamental between different perspectives. The main SST approach can be summarized in a number of points.

- An innovation process, which is moved forward by making (design) decisions.
- A series of choices (made more or less consciously) which create negotiability or flexibility of technology.
- A process that moves towards a point of no return (irreversibility) when the artefact is stabilized and the process terminated.

This model breaks with a more traditional linear model of technology innovation and instead suggests an interactive, feedback, spiralling process, where technology and social factors interact. The aim is to understand technology change as a social process, where the technical and the social interact in a seamless web. This makes it necessary to develop the work organization and the technology in tandem.

Williams and Edge (1996) also discuss a practical design perspective, claiming that SST researchers that become very knowledgeable in the process of studying technology should have lot to contribute to a design process. They could stand together with other actors, technical specialists, in the design process. Williams and Edge use the concept of "heterogeneous engineering" (c.f. Law, 1988) to describe the activities of a designer of technology who employs a wide range of knowledge in creating a complex socio-technical system.

The SST approach has been discussed from an information systems perspective (Howcroft et al., 2004). Howcroft et al. write that "SST conceptualizes the human-technology alloy as unstable and inherently contingent; it is constructed through the interpretive processes of actors and does not therefore embody any definitive capabilities or effects." (Howcroft al. 2004, p. 359). Technology is not viewed as an independent variable; no objective account of it can be established. SST is seen as providing ways of conceptualizing how information technology is integrated into the analysis of human societies. Both the content of technology and the context that frames the technology are examined. Conceptual tools are offered for the analysis and a long range of factors (organizational, political, social, economic and cultural) are utilized for finding patterns in the design and use of information technology. Howcraft et al. (2004) choose to focus on two directions within the SST line of thought as important for the IS area. These are discussed in the coming two sections, first "social construction of technology" and secondly "actor-network theory".

Williams and Edge (1996) point to the practical side of SST theories, referring to policy discussions and practical participation in technology projects by people informed by SST-styled investigations and theories. Sorenson (2002) sees it as a problem that SST studies are often descriptive and that there are other purposes with the studies than problem-solving. For the translation of this kind of knowledge, there just is no easy recipe. Sorensen sees no linear connection between social science knowledge and its application in policy work. It should rather be described in a reflexive model, the SST knowledge being interpreted by policy workers and vice versa. Knowledge gained in SST studies could be used in policy formulation processes, providing mental models, arguments and examples. Theoretical concepts direct the attention of the policy worker, change the perception of the object of technology policy, provide discourses for problems, and indicate solutions. Sorensen (2002) concludes with four inputs that SST research can contribute with:

- SST puts the focus on technology as an object for policy making.

- SST extends the groups of people involved in technology policy work and the range of work that is included, from planning and designing to implementation and use.
- SST redefines the problem types involved, away from a simple artefact towards techno-cultural clusters of practice.
- SST provides different views on the policy-making toolbox, suggesting for example greater concerns for cultural aspects. A more creative use of tools is also inspired, combining tools from different directions, and urging a non-naïve way of using policy tools.

The relevance of SST research is central in this matter, and Sorensen describes it as a negotiated quality. The relevance of a theory or a concept depends on both availability and applicability. The availability depends on how well the knowledge transfer problems are solved, and applicability on whether the policy situation can be related to the theory. An important factor is the perceived reliability of the theories.

2.1.4.3 Social Construction of Technology, SCOT

The social construction of technology (SCOT, Pinch and Bijker, 1984) provides an integrated approach for the empirical study of technology as an innovation process. Four main concepts are used:

- *Relevant social group*. A relevant social group, for example an organization, institution or informal groups of people, is a group that is in some way involved in a development process. The groups are defined by different understandings of a technology which they all have in common. The development of an artefact relies on these understandings and on how understandings of different groups compete over time.
- *Interpretative flexibility*. The concept of interpretative flexibility refers both to the development of the interpretation of artefacts that a relevant social group makes as well as to the actual changes in the design of the artefact.
- *Stabilization and closure*. These two concepts refer to how the design process comes to some kind of end. Two ways are discussed by Pinch and Bijker (1984), first when the social groups define the problem as solved by the artefact. Another possibility is a rhetorical ending when the relevant social groups no longer perceive the problem and the artefact stabilizes. This can be seen as consensus among the groups, the solutions provided by the artefact satisfying the perceived problems. Alternatively, the problem is redefined, effectively ending the current process.
- *Wider context.* One central activity is to relate the process to the wider socio-cultural and political situation of the social groups. This is done in order to understand the background of norms and values that influence the meaning given to an artefact.

This sociology of technology focuses on people's beliefs about technology. These beliefs guide both the constructions of technology and the way the artefact is understood and used once it is constructed. The innovation / development processes are described in network-styled diagrams, where social groups interact around problems and artefacts. The problems are solved by innovative solutions that are implemented. The approach is primarily heuristic, aiming at bringing out the relevant aspects of the process. This leaves a great deal of responsibility to the analyst (Bijker and Pinch, 2002), which could be seen as something positive. The personal involvement of the analyst could work as an antidote against a naïve empirical study of technology. This happens mainly because this influence is always there, and if this is not recognized, its influence will be immune to critique.

2.1.4.4 Action-network Theory (ANT)

A central idea in an ANT (action-network theory) analysis is to understand a technology development process as a network of interacting actants. An actant can refer both to humans and non-humans (objects, artefacts, for example: anthrax germs, a metro control system etc.). These humans and non-humans are given an equal role in the network; they are treated in a symmetrical way. The ANT moves beyond the traditional sociological perspective of studying the beliefs of people and incorporates artefacts as active components of the study. This makes ANT quite different from the SCOT and the general SST perspective. Latour (2005) says that SCOT is different from ANT. Latour (2005) then continues with the claim that the SST school is a failure and just another way of creating names and attaching meaning to things.

First, a short summary of some key concepts will be presented (based on Howcroft et al., 2004 and Walsham, 1997). ANT aims at describing the development of society into a sustainable whole or, in the ANT vocabulary, at describing the development of a seamless network consisting of actants. The actant concept represents a break with the traditional objective-subjective dimension used to structure most sciences. It is a suspension of defining the nature of things in an effort to avoid either social or technological determinism. The network is created by actants enrolling new actants into the network. The interest of the actant is translated to the new potential actant making it an ally. The viewpoint of the actant is inscribed into the new actant, which then acts as a delegate (standing up and speaking) for these opinions. This process is seen from the perspective of a certain actant in the network, the goal being to stabilize the network in a favourable way for that actant. The goal is to enrol actants and create a state of irreversibility, i.e. when the network cannot change back again. This freezes the state of the network; and it then turns into a black box, a predictable machine. ANT is used to examine a process that has taken place; it tries to make a detailed description of the motivations and actions that lead to an end state. When this frozen state is reached, it is possible to sort out the social from the natural or, as Latour puts it, drawing the line between the material infrastructure and the symbolic levels.

In Latour (1992) a simple example is provided of how to apply the concepts. The aim is to explain how social stability is achieved by means of artefacts. The story begins from an individual person's perspectives and that person's need of changing his world. The example focuses on a hotel manager who has problems with disappearing room keys. The first step that he takes is to make an utterance by writing a sign that says: "leave the key at the counter". This is the start of an innovation processes aiming at changing the behaviour of a social group of people, i.e. hotel guests. This process includes creating action programs that gradually change the current situation towards a new stable state. In this case, a new situation arises where the guests leave their keys at the hotel reception desk instead of taking them out and forgetting them in various places. To achieve this, the hotel manager not only resorts to social action (asking the guests to return the key when they register), he must also use artefacts to put force behinds his intentions. The first program includes writing a sign (an actant); the manager enrols the sign in his struggle and inscribes a message that delegates the intentions of the manager. This is done in an effort to include as many of the guest as possible into the manager's network. The example continues with the effect of the message: the guest collective will react to the sign, some will accept and comply; others will create anti-programs, ignoring the sign. The manager must then create a new action program, adding more words (for example, a "please" or an explanation of the dangers of taking out the key from the hotel). If this does not work, other actants could be enrolled: for example, the key is modified, making it too heavy to carry around. The new configuration of the network will go through a new process of inclusion or exclusion. If enough guests comply, the network will stabilize and become a black box. Some guest might still object to the system, but as long as the losses incurred by these people are seen as lower than the costs for expanding the network, the manager will probably let the case rest.

In this analysis the actants can be abstract concepts, physical tings, or people. For the analysis it not important what is human or not. The study makes it clear how a new power relationship is created; the manager creates tools for controlling the guests. The network, the focus of the study, consists of humans and non-humans, forming a chain of actants. Power is a characteristic of this chain and this is an explanation why the chain holds together. Latour (1992) points out a number of principles for this analysis.

- The analyst should never decide in advance what is important or not, which must be decided from the role that the actant, utterance or object plays in the network.
- Symmetry between the social and technical, the outcome of the innovation process, cannot be determined by either the social or the technical. At the same time the social will be changed by the technical and, symmetrically, the other way around.

- The final explanation of a situation lies in the careful description of details. It is important not to try to find the explanation outside of the situation, for example by invoking general social categories.

Howcroft et al. (2004) and Walsham (1997) provide a basic account of the ANT relevance for information systems. The limitations of ANT are also discussed in these two papers. Howcroft et al. point to the moral deficits that ANT seems to have, and recommend that the use of ANT be complemented with critical theory. Walsham (1997) concludes that the disputed state of ANT makes it hard to use, but that many ideas could be reused as tools in the IS area.

2.1.4.5 Critical Views on SCOT and ANT

There have been a number of critical views on both the SCOT (Howcraft et al., 2004) and the ANT (Walsham, 1997) approaches. There are clear similarities between the views on both approaches, but here we discuss them separately. There is of course a great deal written discussing these problems, but here we stop at indicating the type of problems that have been discussed. First the problems surrounding SCOT:

- *Development vs. consumption of technology*. SCOT is seen as focusing on decision during the design process, but reaction from users and other stakeholders are important. Looking at the long process of making a modern bicycle (Pinch and Bijker, 1984), there were many versions of bicycles designed and consumed until it became a stable artefact. In the IS field the focus is traditionally on the development process rather than on the use of the system.
- *A micro perspective is dominant.* This is problematic, because it leaves social structures and the macro perspective aside. The focus is on detailed happenings and no clear place for bringing in frameworks from the broad social structure (a gender perspective is made a special example of this) is indicated. SCOT includes a commitment to connecting the analysis to a wider context, but the focus is on the detailed choices, and there is no clear plan for choosing and bringing in macro level frameworks.
- A lack of moral stance that seems to follow from the realistic view of the social world. For example Winner (1993, p. 368), who writes: “The most obvious lack in social constructionist writing is an almost total disregard of the social consequences of technical choice”. This problem is connected to the micro perspective, which leaves out the broader context of technology. Winner sees the selection of relevant groups and an inability to deal with serious conflicts as the main problems. Winner also sees clear dangers in that the approach deals with the problems of the powerful and visible in society, leaving the powerless in the dark. To be able to deal with injustice one must have some moral ground to stand on. Winner judges SCOT as an elitist and academic approach. Howcraft et al., on their part, conclude that SCOT should be accompanied by the use of a critical theory.

When it comes to ANT some similar issues could be discussed:

- The micro vs. macro problematic is even more accentuated in ANT. The statement that “only what is in the situation should be considered” (Latour, 1992) is on the extreme side. No external concepts should be brought in to explain the situation. Walsham (1997) shares these concerns, arguing that the use of ANT should be combined with the use of theories of social structures, for example theories that link the individual to the global (Giddens, 1990)
- ANT has been connected to a value-free relativism focusing on description (Howcraft et al., 2004). This argument is similar to the argument above in the SCOT critique, and it is related to the micro-macro discussion.
- The indifference to the human or non-human nature of actants has also drawn criticism, as it has been seen as equalling humans to things. This is often seen as an ethical deficit in ANT (Walsham, 1997).

An even heavier assault on the ANT is launched by Bloor (1999). Here the basic position of leaving the subject-objective distinction, equalling humans and things, is incomprehensible or represents a return to naïve naturalism. The problem here is what we know something about; is it the natural world or the beliefs of humans? By referring to a third state ANT ventures outside this traditional framework, which underpins most theories of the scientific community.

2.1.5 Summary – Central Issues

The basic message of the socio-technical perspective is to treat the two perspectives with the same seriousness, i.e. the social and the technical perspectives should be seen as equally important. Practical models for the investigation of each of them must be provided in order to make an informed discussion on their interconnections possible. The contradictions and the reciprocal dependencies between effective technical systems and a durable human social system must be laid in the open.

The inability of organizations to formulate these policies from a broader socio-technical perspective leaves the designers as the real decision makers and interpreters of the organization. If no one expresses an integrated and explicit framework for the intervention, there is no one that takes a real responsibility for the project. There are differences in the languages that are used; the language used to solve the organizational problem is probably not the same as the one used for developing the information technology artefact. Frameworks that make these connections on a strategy/policy level are necessary.

A number of problematic areas can be discussed briefly: strategic planning, the connection between the sociological and the technical, methods and tools, and the critical perspectives. IS researchers (Howcraft et al., 2004) discuss these issues from a research perspective. How these ideas could be moved to a design situation is not investigated. Together these issues form a research agenda for the examination and reformulation of current IS methodologies and maybe the development of new ones.

2.1.5.1 Strategic Phase in IS Development

The first area concerns the necessity of a clearly identifiable strategic phase of the IS development process. There should be a socio-technical policy formulation process, which should be performed before any decisions on the details of the system. Discussions of technology policies (Sorensen, 2002) provide another input to this perspective, focusing for example on problems of changing the understanding of what the core of a problem really is. The great challenge is the integration of the standard strategic approach in IS planning (see for example, McFarlan, 1984) with the socio-technical ideas of strategic planning and policy making. In the "Ethics" approach (Mumford, 1983) there is room for a traditional IS strategy, but the problem here is that the socio- and technical dimensions are brought together after the two investigations are completed.

2.1.5.2 Connecting the Social and the Technical

The second area includes three different views on how social and technical perspectives can be related.

- The social shaping of technology seeks to find a neutral position of technology and then investigate the different choices made by different people around the technology.
- The social construction of technology theory sees technology as a social phenomenon that is defined by the interpretation of relevant social groups. These interpretations decide how people perceive technology and subsequently interact with it.
- ANT tries to make a symmetrical analysis where things and people are interacting in a network; a final decision on the objective or subjective nature is postponed in an effort to avoid any pre-assumption that might interfere with the analysis.

Any IS methodology with ambitions to deal with socio-technical perspectives should be examined on this issue. For example, the "Ethics" approach (Mumford, 1983) acknowledges the importance of both perspectives, but it seems to be a very pragmatic relationship. "Ethics" suggests a two-track process where the two perspectives are investigated separately. The mechanisms for the interaction are somewhat unclear with an ambition to create a best solution given limitations and possibilities from both sides.

2.1.5.3 Methods and Concepts Supporting IS Development

The third area concerns the different concepts and methods presented in the various approaches within the IS planning area. The possibilities for use in IS planning processes should be explored; either as methods standing alone or as concepts, methods and models integrated into existing IS planning models. The recommendation from Walsham (1997) to use the methods and tools from the SST area, even if the frameworks in general are under discussion, could be a guiding star. Some examples have been presented in the sections above, with the SCOT approach

and the ANT as the clearest methods with toolboxes. The examples of how these concepts have been used seem mainly to be examples of descriptive approaches, seeking traditional social science results. Integration into the planning practice for pragmatic reasons does not seem very common. A crude way of doing this might be to add a SCOT-inspired stage to "Ethics", which would deliver an idea of which system to develop. Another way could be to use the ANT approach to plan the design and introduction of an information system into an organization. This would result in a number of design change programs intended to enrol people into speaking for the program and to act according to the program.

2.1.5.4 The Critical Dimension of Information Systems Development

The last area deals with a critical dimension of information systems. This is in line with the value dimension or the lack of it, as identified in the social constructionist view of technology in general. Howcroft et al. (2004) recommend that a SST approach should be accompanied by the use of critical theory. Walsham (1997) says in his comments on ANT that it is not possible to make moral judgments based on the network alone. There has been much written about critical theory and method and about how these might be used in IS development (Mingers and Gill, 1997). However, these ideas seems rather unconnected to the SST perspectives. Integrating critical theory into more mainstream IS development approaches should be part of an effort to apply SST perspectives.

2.1.5.5 Further Issues in Brief

Following these general directions, a number of problems or ideas can be noted for the further studies of this thesis:

- A science vs. design aspect. SST in general is about creating scientific knowledge, and how the practical planning of information systems benefits from this knowledge is not clear (Williams and Edge, 1996). Here we also find the division between descriptive and prescriptive research and how theories that describe are converted into methodologies that guide development projects.
- The social scientist is in the hands of an expert of the technology area to provide the details of the historic development of an artefact.
- A study could include a full intervention cycle, from planning and design to implantation and consumption. Here we also have a difference between the laboratory or design room situation and the industrial processes where the use or prototyping/use of the artefact takes place. Understanding the interaction between these two aspects of the cycle is crucial – concepts that bridge the gap are needed.
- Different sets of concepts that explain a stabilization process are needed. There seems to be a connection between local negotiability and change on one hand and the stabilizing effect that global structures have on a situation on the other.
- The connections between different levels of study (micro, meso and macro level) are a rather unexplored area.

- A technological artefact seems to have both a material and a symbolic side to it (Williams and Edge, 1996). These two sides might work against each other and can be somewhat separated.
- There seem to be differences in the nature of concepts that are used in the socio-technical field. Some might work as a diversifying force on the analysis, leading to a more stimulated and vigorous inquiry, but other sets of concepts work more in the direction of bridging gaps of dichotomies.
- Direct or indirect control of the intervention process. Many of the frameworks describing the process also provide concepts for the management of the process. One example of a direct view is when technology is seen as a catalyst that is domesticated by people and later entrenched into the organization (Sorensen, 2002). A more indirect view elaborates with concepts like technology steering (Russell and Williams, 2002).

2.1.6 The Continued Theory Study

This initial study points in a number of directions. In the continued study, a number of issues are focused on.

- Making the background assumptions of the thesis explicit is a very important task. This section of socio-technical discussion is a first effort in that direction. In section 2.2 the author's perspectives on knowledge creation are expressed. The nature of planning framework is then discussed in section 2.3.
- The ideas of strategic design, i.e. processes where the organization explores the contributions of information systems, are explored further. In 2.4 this is investigated, including traditional strategic models and socio-technical aspects on strategic planning.
- Network society, a concept close to knowledge management, is also explored in section 2.5. The aim is to provide a larger picture for understanding the needs of knowledge management.
- The specific area of information planning, knowledge management, is explored in section 2.6. Much of the theory presented in this section then forms the basis for the formation of a planning framework.
- The critical and multi-dimensional aspects of information system planning are further discussed in a chapter on multi-methodologies (2.7). The aim here is to find some general approaches to the use of critical theories and to the problems of combining theories emanating from fundamentally different points of view.

2.2 Perspectives on Knowledge in Organizations

> *The problems of integrating technical and social aspects of knowledge management support demand an understanding of both the perspectives. In turn, this should imply a good understanding of the central topic, i.e.*

knowledge. The technical perspective of knowledge seems to involve a more simple understanding of the problem area. In this perspective, knowledge is often treated as any data set. Because of this, these systems are handled like any other compute- based system. On the social side, although many suggestions has been made (e.g. Pentland, 1995, Blackler, 1995), there is still no generally accepted model established. This is probably due to the complexity of the perspective, which makes it necessary to allow several theories to be used depending on the situation. This makes it especially necessary to expose the basic assumption about how organizations work, especially the question of how knowledge is constructed and applied. In support of this aim, we give an overview of a number of ways of understanding knowledge in organizations.

2.2.1 The Traditional View

First, we give a short review of the basic concepts: data, information and knowledge. Data comprises the facts recorded and formatted by someone and for some purpose. Data is not innocent, it is someone's view of the world; a representation of "reality". Information is a flow of messages that change a person's state of mind (Vickery and Vickery, 1987, p. 17). One possible and very important aspect of the state of mind is a person's knowledge. Knowledge approximates to beliefs that a person holds, beliefs that the person thinks are true and can justify by certain means (Grayling, 1995). Information and knowledge are inseparably connected to each other and any support system directed to this area must handle them both and in connection with each other. Vickery and Vickery (1987) also point to the differences between information from a sender and a receiver/user perspective. From a sender perspective information is an "instruction" that intends to provoke certain actions or changes of mind. Information from a user perspective is rather a search for knowledge for solving problems at hand.

From a cognitive perspective this is a rather straightforward (but off-course complex) process, from perception as an automatic process to the integration of new knowledge (cf. Stein, 1996, p.32ff). Stein says that the cognitive processes act as programs that by the use of memory translate perceptions of the world into knowledge. Belkin (1990) discusses the cognitive perspective as "the idea of human perception, cognition and structures of knowledge" and continues (ibid., p. 11): "any processing of information, …, is mediated by a system of categories of concepts which for the information-processing device are a model of his world". In this perspective, information systems are artefacts that support the cognitive abilities of a person, and the basic problems of bounded rationality (Simon, 1982).

In an organizational context, the cognitive view of knowledge has a central position, for example in Ackoff (1989), where organizational knowledge systems are discussed. Here knowledge is viewed from two aspects: knowledge and wisdom. Ackoff presents a model of a knowledge/wisdom system, where data, information, knowledge and wisdom are essential concepts. The basic view of these issues is in line with the cognitive view and with a traditional view of information systems in

general. Again, data is understood as representations of observations. Information is the use that, for example, a decision-maker can make of data, a process of inferring information from data. The difference between data and information is functional, not structural, Ackoff claims (1989, p. 3). A data system therefore consists of representations together with rules and tools for their manipulation. An information system consists of pieces of data and rules for how they could be analyzed and presented for an information user in such a manner that they are relevant and fulfil the information user's needs. This means that data is presented so that the information user can infer information from the data.

Ackoff (1989, p. 3) concentrates on activities and functions of the knowledge system, which really extends the traditional information system concept, when it comes to purposes and components. The major components of a knowledge system are storing knowledge, learning functions and how knowledge can be put into use. Knowledge can be contained in personal experience or in instructions. New knowledge can be introduced into the knowledge systems in two ways, either way the process is called learning.

1) Information can be converted into instructions, i.e. knowledge.

2) New knowledge can also be taken in by personal experiences.

The ability for a system to acquire knowledge on its own is named intelligence. Wisdom is the ability to know what is right (1989, p. 3). This demands an ability to judge what is right or wrong, good or bad, and so on. Ackoff views the areas of ethics and morals as the basis for defining what is good.

2.2.2 Tacit Dimension of Knowing

Polanyi (1958, 1966) outlines an epistemology of personal knowledge. It includes two kinds of awareness, focal and subsidiary. From these two types of awareness, Polanyi shows that two kinds of knowing are possible, subsidiary/tacit and focal/explicit (Polanyi, 1966, p. 17). Focal/explicit knowledge is knowledge that we can express explicitly, in some form, and subsequently transfer to other people. Explicit knowledge is only part of the total knowledge of a person. Subsidiary knowledge is everything we know but cannot really express; this is the tacit dimension of knowledge.

The problem is that explicit knowledge is created as a whole when we focus on a number of subsidiary knowledge pieces. The tacit dimension is all the knowledge that is in our mind, and the explicit knowledge is just timely construction based on the tacit knowledge. However, because we do not actively pay attention to it, we are not aware of these particular knowledge pieces. Explicit knowledge is what we have in focus of our current attention. What we attend to is directed from our current interest or problem. The tacit dimension of human knowledge is a complex web of memories that we use in order to produce explicit knowledge. Explicit knowledge is not something more than the existing subsidiary/tacit knowledge, just a configuration of

it. The tacit dimension is the frame of reference within which the explicit knowledge is understood.

It is within tacit knowledge that attitudes, skills and hunches reside. More generally, it is all the things that we know, even though we cannot be actively aware of it all at the same time. This makes up our personality, things that we use for dealing with the world. Since explicit knowledge is based on the tacit dimension, all knowledge is personal. Polanyi sees a problem in just focusing on detached and objective knowledge, for example as in positivistic sciences:

"… suppose that tacit thought forms an indispensable part of all knowledge, then the ideal of eliminating all personal elements of knowledge would, in effect, aim at the destruction of all knowledge. The ideal of exact science would turn out to be fundamentally misleading …" (Polanyi, 1966, p. 20)

2.2.3 The Social Construction of Knowledge

In the works of Berger and Luckmann, it is not the physical reality as such that is the main focus, it is the individual experiences of it. This includes processes like how a social world is formed and how this world then attains its objective status. In the view of knowledge sociology, society exists both as an objective and as a subjective reality (Berger and Luckmann, 1966, p. 153). Berger and Luckmann try to answer the question "How does reality become real to an individual?". It is the subjective reality, the product of interpretation, which is in focus for Berger and Luckmann. This reality is taken for granted by the individual, but how is it achieved, and how can it at the same time be an objective entity?

There are three basic concepts used by Berger and Luckmann (1966): externalization, objectifying and internalization. These concepts do not follow in any time order; they are all constantly at play. There is a dependency and a reciprocity between them, for example at the same time as a person internalizes an objective fact he is also externalizing his experience of it and contributing to the meaning of the object.

2.2.3.1 Internalization

The first step that a human takes is to internalize others' subjective meaning by attaching meaning to objective events. In this way, the individual will be part of a social world that is experienced as meaningful. The individual does not create a world, but takes over an existing world.

This is done in two processes, primary and a secondary socialization. Primary socialization is the first introduction to society, mainly when a child grows up. However, it is also important because that structure will guide the later secondary socialization. Typically, primary socialization is guided by others who "force" the social structures on the individual. The understanding that reaches the individual is chosen and filtered by others.

This process is of an emotional nature. The emotional bond is directed towards guiding others, for example parents, and it is necessary for the process. This process

creates an identity in a dialectic process between the pressures from others and a growing self.

Secondary socialization is the internalization of institutions. Secondary socialization is necessary when some kind of social knowledge diversion is needed, that is when not everyone can know everything in a society. This process demands that the primary socialization is finished. Typically, this happens when a person learns a role, and the knowledge and language that go with it. By this, the semantic field is internalized. Teachers that have the institutional role of transferring the necessary knowledge perform this learning process in a formal and impersonal way. This impersonal aspect creates a need to strengthen the learning process, for example, by pedagogic tactics or initiation rituals. If a deeper transformation of the individual is required, the learning process must follow the original structure of the primary socialization in order to obtain the necessary emotional effect.

The processes of socialization never end, as new challenges to the subjective reality emerge all the time. Two general strategies can be found for this kind of reality maintenance. The first is more or less a continued socialization process, that is interaction with others and the creation of routines. The other one is to put ritual techniques into play or to create ideologies.

2.2.3.2 Objectification

Every individual is conscious *about* something, whatever this might be. To be conscious implies being intentionally aware about a phenomenon, be it subjective or objective in its nature. The phenomena that are experienced in this way appear as not depending on the individual but force themselves on him or her, and are in that sense objects.

In this way, an every-day-reality is created, and it is created around the things that are intentionally acted upon. The common-sense world is taken for granted and does not need any further explanations. The intention comes from a practical need of dealing with the world surrounding the individual. What more is needed is an interaction with other people, which creates the reality experience, with an objective status. In a continuous match against other people, one experiences a sense of reality that does not depend on oneself and is stable over time.

The key to this process is the interaction with others. In a face-to-face relation with another person, the experience of reality is absolute. In cases that are more distant the interaction relies on generalized types of persons. People that we meet we classify and treat accordingly. The types are necessary in order to establish patterns of interactions on which the firm perception of reality depends.

A reality created in this way appears to be objective, and it is perceived as meaningful. The world is a world of signs, that is, objects with meanings attached to them. Berger and Luckmann (1966, p. 48-49) give the example of a knife that is thrown at a person, where the next encounter with the object knife will bring the message of fear, and a dream or an image of a knife will work in the same manner.

2.2.3.3 Externalization

The subjective meaning can be transferred to objects that are specially created to bear a subjective meaning, for example, symbols. Language is the prime example of such a system of symbols. Language can transcend from the here and now experience of the face-to-face situation. Language is therefore the most important objective storage for subjective meaning over time.

The ability to externalize subjective meaning is necessary for social constructions, like cultures or, for that matter, organizations. However, another necessary assumption is that of human action being subject to habitualization. In human action there is a striving for finding patterns, because of the psychological advantage that is gained when the number of alternatives becomes smaller. Habits save energy. The institutionalization of human action, in the form of behavioural patterns conserved in objective symbols is a key to human prosperity. It adds a dimension of social control to human interaction, and it enables humans to specialize and to achieve more than what otherwise would be possible. These steady patterns of behaviour are called institutions.

A special function of the institution is the roles. The roles are a collection of actions that are institutionalized and that a person can identify with. The role has a controlling function in the institution. It keeps track of the rules of the institution and exercise control of the rules. At the extreme end of humans taking on roles, one finds the phenomenon of reification. This means that the person entering the role completely forgets that the role is a social construction. In this way, a paradox is created (Berger & Luckmann, 1966, p. 107), in which human beings are able to produce a reality that denies them.

The institutionalized human behaviour is predictable; this is a necessity, for example for building organizations. However, for the human to accept the institutionalized order it must be legitimized. That is, it must be explained and made acceptable to the human. Legitimization is based on formulas, truths that are transferred and accepted because of the acceptance that the sender gives them. Types are examples of such formulas but, generally, knowledge and the understanding of why constitute the central aspect of legitimization. They are sediments of meaning that have become permanent solutions to permanent society problems (Berger & Luckmann, p. 87). Typical for these formulas is that they are constructed and transferred as totalities. These truths often seem to be simplified during their transfer.

Four levels of legitimization are possible. First, legitimization is achieved by answering the question “why” by saying “just because”. This approach functions in power asymmetries, like parent/child, or worker/boss, or maybe just because the explanation is convincing.

The next level includes explanations, often in the form of stories or examples explaining how things are related.

On a third level more explicit theoretical explanations take place, knowledge being used to explain why, and in that manner legitimization is achieved.

The fourth level assumes a working symbolic universe within which the individual's world is contained. Connecting whole chunks of meaning into the symbolic universe must make legitimization of the experience of realities other than the every day world experience. The symbolic universe marks the limit for what is real, and is used to explain what happens to the individual.

The symbolic universe contains the institutional processes and roles and integrates them into a whole. To legitimate an experience into the symbolic universe one must make it fit into the system, otherwise the experience is not understandable. The symbolic universe is constantly challenged by incidents that must be assimilated or rejected, and the four types of legitimating processes work as machines that uphold the universe (Berger & Luckmann, 1966, p. 126).

In the end, the symbolic universe relies on the amount of power that the owner and manager of it possesses. Potential competitors will be destroyed physically or be assimilated (Berger & Luckmann, 1966, p. 142). When a certain definition of reality is tied to a power structure, it is called an ideology (Berger & Luckmann, 1966, p. 144).

2.2.3.4 Summary

This theory is central, both as it investigates how individual experience of physical reality is formed into a social world and how the social world of individuals or groups is transformed into objective institutions. At the same time, it does not explain everything.

These interpersonal processes are central to the understanding of some key KM problems. Some examples of this include: the connection between the individual knowledge of organizational personnel and the social institution of the organization and the connection between the individual experience and the abstract representation of these experiences that can be handled by information systems.

This said, it must be remembered that this is not an all-inclusive explanation of all knowledge-related problems in an organization, just a central one. An important theme in this research is to allow different traditions and world views to co-exist in a fruitful and interactive manner.

2.2.4 A Critical View of Knowledge: The Power-knowledge Connection

From a critical perspective, knowledge and power are intimately connected (Foucault, 1979). It is not possible to think about one of them without the other. Foucault writes in "Discipline and Punish" (Foucault, 1979):

"We should admit rather that power produces knowledge (and not simply by encouraging it because it serves power or by applying it because it is useful); that power and knowledge directly imply on another; that there is no power relation without the correlative constitution of a field of knowledge, nor any knowledge that

does not presuppose and constitute at the same time power relations" (Foucault, 1979, p. 27).

This view is at odds with the more common understanding of knowledge as the source of power. These powers are often not very obvious, and making these processes explicit and visible requires efforts. This process of revealing these processes is a form of genealogy of power. Foucault calls them micro powers, consisting of practical decision-making, performed by individuals. These decisions shape the perception of the people that are affected by the decisions. The decisions are based on ideas of the individual and are performed for certain purposes.

The main thesis in "Discipline and Punish" is about a shift in western society of how power is exercised. The book presents an evolution from corporal punishment of the criminal to imprisonment. Behind this shift lies the use of the principle of discipline as the power tool. Corporal punishment was not effective; it created an outsider, a person that could oppose power. A better approach was a policy of incorporating the criminal within normality. This was done by detailed instruction that directed every move of the person, that is, discipline. To achieve this required detailed surveillance,including watching the person and taking notes on behaviour. In this way the person became an information object, who could not move in any way without being noticed. Transgressions where met with even harder limitations of movement. This created problems of economy of observation, and architectural constructions that allowed observation without revealing the observer (the panopticon) were devised for this purpose. This invention made it possible to let one prison guard watch more people. The prisoner could not see if the guard was watching or not, and the suspicion of being watched was often enough to uphold the discipline. Foucault claims that "the panopticon" was an invention of the same importance as many other machines of the industrial revolution. Information is central for discipline, and the handling of information is based on simple techniques, for example the table (time table etc.), which of course is well known to the IT area. This connection with more modern information technology and the possibilities of using the theory of panopticon have been noted in the IT field, for example by Zuboff (1988). Foucault's book is focused on the prison and criminals, but this theory can be extended to many western institutions, like schools and workshops.

2.3 Planning Concepts: Approaches, Frameworks, Methodologies and Methods

A number of concepts are frequently used when talking about the planning of information systems, including approach, framework, methodology, method, tool, and technique. There is probably no final theoretical or practical definition of these concepts or consensus on how they should be used. Nevertheless, it is necessary to describe how the concepts are used in the current work as clearly as possible.

2.3.1 Methodology and Method

The methodology concept is discussed in Avison and Fitzgerald (1995). Here, an information systems development methodology is defined as:

"a collection of procedures, techniques, tools and documentation aids which will help the systems developers in their efforts to implement a new information system. A methodology will consist of phases themselves consisting of sub-phases, which will guide the systems developers in their choice of the techniques that might be appropriate at each stage of the project and also help them plan, manage, control and evaluate information systems projects." (Avison and Fitzgerald, 1995, p. 10).

In Checkland (1981) a discussion of the two concepts of methodologies and methods is laid out. A methodology is a general idea of how to solve a problem; it provides general ideas, concepts and techniques and how they can be used. In the individual application, these must be brought down to the specific problematic situation. A particular method based on the methodology must be developed; the use of concept and techniques must be based on an in-depth insight into the problem. The methodology is a set of principles for the method. The meaning of method, according to the dictionary (The Oxford Handy Dictionary), is "a special form of procedure; esp. in mental activity; orderly arrangement of ideas". The order of the problem-solving process, that is which phases or steps should be taken in which order, must also be individualized. Techniques, in very general terms, are about turning means into ends (Checkland, 1981). A technique is a precise programme of action that produces a standard result. A tool is a computer system that is used as an aid for performing the tasks of a technique (Avison and Fitzgerald, 1995). What distinguishes a methodology is that it is based on a philosophical view of the world (Avison and Fitzgerald, 1995), that is, ideas about how the world is constructed and the nature of it (ontology).

2.3.2 Frameworks and Models

A framework is a way of understanding a situation and contains concepts and their connections. There are connections between the concepts of "framework" and "model". A model is a representation of the world that works well in view of the current problem situation. The model should represent the world in such a manner that, when operated on, it acts in the same way as the real world would. A conceptual model consists of a set of concepts that are put into relation with each other. Since this is often the case of frameworks, too, this makes up the similarity between the two concepts. The difference is that the framework also expresses a way of interpreting the world on a more philosophical level. On the other hand, the model is more concrete and concerns representation on a practical level. Both help the user to understand the world. A framework consists of a number of models; it also provides reasons behind the choice of models and answers questions like when, how and why they should be used.

Jayaratna (1994) describes a framework as:

"… a meta-level model through which a range of concepts, models, techniques, methodologies can either be clarified, compared, categorized, evaluated and/or integrated." (Jayaratna, 1994, p. 43).

Checkland (1985) describes information systems development as a form of inquiry, consisting of three components: an intellectual framework, a methodology, and an application area. The intellectual framework, Checkland says, consists of ideas that we use to make sense of the world. The framework is the philosophy that guides the inquiry. Like any philosophy these are based on ontology, that is, basic assumptions of the world and an epistemology, the grounds for knowledge of the world. The methodology is the prescription for the inquiry, in essence making the framework workable. The third part, the application area, forms part of the world that is under inquiry.

2.3.3 Theory on the Concept of “frames”

The special role of frameworks is sense-making in problematic situations. “Sense-making” in the system-planning process refers to the need for the analyst to answer the basic question “What is going on here?”. The frameworks should help the analyst to answer that question. To dig deeper into this aspect of frameworks, we will go further into the work of Goffman (1986) and his idea of frame analysis.

In Goffman (1986) the concept of frames is discussed and the way it can be used to understand the organization of a person’s experience. The frame helps the individual to make sense of an event or series of activities. It does not tell him what is real or not, only whether the event should be perceived as real. The main problem is that events can possibly have multiple meanings on an individual level.

The definition of frame used in Goffman (1986, p. 10) reads as follows:

"… principles of organization which govern events and our subjective involvement in them".

The definition is somewhat short and theoretical. Generally, a frame is about giving meaning to the situation. The words of Goffman again:

"… a frame is seen as rendering what would otherwise be a meaningless aspects of the scene into something that is meaningful." (1986, p. 21)

The frame helps us to sort out what is important from what is not. The typical example and a very down-to-earth understanding of the concept is to see it as the frame around a picture. The four pieces of wood surrounding the painting send a signal to the viewer that another view of understanding the situation is needed. Moreover, Goffman continues the discussion of the painting:

"… we permit our visual field to be limited by what is within the frame as the passage into the pictorial world." (p. 4)

What the frame is made up of is more loosely defined. It can be more or less anything that has the stated effect. Examples of frames include "system of entities", "postulates", "rules", and frames without any generally defined shape.

Goffman uses two levels of frames, primary frames and frames that build on primary frames, mainly "keys" and "fabrications. The primary frame is:

"seen by those who apply it as not depending or harking back to some prior or original interpretation" (p. 21)

The primary frame is not very obvious to the individual. People create a primary frame just by being in a cultural/social context long enough. During this period the individual might question the frame actively. Later on, the individual can probably not even express the primary frame in a consistent manner. This is not necessary in order to apply it. The frame becomes a tacit form of knowledge.

However, what the primary frame does is necessary; it performs the necessary act to:

"… locate, perceive, identify and label a seemingly infinite number of concrete occurrences defended in its terms." (p. 21)

Some short notes may elucidate the secondary frame concepts. Goffman says that a key is:

"… a set of conventions by which a given activity, one already meaningful in terms of some primary framework, is transformed into something patterned on this activity but seen by the participants to be something quite else" (p. 43-44).

The fabrication concept also refers to a transformation process but takes in the intentions behind performing it. Here the fabricator or deceiver tries to induce a false belief to some one else. This could be done with a good intention (to make a point, to explain or even entertain) or with intentions that are more hostile.

Every event that we encounter must be framed. No matter how elementary and simple the event, it is subject to different interpretations.

2.3.4 Approaches

The concept of "planning approaches" may gather up the concepts (frameworks, models and so on) discussed above.

The concept of a "planning approach" is used to describe a more or less structured way of planning. Checkland (1981) defines "approach" as "…a way of going about tackling a problem". Further, Checkland qualifies this term and discusses "systems approach" as using a "broad view, which tries to take all aspects into account, which concentrates on interactions between the different parts of the problem." (Checkland, 1981, p. 5). The "system" concept is defined as "the idea of a set of elements connected together which form a whole, this showing properties which are properties of the whole, rather than properties of its component parts", (Checkland, 1981, p. 3).

Within the field of information systems development, there are different themes (Avison and Fitzgerald, 1995). Some of the themes are directed more towards the

organization, while others are more directed towards software (software engineering or prototyping). One theme is “Planning approaches”; a concept relevant for this research. A planning approach looks at the role of the information systems in the organization, not at the detailed or technical functions of the individual information system. A planning approach is a reaction to a piece-meal implementation of information systems, through a firm focus on the organization, for example on its goals and aims. A strategic dimension is common in this theme.

One example of this type of approaches is the “strategic planning of information systems” (Earl, 1993). The approach consists of a mix of procedure techniques, user-IS interaction processes, special analyses, or random discoveries. The approach to planning is distinguished by underpinning philosophy, emphasis, and influences. The elements of an approach can be seen as “the nature and place of method, the attention to and style of process, and the focus on and probability of implementation” (Earl, 1993, p. 7). The aim of the approach is to describe the totality of organizational information systems use and the value for the organization of these information systems. Central is the connection between business planning and the use of IS/IT resources, rather than looking at individual applications and their internal structure. Within this idea, plans for the individual information systems could be made. It is important to discuss both the direct and indirect consequences that an IT support system might lead to. These effects are to be discussed from many points of view further on in this thesis.

2.3.5 Summary

The relations between the concepts above could be summarized in a few statements:

- An approach implies a problem area and a set of frameworks and methodologies to deal with the problems in the problem domain.
- Frameworks are about content and methodologies about structure.
- Both frameworks and methodologies are supposed to have a philosophical dimension.
- A model is a representation of the world from the view of the current problem and representing the world in such a manner that, when operated on, acts in the same way as the real world would.
- A technique is the practical point where methods and models meet. One example of a technique is Checkland’s (1981) description of how to create a rich picture or a conceptual model.

This vocabulary can be exemplified with the ARIS approach (Scheer, 2000). ARIS is described as one of many “business process modelling” approaches consisting of a number of frameworks. Each framework consists of a number of models and methods that describe how to work with the models. The framework represents different views of the business and its specific planning area (KM). The methodological discussion is covered in rather general terms, using terms like engineering approach to business

modelling to describe the underlying assumption about the company and the role of people. Tools are an essential part of ARIS, the whole set of frameworks and models being represented in a computer tool within which most work is done.

2.4 Strategic Planning for Information Systems

Here an overview of basic strategic concepts is provided and they way they have been used in the IS field. Then, a selection of different types of approaches to strategic IS planning is presented, including critical success factors and IS portfolios. Then we move on to strategic approaches covering broader ranges of issues for strategic planning, including soft systems methodology and participative approaches.

Strategic information systems planning (SISP) is the process of deciding the objectives for organizational computing and identifying potential computer applications that the organization should implement (Lederer and Sethi, 1988).

The traditional understanding of strategic perspective planning for information systems includes that the information systems strategies should be consistent with organizational strategies and support the achievement of the organizations' strategic goals. To manage this, a top-down approach is common, preferably with an overt support from top management. Essentially, this means breaking down business objectives into information system requirements. The alternative is a bottom-up approach where business process modelling is the key approach. A combination of the two is often seen as a possibility.

An example of this is a strategy-guided process engineering approach, ARIS, (Scheer, 2000). Here a combination of critical success factor analyses with a top-down perspective is combined with a generic value chain that provides a bottom-up aspect. In this way, a few selected processes are targeted for analysis and reengineering, and finally new information systems components are developed. The use of the original CSF approach (Critical success factors, Rockart, 1979) seems to be limited. There are various ways of generating success factors, but the basic idea is to break down goals to more concrete activities. In order to succeed with the CSF method one should follow the general intentions of the method but also adapt it to the current situation, which might prove difficult (Shank et al., 1985).

2.4.1 Strategy as Plans and Patterns of Actions

Looking at some of the literature on strategic planning, one finds a number of definitions, focusing either on strategy as action or as a plan (Bracker, 1980).

One early definition of corporate strategy is provided by Ansoff (1965, Chapter 6), with a focus on plans that direct future decisions.

"Strategy … means 'rule for making decisions under conditions of partial ignorance'." (Ansoff, 1965, p. 121)

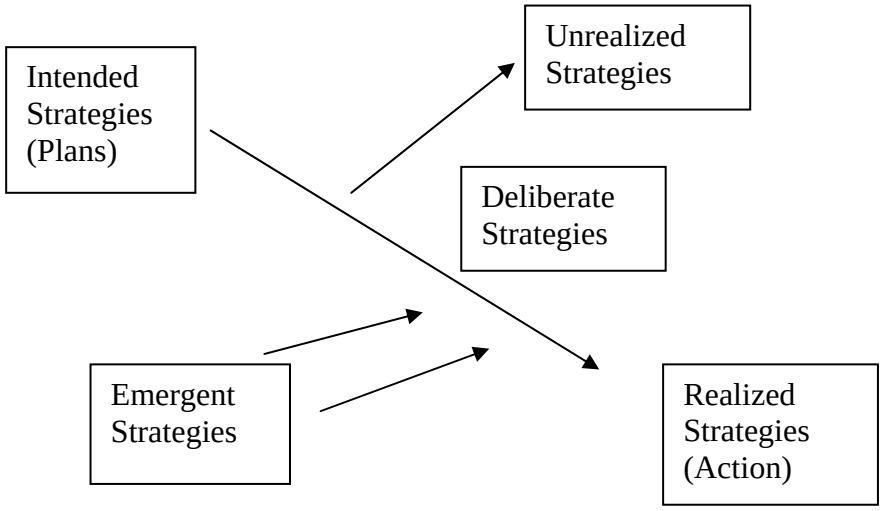


Figure 4. Forms of strategy, adapted from Mintzberg, 1994 pp 24.

and

"…decision rules are required if the firm is to have orderly and profitable growth. Such decision rules and guidelines have been broadly defined as strategy...." (Ansoff, 1965, p. 103)

From this view, a strategy is achieved by an analytic planning method. However, the planning concept as such is complex (Mintzberg, 1981), and strategy is not just about planning. It is possible to achieve a strategy without planning. Mintzberg (1981) sees planning as the method-driven explicit prescription for action and the strategy concepts as denoting something important, as in a strategic plan or decision (Mintzberg et. al, 1976). Strategy could be understood as a pattern of consistent action over time (Mintzberg, 1978), whether planned or not. The pattern evolves over time, where some of our intended strategies together with emergent ones become the actual strategic pattern (Fig. 4).

Minztberg argues that the pattern aspect of strategy must be taken into consideration; otherwise planning might end up in a drawer, soon to be forgotten.

"... effective strategies mix these characteristics in ways that reflect the conditions at hand, notably the ability to predict as well as the need to react to unexpected events." (Mintzberg, 1994 p. 25)

Many planning methodologies favour strategy as plans rather than patterns. Mintzberg sees this as a fundamental problem. He fears that strategies as plans will not serve organizations well enough. The pattern aspect is harder to work with; it demands a more direct contact between the manager and the organization. Generally, Mintzberg argues that strategy-making should be more about learning than about writing down plans (Mintzberg, 1991). This is not to say that planning is not needed

(Mintzberg, 1978, 1991), just that planning is part of strategies and that strategies are more than planning.

The strategy concept connects the long-term goals and the values of the organization with the organization's actions dedicated to upholding those values. In this sense, strategy has a responsibility to balance the need of being flexible with preserving the long- term values of the organization.

Russell Ackoff (Ackoff, 1979) wrote critically of the area of "operational research", calling it a "predict and prepare" paradigm. Many of the problems were associated with the general ideas of traditional planning, based on hard systems thinking. These are principles that the information systems planning field has inherited. "Operational research" is of course located at the extreme end of the "predict and prepare" paradigm. Nevertheless, it provides a good example of the trouble with analytic aspects of planning. One such aspect is the lack of a value discussion.

Ackoff discusses two problems related to the connection between values and planning. First, that the values that planners usually deal with are more or less invisible. They are built into the models or frameworks that the planner uses to predict the future. The plan made for, for example, an information system, will reinforce and carry with it a set of values without a discussion. The planner will unconsciously contribute to these values.

The second problem area is concerned with the fact that nothing is objective. Planning is often expected to be based on objective and "hard" facts. This is an ideal inherited from scientific thinking into management and planning theory. However, Ackoff argues that there are no such things. One cannot exclude any ethical-moral values in professional work with the argument that being objective is more professional. Instead, the opposite is truer: to act with a value dimension included is more professional.

2.4.2 Critical Success Factors (CSF)

The CSF method aims at the development of management information systems, based on factors that the manager must be provided with information about. A critical success factor is a factor in a manager's work practice where things must go right, if goals are to be attained. The method identifies a number of sources of information needs (Rockart, 1979). By scanning through these CSF sources the focus of the manager's attention is directed towards a wide spectrum of the problem situation. Then, the information needed to control the CSF's is identified. Based on this, the development of database definitions and computer-based information systems follows.

The CSF method was constructed with the problems of four general types of planning approaches in mind (Rockart, 1979).

1) The first approach is data-driven. Here, the information that information users get are the existing data of the transaction processing systems of the organization. This

approach builds on a previous automation of existing routines; possibly even without any preceding information needing analysis.

2) The next approach builds on a view of managers as dynamic experts. The information needs are complex and personal, which makes them very hard to predict. Because of this, there is a need for assisting people who support the manager's information needs when they arise.

3) The third approach works with the assumption that it is possible to redefine information needs which are suitable for different types of companies. This perspective assumes that a certain group of information users, for example within a branch, have the same needs. By a study of the branch, these general information needs can be established.

4) The forth approach suggests a broad, in-depth study of every information user (user group) of the organization. The total business study has a potential for a very good result. The approach meets the basic idea of "asking the individual about the information needs". The problems of this approach are that it might prove expensive and time-consuming.

The core problem is about finding a way of achieving a balance between satisfying the needs of the user without extensive costs for the planning of the system.

The CSF method works both on a personal and an organizational level. The method suggests interviews with many managers on the top three levels of the organization. Based on this material, patterns in the information needs are explored. These steps provide a definition of management information needs for decision and control, (Bullen and Rockart, 1981). From a more general organizational perspective the organizational goals and strategies of environmental issues are investigated.

The CSF method found a middle way between the general/special and the internal/external in a situation. The method proposes asking the individual information user questions that are generated from general perspectives. At the same time, the CSF method tries to find patterns in the information use. The CSF method assumes that the manager has special needs and that these needs must be connected to a large organization whole. In addition, a comparison between current information support and needed information support can be made in order to provide an information requirement specification for future information systems design projects.

A limitation of the CSF method is that it is focused on controlling and monitoring issues from a top management perspective. In this sense, it is not a general information systems development approach, but rather an approach for strategic systems. The basic definition by Rockart (1979) had this limitation. In the works following Bullen and Rockart (1981) and Henderson et al. (1984) this view was expanded with a decision-making and an assumption aspect.

Another problem area is that the method is very much a top-down approach. It is goal-oriented, control-focused and has organizational effectiveness as its rationality. The planning problem that CSF tackles is described as how to get a practical and

busy manager to reveal his information needs. The solution given is a well prepared interview, adapted to the person in focus and also planning for a repetition of the interview. The crucial points are good communication, interaction and trust. The manager might not always want or be able to express the need for information.

2.4.3 Multiple Methodology Approach

It has been recognized that a pure top-down approach is not always suitable and that combinations are needed (Earl, 1989). Earl (1989, p. 68) argues that no single strategy formulation methodology will work in every situation. The strategy should be developed depending on the problem situations. The outcome of the planning process should provide a general direction without details. An important part of the outcome is a business-related statement on which applications to be developed. A good support for this could be a portfolio view of the organization's information systems (McFarlan, 1984).

What is not required is a formal systems model with interfaces, and so on. Important parts of a strategy include: statements about the strategic arguments of each information system, their importance to the overall strategy and the relations between the systems. To achieve this, Earl (1989) suggests a number of possible approaches.

- *Top-down.* This is an analytic, structured methodology based on business plans and goals. This is business–led approach, where the alignment of information becomes the main concern.
- *Bottom-up*. This approach focuses on the analysis of current systems. These systems are evaluated and on the basis of these finding developments take place. This is an infrastructure-led mode, promoting stability over time, but needing visionary support in a changed climate.
- *Outside-in.* This is a creative process where opportunities of information technology are investigated. This is an opportunity-guided approach.

Earl argues that these three modes support each other and together provide a more complete understanding of information systems.

There are different ways of putting together such a multiple methodology. Earl (1993) identifies empirically a number of approaches to strategic planning

- *Business-led*. The information systems needs are derived from business goals.
- *Method-driven*. This approach builds on an explicit, formal method. These methods are often of a more IS/IT-oriented kind and sponsored by the IS department.
- *Administrative*. This is a resource-driven approach. Resources are given to certain projects, which then have to manage within the given budget. The projects are initiated by local needs in a bottom-up manner, but the decisions are made top-down.

- *Technological*. This approach works with formal methods and has a focus on business models and data models. The emphasis is on deriving blueprints for IT and IS and using information engineering terminology.
- *Organizational*. This approach is focused on an organizational learning process of continuous decisions on information systems through which the systems are integrated into organizational life. This is not a formal method, but a multi-dimensional language for a discussion. Methods are used when they are needed and chosen with respect to the problem situation at hand. The methods are aimed at increasing the understanding of the problem situation and the expected business value. Multi-disciplinary project groups conducting special investigations into selected themes seem to be a successful way of working.

2.4.4 Planning with Portfolios

Various kinds of portfolios have been employed to bring some order into the use of information systems in organizations. The general aim is to create a balanced understanding of the impact of the systems and then use this as map to make decisions on which systems to develop. An early example is given by McFarlan (1984) who used a development of a product portfolio to position companies according to the strategic importance of information systems.

Ward and Peppard (2002) suggest an application portfolio, also based on the product portfolio. Here information systems are characterized according to their importance (high/low) within a time frame (now/future). In this portfolio information systems can be strategic (important in the future), key operational (important today), supporting (low importance today) and high potential (might be important in the future). The relative position of the information systems will be used to make decisions on the future of the systems. Depending on what segment of systems are targeted for development, different kinds of development strategies will be applied to the development process. Based on this portfolio, it is also possible to lay out a life cycle for an information system and by this manage it over time.

A number of different types of portfolios have been proposed:

- *Infusion and diffusion* (Sullivan, 1985). Infusion, the level of importance information systems has for the organization in general, and diffusion, the degree of decentralized control of information systems in the organization.
- *Return on investment* (Earl, 1989). Payoff, the return of investment expected from the information system and the time when the return is expected.
- *Value and quality* (Weill and Vitale, 1999). An information systems health grid, consisting of the value for managers and the technical quality of the system.
- *Generic strategies* (Ward and Peppard, 2002, p 325). The basic application portfolio is connected to different IS development strategies. A certain type of development process is linked to a type of information systems, for example prototyping to a high potential type of information systems.

- *Organizational benefits* (Parker and Benson, 1988). Parker and Benson (1988) present a matrix connecting types of information systems support (substitutive, complementary, and innovative) to types of organizational benefits (innovative, value linking, value restructuring, cost-benefit and value acceleration).

2.4.5 A Participative Approach to Strategic Planning

Strategic planning is about generating projects that have the greatest and most positive impact on the organization. Here we have problems in predicting the future (cf. prediction fallacy, Mintzberg, 1994) and allowing novelties to emerge. A more general discussion on reengineering vs. innovation is found in Hamel and Prahalad (1994), who argue that innovation is the key to strategic advantages. This view is also supported in Rigby and Bilodeau (2005), who report that 86 % of interviewed managers believed that innovation was more important than cost reduction.

An approach to generating more diverse project ideas is to invite large parts of the organization personnel (Seagers and Grover, 1999). At the same time, Seagers and Grover (1999) caution against the heavy costs that follow from broad and prolonged investigations. Strategic information systems planning is traditionally assumed to be a top-management affair (e.g. CSF, Rockart, 1979). This is an assumption that relies on managers' closeness to the daily work of defining goals and strategies. In a study of an application of the CSF method, Shanks et al. (1985) conclude that the more levels of personnel involved the better the result when respondents validated the result.

The bottom-up approach is often handled using surveys (and building process maps, Earl, 1989). This limits the possibilities of innovative ideas that might come from the personnel working practically with problems and using the information systems. It is of course possible to ask everyone throughout the company, for example the BSP (business systems planning) from IBM. However this is approach is often seen as too slow, using too many resources and producing a result that is hard to handle (Rockart, 1979).

In Peffers et al. (2003) an extension of the CSF method towards a more general participation by many people within and around the organization is presented. The method includes a number of aims:

1) To produce a wider range of ideas.
2) To better balance important systems in the portfolio.
3) To consider a full range of options for accomplishing goals.
4) To optimize the allocation of resources.

Peffers et al. (2003) argue that a top-down-dominated approach threatens to create an unbalanced plan by excluding the effective use of grassroot knowledge. This might prevent important ideas from emerging, which is crucial in an era where quick, proactive adaptation to new environments is required.

Peffers et al. (2003) suggest a method that they call critical success chains (CSC) and which is built on the CSF method. The goal is to generate strategic information systems project ideas. The method aims at understanding employees' preferences for new systems features and to understand the reasons why they think that the features are important to the firm.

2.4.6 Information Requirements as Social Constructions

As argued under the CSF section, the definition of information needs is an early stage activity in IS development and works as a defining moment for the nature of the information system and its place in the organization. This process might be viewed as a formal and objective planning process, which is the better the more univocal and unambiguous it gets (cf. planning for planning in Ward et al., 1990). The univocality becomes more necessary the closer the computerization of the information system comes. However, the early stages seem to benefit from a more open argumentative attitude rather than rushing towards hard definitions. These issues are discussed by Galliers and Swan (1997, 2000), who call for a social constructionist view of the early stages of the IS development process.

Galliers and Swan (1997) argue that the dual nature of information systems should be reflected in the development methodology. Two assumptions are seen as the root of the problems of information systems planning. First, goals are unitary and, second, knowledge is objective. The problem is that neither is right, because there are multiple sets of goals for information systems and the knowledge about information needs to reflect this. The people involved in the planning process could best be described by using network metaphors. Informal connections, between people both within and across organizational borders, are the right background for understanding both goals and information.

An approach is needed that embraces the socially mediated nature of the organization. This might be achieved by understanding the planning approach as socially mediated. Galliers and Swan (1997, p. 181) summarize these strategic approaches as "Soft systems" approaches. The basic idea is that the socially mediated nature of information should be reflected in the strategic planning process. A number of perspectives and qualities of the planning process should be added to the traditional SISP process (Galliers and Swan, 1997):

- Realizing that the planning process is socially mediated.
- Attending to both formal and informal aspects of information.
- Understanding the network dimension of information, including the importance of informal networks for understanding how information is used.
- Integrating political and social aspects of information use into the planning process
- Understanding the first- and second-order effects of the planned information systems.

- Planning both a change management organization and an organization for the management of the system.
- Moving generally from a technical, engineering perspective to a human, organizational perspective.
- Applying the understanding of the items in this list to both the planning process and the later usage of the systems.

2.4.7 Soft Systems Methodology and Strategic Planning

The soft systems methodology (SSM), developed by Peter Checkland (Checkland, 1981), deals with problem-solving in situations in which there is a high level of social, political and human activities. SSM is for problem-solving in general and not as such connected to the IS field; however, SSM is being increasingly used for problem-solving within the IS area (Holwell & Checkland, 1998).

SSM aims to make use of system concepts in the human/social area, which have traditionally belonged in more technical environments. This was achieved by testing concepts in real-time problem-solving. The outcome of this process was a number of principles for the use of system concepts, being expressed in SSM.

Checkland shows that there is a clear connection between the underlying principles of SSM and areas like phenomenology and hermeneutics (Checkland, 1981, Chapter 8). One of the most important principles is the epistemological view of systems, that is, studying the world using system concepts, without assuming that the world really constitutes a system. This view is expressed in the idea of soft systems thinking versus hard systems thinking. SSM is about inquiring into the social world and Checkland compares it to Churchman's (1971) concept of the "Singerian inquiring system".

The methodology could be understood on a number of levels, including philosophy, method and models/techniques.

On the highest level, philosophy, the "soft" concept, is used to give a hint about the underpinnings of the methodology. These include an assumption about the nature of the world, for example, the idea of "human activity systems" (HAS). A human activity system is a designed system, which might be a less tangible, but still clearly observable, system. A HAS consists of sets of human activities, more or less consciously ordered in wholes as a result of some underlying purpose or mission.

The methodology includes a working order, or a method. There is a well documented set of working steps, containing a number of principles, concepts, models or techniques for each work task included. At the same time, it is pointed out that this list constitutes a possible way of working, but not the only way. The following set of work steps could be used in other orders or configurations:

1. Describe the problem situation in an open manner, without the use of system concepts. Here we try to find focuses by discussing one or more "feelings of unease".

At this stage it is important not to define a clear problem that might control the continued process. The purpose is to possibly get to know the situation and to keep an open mind.

2. Express the problem situation by using a “rich picture” technique. It is suggested that the rich picture be presented as a simple, often hand-made, drawing of the important aspects of the situation. These aspects might include: structures, processes, actors, problems and conflicts.

3. Make a systemic definition of the problem situation, using the concept of “root definition”. Checkland suggests utilizing a set of concepts for doing this, including customer, actor, transformation, Weltanschauung, ownership and environment (CATWOE, Checkland, 1981, p. 225).

4. Create a number of formal system models, either by using a conceptual modelling technique or a third-party technique. The conceptual model describes how the system works through a basic set of verbs and their connections.

5. Compare 2 and 4 in order to find out what should be done about the situation. The purpose is to find out if the solution makes sense in our real-world description. This is not a comparison of “like-with-like”, i.e. the two techniques are not supposed to be the same. This step takes the models of Step 4 into the complexity of reality as described in the rich picture.

6. Make a “feasible and desirable” analysis of the systems chosen in Step 5.

7. Take actions, try to implement the changes and if necessary, restart the process based on the experiences made in the implementation process.

Checkland argues for a wide range of uses of SSM, both in research and in solving practical business problems. SSM is built on the idea that system concepts could be explored and developed by applying them on the actual problem situation and taking the level of success as a measure for the research success (Checkland, 1981, p. 151). An example of the planning of an information system is provided by Checkland (Checkland, 1981, p. 208). Here a broad study of a system development project is presented, explaining the power of SSM when it comes to bringing in diverse perspectives and rethinking the basic assumptions of the situation.

There are a number of more recent examples of SSM being used in organizational development, including: BPR (Bustard, 1998), management of information systems development process (Bennetts et al., 1999), knowledge management systems (Fennessy, 2002), product and process innovation (Presley et al., 2000), performance improvement and organizational change (Jacobs, 2004), and business reengineering (Galliers, 1994).

Central for SSM is the use of systems thinking concepts for exploring solutions, given multiple frames for understanding the situation. However, these frames are not easy to establish and the system concepts might hinder an open-minded understanding of the situation. Here the methodological aspects are essential. The

SSM is a learning process for all parties involved. SSM is not designed as a strategic planning approach. However, it seems to be a suitable framework for developing special planning methods for strategic planning. A number of the reviewed concepts and underlying assumptions might help creating a better work-planning approach.

2.4.8 Summary

Both strategic planning in general and strategic information systems planning are complicated activities, sometimes consisting of contradictory elements. A number of difficulties should be treated with special attention:

- *The planning – learning* dimension of methodologies. A methodology should not be exclusively about one or the other.
- *Comprehensiveness – effectiveness*. A good balance in the planning process demands a balanced set of models of tools that both provide a broad picture of the situation and are fairly easy to work with.
- *Approaches and portfolios*. There is a need of good ways of dealing with the balance between models used in a strategic planning process. The formation and packaging of these approaches, so that they fit a certain planning situation, are important tasks.
- *People / social.* This side of strategic planning is not very well developed, but nevertheless necessary.

These issues should be treated with extra consideration in the development of the planning approach.

2.5 Towards a Network Society

> *This section discusses some key concepts presented by Castells in* The Rise of the Network Society (1996). *The basic assumptions that are presented here include: 1) knowledge is a key production factor, 2) enterprises organize themselves in networks rather in hierarchical organizations, and 3) information technology is at the centre of this development.*

The development towards a network society is a major change factor closely linked to the issues raised in the knowledge management area. Here we discuss how the problems of a dissolving hierarchal organization profoundly change the conditions for how a company can manage its knowledge. This could lead to either a positive focus on creative knowledge workers or to an increased need of codifying knowledge, separating the knowledge from the worker.

2.5.1 The Informationalization of Society

The background to this research area is the change in society in general, the move towards a “post-industrial” society, an information society, or a network society. A discussion of this idea is found in Castells (1996), where the concept of

informationalization is put forward. The basic change is that the important production factor is changed from the ability to manage energy to the ability to handle knowledge and information. Castells also makes it clear that it is not just the information society that handles information, because every society has had a need of handling information. It is the production of knowledge, enhanced by the use of symbol-manipulating machines that is the key production factor. Castells uses standard definitions of knowledge (justified, true beliefs) and information (communication of knowledge).

Society is informalized, Castells says, when these processes of knowledge and information reach out to every part of human life, into the processes of individual sense-making. People create their identities in symbolic interaction with others in the context of their culture. Society is organized around information, with the goal of a higher level of knowledge generation.

The background to this development is a need of reviving the economic life of our society. Castells distinguishes between the way of production (for example the capitalistic way) and the mode of development, which is changed from industrial to informational. The change is driven by a re-structuration of capitalism. This new techno-economical system should be called informational capitalism. Castells argues that it is the abilities to create knowledge that form the basis for development. The changes in the economic system, including higher profits, increased productivity, and a globalized economy, all depend on the use of information technology. In this wave of change, companies have striven for more flexibility and a higher ability of innovation, also depending on information technology. Again, the sources of productivity are knowledge creation, information handling, and symbol communication. However, the empirical evidence of this assumption is not clear, the reasons for this, Castells claims, being problems with how development is measured and the change not being equally rapid in all parts of society.

Castells studies these changes by looking at the relations between production, human experience and power:

- Production is human interaction with nature.
- Experience is human relations to herself, how she sees herself and her identity.
- Power is the relation between humans, how people can force their will on others.

Castells tries to explain the general development of society, focusing on information technology and knowledge production as key factors. The development is structured around a revolution of information technology, the need of organizations to improve profit and production, and the changes in cultural patterns. Information technology was necessary to make changes in the capitalistic system; by enabling globalization, innovation based on knowledge work and increased flexibility. The effects and, indeed, the successes of the application of information technology are dependent on cultural issues. At the same time the development of cultural codes is dependent on the use of information technology.

2.5.2 Networks, Globalization and Identities

Networks, Castells argues, are the way of understanding this new world, rather than hierarchies. Networks reflect the opportunity to organize human activities that new information technology provides. It is not country borders or traditional institutional structures that define the way people communicate. A central aspect of these issues is identity; one might see facilitating or limiting the development of personal identities as a form of control. Identities determine the way the humans understand themselves and their world. Identities are formed within a culture. Symbol-manipulating machines interfere in these processes and become part of these sense-making and identity-building processes. The use of these machines and the information- and knowledge-handling processes must be related to the cultural spheres that they take place in. It is certainly very important to understand the connections between the production of identities and cultures, symbol-manipulating machines and knowledge management processes.

This makes it possible to be in contact and belong to other cultures or communities than the ones that are physically close. There is a fundamental change in time and space, Castells argues, (1996, Ch. 6 and 7). It is in the network that flexibility and creativity grow. This is a change that is still in progress and, according to the network logic, this will not take place all over the world at the same time. It will be created along the paths of the network, and will emerge rather than be designed. Here we have a paradox: at the same time that information-handling techniques provide powerful tools for understanding the world the circumstances for the creation of identity will be different. The traditional ways of culture-building, like basing them on a place or a stable community, will be changed. A self-identity is not a fixed set of attributes; it should rather be described as a process of creating meaning performed by a person. This sense-making process is generally based on the culture that the person belongs to. Alternatively, identify can be based on a reaction against the dominating culture. The process is reflexive; the identity is how a person perceives himself or herself in the context of the cultural situation. Castells calls this context dominating institutions or more generally the civil society. It is a process of internalization and externalization and builds on a working contact between the individual level and a dialectic interplay between the local and the global.

2.5.3 Summary

According to Castells, knowledge acting on knowledge is the source of productivity. Knowledge and information technology/information systems are the central issues in the development of society. A number of insights can be gained, as concluded:

- Information systems must be understood in the context of culture and identities. The use of symbol-manipulating machines change the ways of symbolic interactions between people that produce cultures and identities.
- A network perspective on how enterprises organize production, using information technology, is needed. This leads to flexible production and globalized markets;

with changes in both where and by whom products are produced and consumed. The network logic is not new per se, but developments in information technology lead the way for a change towards a society where the network logic dominates.

- Knowledge is the source of productivity and, by extension, knowledge management is becoming the key activity for organizations.
- There is no absolute technological determinism, but society cannot be understood without its technology. The outcome of the use of information technology depends on the choices made by owners, planners, developers and users. However, society does not determine its technologies in an absolute sense either, because there is a dialectic interaction between the two, technology embodying society and society using technology. Unintended consequences of technology should not be overlooked.

2.6 Knowledge Management: Background Theory, Perspectives and Systems

The knowledge management area is a broad area, so here is given an overview of the ambitions of the area and the background ideas and theories that underpin it. A deeper analysis of the central theory of knowledge creation and its critiques will then be presented. After that there is a discussion of the perspective of knowledge management as interaction between people, as the key to understanding the problems of the area. The chapter is closed with two sections on the way knowledge management systems are developed.

Knowledge management is a growing application area for information systems, and one of great importance. Knowledge management frameworks (e.g. Nonaka and Takeuchi, 1995) seem to be natural way of leading the planning and development of knowledge management systems, i.e. information systems supporting knowledge management processes (e.g. Alavi and Leidner, 2001).

Knowledge management is an information- and communication-intensive organizational activity. There is a multitude of frameworks for the management of knowledge in organizations, but no “best of breed” has as yet emerged. (Rubenstein-Montano et al., 2001). There are many meta frameworks that represent different ways of understanding knowledge management, including HRM and KM (Carter and Scarbrough, 2001), four paradigms for KM (Schultz and Cox, 1998); intervention/interaction (Alvesson and Kärreman, 2001), and networks, cognitive and social (Newell et al., 2002).

2.6.1 Knowledge Workers and Knowledge Organizations

The basic assumption about knowledge workers is the idea of knowledge as a key resource or production factor. The extent of the concept of knowledge workers is sometimes very wide; see for example Malchup (1962), where anyone that deals with information is counted.

What are the characteristics of those people that are central for knowledge to become an important production factor? Knowledge workers are people that rely on personal knowledge in their work (Davis and Naumann, 1997). Their work entails producing new knowledge and information, which is to be used in the organization (Stehr, 1994). Davis and Naumann (1997) have developed an idea of the structure of knowledge work. It contains four major work tasks, acquiring knowledge, designing knowledge output, decision-making, and communicating the designed output.

Castells (1996) discusses the major changes of our society in the context of information and information technology. The central phenomenon is when knowledge works on knowledge, which is the key issue in the information age. Castells provides a detailed list of different types of workers. Three dimensions of work are presented: value-adding, relation-building, and decision-making. The value-adding list includes the following work roles:

- *Leader*, strategic decisions and planning.
- *Researcher*, innovation of products and processes.
- *Integrators*, dealing with the relations between information, innovation, design and action.
- *Operators*, performing tasks on their own using their own knowledge.
- *Human robots*, performing pre-programmed tasks that have not yet been or cannot be automated.

Competition is based on the organization's flexibility. The network-based company, Castells claims, is the organizational form that is best suited for this. In the network society, building relations is an essential task, and Castells therefore divides the workforce according to its role in these efforts. The ability to create relations among members in the workforce and outside the organization in the greater networked context where the organization exists could be used to divide the workforce into three categories:

- *Networkers*, who create contacts on their own initiative.
- *The networked*, who belong to the networks but are without influence on the design of the networks.
- *The decoupled*, who are excluded from the networks, only being passive receivers of information.

New ideas and creativity often depend on input from many sources; the successful knowledge worker should be a skilled relation maker.

The third aspect on the workforce is decision-making, where the following division is given:

- *Decision makers*, those who ultimately decide.
- *Participators* in the decision process, those who are involved in the process.

- *Executors*, those who implement the decisions.

No knowledge worker can be completely shut out of the decision-making process, even though not all can be decision-makers.

The knowledge worker exists in the information-based production, which has, according to Castells, the following characteristics:

- *Value-adding*, through innovation in processes and products.
- *Innovation* based on research and specialization, the creation of new knowledge and its application as an organizational resource used in, for example, new products.
- *Effective management and control*, the effective use of man and machine resources.
- *The network as an organizational form* for flexibility and internal adaptability, flexible decision-making and process development.
- *The use of information technology*, to boost innovation, effective control and feedback, flexibility in infrastructure and processes.
- The knowledge worker seems to be the key to most of these tasks.

The knowledge worker's personal skill is the ability to learn, and to redefine his or her qualifications. Education, Castells says, is about learning to learn, gaining the ability to gather new knowledge or skills, as these will constantly become obsolete.

Connected to the concept of knowledge workers are ideas about new ways of organizing. One aspect of this is flatter organizations (Drucker, 1988). These are based on knowledge workers and need different kinds of information support systems in order to survive. In Drucker's vision, he talks about the information-based organization, but the most fundamental is the knowledge worker who leads the organization by means of his or her expertise. Knowledge is a focus for the organization. Drucker says:

"In the information based organization, the knowledge will be primarily at the bottom, in the minds of the specialists who do different work and direct themselves." (Drucker, 1988, p. 47).

Drucker's assumption is that this kind of personnel needs to have an information and knowledge environment. That is, routines for learning and using knowledge, together with the right mix of information supporting these activities. These work practices, connected to information and knowledge, must be supported and these support systems must be planned. The knowledge worker has some knowledge activities (creating, saving, using, and transferring of knowledge) as a core of his/her workday, but these activities are not conducted in solitude. The social work context, that is, the set of people that the individual knowledge worker works together with, is the people that he/she cooperates with in the creation of knowledge.

2.6.2 Perspectives on Knowledge Management

One basic understanding of knowledge management is the use of database systems to save organizational knowledge, for example the knowledge of employees, coded into instructions and saved as data in a database. Operation knowledge will, it is hoped, not disappear when employees disappear. This knowledge could also be used to help new employees to learn their work faster.

The technological knowledge management direction assumed that the object for management was the data in the organization's data repositories. The data were managed using traditional database techniques for presenting know-how, which is used to support problem solving, performing tasks and so on. For this to work, the conversion between individual experiences and skills and codified instructions must be smooth and well functioning. This is often not the case, and these problems are often connected to the cultural or social aspects of the organization (McDermott, 1999).

From this more organizational and functional point of view, knowledge management is a series of organizational processes connected to knowledge. It might be any process or practice associated with creating, acquiring, capturing, sharing and using knowledge (Prusak, 1997). There are also problems associated with interpretations and knowledge; and more general ones about how the organization works as a learning system (Huber, 1991). Information systems that support these processes are often called knowledge management systems. However, to get these organizational processes and their support system to work, the wider organizational context must be taken into account. Here we find discussions about cultural, structural and political preconditions that are necessary for knowledge management initiatives to be successful.

In this way, the technological and functional position has developed towards a broader concept of organizational knowledge management, including structures, work practices, decision-making, and business strategies. From a strategy point of view, the organizational approach to knowledge management can be summarized as the attempt of the company to make knowledge a corporate resource. One example of this knowledge management perspective is given by Sveiby (1996), who says that it is the art of creating value from an organizational resource. It is a knowledge-based view of the company where knowledge is the prime source of competitive power. In this perspective, knowledge is the company's key resource for its business strategy and it is used to produce the company's products and services (Grant, 1996). A more detailed list of the benefits of knowledge management is presented in KPMG (2000) in terms of what has been realized, including:

1) Improving decision-making.

2) Better customer handling.

3) Faster response to key business issues.

4) Improved employee skills.

5) Improved productivity.

The area of knowledge management is disputed. In Swan et al. (1999) the question is raised: “Knowledge management - the next fad to forget people?”, which is also the title of the paper. Swan et al. (1999) discuss how knowledge management should be more than just a reuse of old technology with new arguments. By focusing on the knowledge workers’ situation and the problems therein, this might be avoided. This view is also supported in KPMG (2000), where it is concluded that companies are blind to the human side of knowledge management and still see the area as a technological one.

2.6.3 Knowledge Management and the Knowledge Creation Theory

Much of the knowledge management trend was started by Nonaka and Takeuchi (1995), who argue that organizational success could be based on knowledge creation and distribution. The underlying theory is tacit knowing (Polanyi, 1966) and is used to explain how personal knowledge can be created and later converted into explicit knowledge and become a useful organizational resource. The research was carried out by studies of success stories from companies, with a focus on how they had organized their knowledge management. Based on these experiences the concept of “knowledge creation” (Nonaka and Takeuchi, 1995, p. viii) was suggested, which includes the following activities: “create new knowledge, disseminate it throughout the organization and embody it in products, services and systems.”

Nonaka and Takeuchi (1995, p.8) argue that knowledge is created in the personal experiences and is stored in the human body/mind in the form of experiences, memories, belief, values, abilities, skills, and so on. The big issues are thus how to let people gather and develop this kind of knowledge and how to make it useful for the organization. Practical knowledge management is the support of four knowledge processes: 1) internalization, 2) externalization, 3) socialization, and 4) combination. These are the concepts of the theory of dynamic organizational knowledge creation.

In Nonaka et al. (2000) this theory is extended into discussing a model for the dynamic process of organizational knowledge creation, maintaining and exploitation. At the core of this model, a dialectic relationship between tacit and explicit knowledge is recommended. This includes a dialectic understanding of both hard and soft views on knowledge. The model consists of three parts: 1) a process of knowledge creation and conversion, 2) a context that allows and supports knowledge creation and conversion, and 3) leadership that directs the process and designs the context. Nonaka et al. (2000) call this context the “Ba”. The context is the social, historical and cultural mix that the knowledge worker lives in. It is the source of his/her understanding of the world and the basis for knowledge creation and interpretation of information. The context is time-dependent and sets the boundaries for the social interactions of the people within that context. The leadership of the knowledge process and context is characterized by a series of important tasks, including: a knowledge vision, promoting knowledge sharing and creating the

context. The creation of context includes giving autonomy, allowing creative chaos, accepting redundancy and variety, and providing a trustful and caring climate.

2.6.4 Critique of the Knowledge Creation Theory

The poor record of knowledge management projects around the world (in western-styled business organizations) is discussed by Ray and Clegg (2005). Ray and Clegg identify two very fundamental problems that seem to cause these problems. First, the general organizational culture which makes these processes possible and, secondly, a misconception or redefinition of Polanyi's basic ideas. This makes knowledge management an illusion to the managers in organizations belonging to the US-oriented cultural sphere. For the first problem, Ray and Clegg refer to a theory of low- and high-context cultures. In low-context countries (the US, the UK, Germany, Scandinavia) a great deal of the context is included in the message, while in high-context countries (Japan, China, Arab countries) the receiver of information must be well incorporated into the local tradition and culture to understand the message. Building culture has also become a major theme in knowledge management methodologies. However, building culture is not the same as having a culture that is ever present and natural to every one, so there are clear limitations of what can be achieved by methods or systems. This leads to a problem in a low-context country, as there is a limit to what can be coded into the message.

The second problem is related to the first and even harder to deal with, as it refers to fundamental functions of the human mind. The basic problem of tacit knowing is that it is not transferable as such, as only explicit knowledge is transferable. Each time a person focuses on a problem, becomes actively aware of the subject and expresses the ideas, the explicit knowledge that is thus created will still rely on a context of tacit knowledge. Polanyi sees the strife toward the detachment of knowledge from its tacit origin as a serious problem, as for example objective knowledge in modern science. Polanyi says:

"But suppose that tacit thought forms an indispensable part of all knowledge, then the ideal of eliminating all personal elements of knowledge would, in effect, aim at the destruction of all knowledge" (Polanyi, 1966, p. 20).

In a knowledge management process it is supposed to be possible to extract some key ideas from one person, code it using language, and transfer this explicit knowledge to other people. However, the tacit dimension that is necessary (as the from-to relationship between explicit and tacit knowing explains) is not possible to package and transferred. The reason that "Eastern-styled" countries seem to be more able to deal with this situation is their high-context cultures. There is a lot of taken-for-granted knowledge that is common among everyone within the culture. Ray and Clegg (2005) call this an alignment of tacit knowing between people, which makes transfer of explicit knowledge between people more feasible. A concept of "insider-outsider" is presented as a way of illustrating the problems, the idea being that among insiders there is a high level of knowledge alignment.

Another aspect of knowledge transfer is the concept of trust. Connected to this is the way authority is perceived. A learning process means that the pupil comes to share the teacher's world; this is the process of context alignment as discussed above. Polanyi states that in this process:

"… the pupil must presume that a teaching which appears meaningless to start with has in fact a meaning which can be discovered by hitting on the same kind of indwelling as the teacher is practicing. Such an effort is based on accepting the teacher's authority." (Polanyi, 1966, p. 61).

Indwelling is a process where a person experiences the world around and keeps the experience inside him, in other words, the very engine for creating tacit knowledge. Knowledge is gained, first by indwelling and then by relying and acting on it. This process of acceptance of knowledge Polanyi calls exteriorization. In turn, the teacher can only demonstrate and hope that the pupil is an intelligent observer, who lets the ideas dwell in mind.

This process can be found in the Nonaka and Takeuchi case, for example, when a central piece of knowledge is handled in the "bread-baking machine" case. A person in the bread-baking machine project team attends to the master baker's actions, imitates, fails and retries until (at least) some of his expertise is gained. The tacit knowledge is not transferred as such. What happens is that that person gains experience personally by performing the activities suggested by the expert. In the process, new personal tacit knowledge is gained by trusting an authority. In conversation between the pupil and master an explicit account of the processes is created. In the case, it was labelled "twist and stretch". When this knowledge travels through the organization and the product development process it is the person who personally has the knowledge who also moves from place to place. This is done in order to keep the tacit background of the explicit knowledge at hand. Even if some aspects of the baking process can be codified into the machine, this is still not tacit knowledge as such. In the end, the users of the bread-baking machine must create their own experience of applying the instructions of the machine, effectively creating their own personal and tacit knowing.

In this critical study of organizational knowledge creation, three perspectives become clearer. It is necessary to understand all three perspectives: the cognitive, the social and the power dimensions of knowledge, and how they interact. Further, the central focus should be on the social or group perspective. This is a perspective that is very dependent both on how individuals develop knowledge and on broader frames of power and authority that exist in the context. In the next two sections, we will look at a number of concepts and ideas of how people interact around knowledge creation and transfer in organizations.

2.6.5 Knowledge Management in Ecologies or Communities

The idea of knowledge as a social process focuses on knowledge in a group of people. The support of knowledge work assumes a situation of a context of other knowledge workers.

This situation can be illustrated with the concept of knowledge ecology as presented by Malhotra (1998). Ecology is, in general, the study of the relationships between organisms and their environment. In a social perspective it is the study of the ways in which the social structure adapts to the quality of natural resources and to the existence of other human groups. Human ecology is a complex system, as one definition of the concept tells us:

"[Human ecology] views the biological, environmental, demographic, and technical conditions of the life of any people as an interrelated series of determinants of form and function in human cultures and social systems. It recognizes that group behaviour is dependent upon resources and associated skills and upon a body of emotionally charged beliefs; these together give rise to a system of social structures." (Brittanica.com, on "human ecology").

The central part of a knowledge ecology is a social network (Malhotra, 1998). In the knowledge ecology the focus is on knowledge exchanges or knowledge flows. The partners involved in these networks co-operate for survival. Within knowledge ecology the relations between people are based on knowledge exchanges. The knowledge ecology will prosper only if a diversity of knowledge is allowed. The relationships in the ecology are of a "co-operative/competition" nature. People compete, but under certain conditions choose to co-operate. In knowledge ecology, knowledge creation is a dynamic evolutionary process in which knowledge is created and re-created in various contexts and at various points of time.

The idea of a community of practice (Wenger, 2000, Wenger, 1998, Brown and Duguid, 1991) takes a consensus approach to knowledge development and its use in groups. The concept reflects the general need of humans to share knowledge and to learn from each other. The community acts as a repository of knowledge. By participating in the community, we can give others of our competence and share the competence of others. A community of practice consists of three elements. First, members are joined together with a sense of a joint enterprise. Second, the community builds on mutual engagement, and norms are developed in interaction. Third, the community has a shared set of resources, like language, routines, artefacts, tools, and so on. The key to the community is a person's competence, competence to understand and to be able to take part in knowledge-sharing, both the giving and the taking of knowledge. A more general concept of knowledge-sharing in a community is social learning (Wenger, 1998, 2000). Knowledge is socially and historically defined. The creation of knowledge is a social process, that is, an interplay between the socially constructed knowledge and the individuals' personal experiences. The key to this is that the people feel a belonging to a social setting. Three kinds of

belonging are reported by Wenger (2000), including engagements, imagination and alignment.

2.6.6 Knowledge Management in Networks and Markets

The organizational form of the information age is the network, Castells claims (1996, Chapter 3). The networks might be of different kinds, but above all, they stand for a new logic of organizations. The network organization, together with innovation and new ways of command and control, creates organizational flexibility and productivity. Culture and identity are no longer based on a hierarchical organization but on a network of people. The basis for knowing from a social point of view is the network and the identity of people based on that network.

The creation of knowledge can be supported in a network, being a place where people from various positions and spheres of experience can create a very innovative environment. However, this demands an open atmosphere among the participants in the network. The problems are the basis of the network and the incentives for sharing knowledge. Whether to contribute or not is a complicated trade-off: "[W]ill I gain more from the knowledge that I receive than I lose in competitiveness when others gain from the knowledge I give?" Trust and reputation are two important factors in this choice (Davenport and Prusak, 1998).

The previous section dealt with this problem from two different points of view, the first based on a competitive view of the world and the second on openness and generous sharing. The open approach is assumed to benefit the total knowledge expansion for the whole network, though not always necessarily for the individual contributor. The general approach of the company is that everyone contributes to the company for the common good. Drucker (1988), for example, points at how important incentive structures are for this to work.

A problem arises when the network developed for solving a problem consists of people from a number of hierarchical companies. Networks are often built on social connections and do not follow the formal organizational chart. In Carlsson (2001) a difference is made between natural or emergent networks and designed and planned networks. The planned network can be somewhat controlled. A network that is controlled by the logic of incorporation and exclusion, based on individual choices, will be hard to predict. Each node taken into the network will bring its own network of nodes, which will make the network grow in an emergent way. This is the key to the dynamics and flexibility of networks. A company might look comprehensible and well structured on the organizational chart. A changed perspective to a network view might reveal a mess of internal and external networks.

Knowledge is based on the individual, i.e. his or her identity, and has its roots in the social interactions that build cultures (Carlsson, 2001). If these interactions are of a network type, the company will soon turn into a series of islands of knowledge paradigms. This is, in a way, not a new problem. The battle tales of confrontation between different sections of organizations are easy to find, such as sales against

construction and R&D against treasury. However, these problems were manageable as long as they followed the organizational charts. In the network world, the lines between cultures will be invisible. The ability to plan and control the identities of the company will become more difficult and thus the ability to plan for knowledge creation and transfer, which is said to be the key to competition and long-time survival. Castells (1996) calls this the basic paradox of joining and dispersal of the information age, both forces facilitated by information technology.

From a more external perspective, the same forces will affect companies in general. The identities and culture assumed by Nonaka and Takeuchi (1995) will be harder to sustain, thus removing the base for effective knowledge management. When a company exists in a network of companies, possibilities for the reconfigurations of the production will appear. Effective and innovative parts of the companies might be drawn to each other, forming new units that are more productive. These will form their own cultures of knowledge, effectively blocking control and command.

2.6.7 Knowledge Management Support Systems

Huber (1981) accounts for alternative approaches to organizational decision-making. Here four perspectives are presented, displaying different environments of decision-making and how they affect the use of support systems. The aim is to give guidance to the development of decision support systems. Decision support systems must be in line with the different types of environments where they are to be used.

Huber (1981) makes a difference between, “dss” with lower-case letters and “DSS” with upper-case letters. The former means the efforts a decision-maker makes to become informed and generally to support the decision process. Every decision-maker has some kind of “dss”. The “DSS” is a type of computer-based data system that is designed as a support system. One of Huber’s assumptions is that most “DSS’s” do not support decision-making because they assume a rational view of it. Huber criticizes the “DSS” concept, because it focuses only on the characteristics of a computer system and does not take into account the broader organizational context.

Knowledge management systems (KMS’s) are discussed by Alavi and Leidner (2001), as information systems used for managing organizational knowledge. They are said to be “IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer and application.” (2001, p. 16). A model of organizational knowledge processes (knowledge, creation, storage/retrieval, transfer and application) and the relationships between these processes are presented and employed to discuss the potential role of IT.

The general approach for understanding IT and KMS is suggested as a three-step approach (Alavi and Leidner, 2001).

1) Look at the knowledge process and what is involved in it.

2) Look for potential improvement that IT can bring.

3) Suggest a support information system.

The knowledge creation process is about developing new contents or replacing the old contents of organizational knowledge. Using the knowledge creation model (externalization, internalization, socialization and combination, Nonaka and Takeuchi, 1995), a set of activities that constitutes knowledge creation is brought forward. Alavi and Leidner (2001) suggest some examples of support systems that could be suitable in each part of the knowledge creation model.

- Externalization – best practice systems / expressing knowledge into databases.
- Socialization – better contact between people / computer-supported cooperative work systems (CSCW) and communication systems.
- Internalization – learning / learning tools, or the use of many sources of knowledge/data-mining.
- Combination, externalization and internalization in interaction.

2.6.8 Strategic Knowledge Management Planning Approaches

In this section, examples of approaches to knowledge management planning are presented. The examples represent different possible types of organizational knowledge management planning. The first is based on a traditional strategic planning cycle and the second looks at the human perspective of the organization and the third is an example of a multiple perspective approach. The aim is to establish a direction and select a focus around programmes of KM activities. Developing the technical parts of information systems is not very different as such to any other application of IT. Traditional development methods should be good enough, and these will not be discussed in this thesis.

A framework for knowledge management is given by Carlsson (2001), focusing more on the strategic view of an organization and some urgent problems of handling knowledge. The framework has a clear resemblance to a traditional IS lifecycle model, and as such contains the basic moves of an ISD process. There are six main steps in the framework.

- *Strategic vision*. This is a traditional planning step, including concepts like mission, values, vision, goal and objectives. Any organizational effort must be anchored in the basic assumptions of the organization.
- *Knowledge vision and identification of knowledge resources*. This stage should answer the question of how knowledge can be part of the strategy of the organization. Knowledge resources are identified and their importance for the organization to stay competitive is investigated.
- *Design of knowledge management activities.* This step includes anything that is needed in order to have the benefits planned in the knowledge vision, from organizational processes to software or organizational reward systems. The design should also be evaluated, that is, checking its consistency with the vision.

- *Knowledge protection.* In order to ensure the competitiveness of the knowledge resource. This is done by protecting against imitations and value erosion.
- *Implementation*. The realization step of the planned knowledge efforts includes learning and unlearning programs.
- *Usage*. Knowledge is turned into action in the organization. This is followed by evaluation and possible effects on the knowledge vision and even on the strategic vision.

The key point is the conflict between an open attitude towards knowledge, needed to promote innovation and the creation of new knowledge and, on the other hand, the protection of knowledge in order to keep it safe.

The framework is built on a more general "framework for IT resource management processes" (Kalling, 2000). This issue is shortly discussed by Kalling (2000), highlighting the fact that KM frameworks or approaches are naturally not separated from other more general approaches in the field of information systems or from general strategic planning. It is often an adaptation to the special problems and ideas connected to knowledge and the business environment of today.

Another typical way of approaching planning processes is to take a human-centred approach to it. One example of this idea is "information ecology" (Davenport and Prusak, 1997), which is an approach to understanding information in organizations from many perspectives, focused on human-centred issues. The ecology concept is used as a metaphor for a complex situation where many diverse entities are interacting and forming a whole. This approach is further elaborated from a knowledge perspective in the book *Working Knowledge* (Davenport and Prusak, 1998). Davenport and Prusak see this as an alternative to the technology-centred paradigm of information planning in organizations. Davenport and Prusak claim that the focus on computers and not on humans is part of the failure of information systems. The problems that Davenport addresses are based on Mintzberg´s (1994, 1973) view of organizations, which includes non-predictability, political issues, conflicts, imperfect perceptions, and so on. There are deliberate, design strategies and emerging, exigency strategies that shape the organization. In a "holistic" view of the organization four issues are in focus, including: diverse information types, evolutionary change, a focus on observing and describing, and people and their information behaviour. These problems are approached using a model consisting of three areas, external, organizational and information environments. The information environment is described in a series of interacting components, staff, strategy, politics, culture, processes and architecture.

These two first approaches focus on models and what should be included in the knowledge management activities. A third type of approach combines an explicit method with the use of a broad set of KM models. In Earl (2001) seven types of KM approaches are presented. These are built on known examples of KM projects and generalized into KM strategy types or schools. Earl calls this division a step towards

a taxonomy of KM strategies. These are then used as the core in a planning method comprising six steps. The seven types of approaches are divided into 3 categories, which are in turn subdivided into the different schools. Each school is characterized along a number of aspects. Here we give a short presentation of this extensive KM framework.

A. Technocratic approaches.

A1. Systems school. Focuses on technology, knowledge-based system and problems of codification of knowledge.

A2. Cartographic school. Focuses on the mapping of organizational knowledge, using knowledge or yellow-paged directories. The school aims at supporting people to get in contact with the right expert.

A3. Process school. Focuses on business processes and the knowledge flow in the organization.

B. Economic approaches.

B1. Commercial school. Focuses on how to make an income from knowledge research, including the commercialization of knowledge and handling the companies' intellectual assets.

C. Behavioural approaches.

C1. Organizational school. Focuses on how networks and communities of knowledge creation and share are encouraged. The school often suggests support for collaboration using groupware or Intranets.

C2: Spatial school. Focuses on how to arrange people in space or time to create or share knowledge, for example setting up knowledge cafés or otherwise make contacts easier.

C3. Strategic school. Focuses on knowledge as the prime resource of the company and how to create a competitive advantage based on knowledge.

Earl also discusses some method steps that guide planners to work practically with the seven schools. The aim of the method is to direct the company as to what KM strategy to choose and what knowledge management project, systems or initiatives to undertake. The following work steps are included in the method.

1. Investigate the general statement about corporate purpose. Starting from the business strategy, we search for a knowledge vision.

2. Analyze performance gaps in the business as a basis for knowledge management initiatives. The gap consists of differences between the current capabilities and the intended business or knowledge strategy

3. Search for opportunities for how to use knowledge resources to fix the discovered gaps.

4. Identify and examine possible knowledge management initiatives. Here the taxonomy is used to suggest different sorts of projects that might be right for the particular organization.

5. Validation or test to see if the suggested initiatives fit the organization's values or culture.

6. Create knowledge management programmes, allocate resources and plan execution. The programme should be understood as a package of initiatives, systems or organizational changes.

The KM strategy school framework is an important starting point for further investigations of KM approaches. The content/method dimension, that is the combined question of how to plan and what to focus on, becomes an important factor for working with KM planning approaches.

2.6.9 Summary

The key division seems to be between a technical vs. a human view of knowledge (Sveiby, 1996). This has a direct connection with a more basic subjective / objective understanding of human knowledge (Schultze, 2000). The trouble of the concept of knowledge as it is used within the broad field of knowledge management is that it denotes several different things. People use the same word but refer to different phenomena. For example, it can refer to an item in a database or to the mental state of a person or something that a person can do, etc. However, to make it more complicated, these different phenomena have relations and are all part of a possible solution to problems of competitiveness and survival for companies and organizations.

A knowledge management project must deal with this situation. However, even the idea of constructing the ultimate meta-meta framework for knowledge management seems pointless. The area is contradictory and this must be acknowledged, and not forced together at any price. The aim should be to draw on different ways of perceiving knowledge management in order to be able to plan feasible and desired knowledge management systems.

2.7 Multimethodologies

This section discusses the problems of combining methods in a practical manner without resorting to an "anything goes" mentality. The discussion revolves around a number of articles presented in Mingers and Gill (1997). The general approach in this area is to focus on the principles used when making choices of which methods to use to solve problems. This is a process that is supposed to be repeated in each project. These principles are sometimes called a meta-methodology, guidelines for the choice process. The questions relevant for the current research are how to provide a diversity of planning approaches matching the complexity of the problem area and how to ground this decision in a theoretical argument.

In Mingers (1997) the problems of multimethodologies containing multiple paradigms are discussed. A central problem is how to work effectively and get acceptance with plurality at many levels (philosophical, pragmatic). An important part of both the information systems field and the management science area is a critical perspective; this is grounded in the insight into the unequal and constraining nature of social arrangements. The problems of multi-paradigm multimethodology are connected to the difficulties in mixing different methodologies together in the same intervention, and mixing parts of different methodologies from different paradigms.

A number of general problems, which are to be reviewed below, are presented by Mingers (1997).

- Theory vs. pragmatism.
- Paradigm incommensurability.
- Pluralism.
- Critical dimension.
- Multimethodologies in practice.

These questions are reviewed in the following sections, and then two examples of approaches that provide different ways of tackling the problems are discussed.

2.7.1 Practical Application of Multimethodologies and the Need of Theory

Midgley (Midgley, 1997, Chapter 10 in Mingers and Gill, 1997) discusses a theory vs. a pragmatic dimension of multimethodologies. The basic pragmatic standpoint could be summarized as follows: “use any set of methods or frameworks when the need arises”. For example, Ormerod (1997, Chapter 2 in Mingers and Gill, 1997) gives a number of examples of real-life intervention, where a wide range of methodologies from different paradigms have been used successfully. However, Ormerod (1994) admits that this free-spirited approach does not work when an academic perspective is put on the process. The lack of a theoretical underpinning makes the generation and distribution of knowledge based on these practical experiences hard. Midgley (1997) presents some arguments for basing a multimethodology on a theoretical frame.

- A pragmatic “trial and error process” might turn out to be a costly experimentation in the social domain.
- Theory should be about understanding when and when not to use a certain methodology and why that methodology does not fit in that particular situation.
- Without a theory it is hard to communicate results. There is a need of a theoretical language that is commonly understood.

- Theory makes it possible to predict or at least discuss the long-term effects of a methodology.
- A theory must provide guidance but also give room for a flexible and responsive practical intervention.
- The theory should provide a systematic understanding of the problem situation, where questions covering different perspectives are related to each other as a whole. Midgley suggests a way of achieving this in a framework called the "creative design of methods". An important issue here is boundary judgement, i.e. defining the limits of the system or problem situation.

2.7.2 Paradigm Incommensurability and Complementarism

From a theoretical point of view, the combination of paradigms becomes a major problem, even though it might not be too difficult in practice. When a number of methodologies based on different paradigms are incorporated within the same intervention, there will inevitably be contradictions. Methods from different paradigms are not comparable, as they rest on different basic assumptions. If these contradictions are not handled properly, they might turn out to be a real problem for the analyst. One way of dealing with the situation is to declare incommensurability between perspectives and avoid mixing them up.

Examples of this can be found in any of many socio-technical approaches; the functional approach will provide solutions that focus on productivity and the social approach will discuss how the quality of work is satisfied. This will create a dual set of demands on the systems; the suggestion is to create joint optimization.

An alternative approach is discussed under the concept of complementarism. Different methodologies and their paradigms are complementary in the sense that they are appropriate for different situations. A number of approaches have been developed as support for how to combine methodologies into an intervention package that fits the problem situation. One example is the "Total Systems Intervention" (TSI), first presented in Flood and Jackson (1991a) and then further developed in Flood (1995). The major development between these two versions is that it becomes more flexible and easier to use in practice. The TSI is a meta-methodology, as it offers direction to practitioners for choosing between methodologies and relating them in a theoretically informed way. Here TSI is looked at as discussed in Flood (1995). TSI consists of three phases to be used recursively.

- *Creativity*. The phase includes the exploration of the messy situation by the use of metaphors (Morgan, 1986) or perspectives developed in the group, using for example brain storming techniques.
- *Choice*. The selection of system methods is guided by a basic framework. The framework contains four areas of intervention: organizational process, organizational design, organizational culture, and organizational politics. Here, a high degree of flexibility is needed when combining methods or parts

of methods. This is possible to do, as long as it is performed in a manner that is true to the intentions of that method.

- *Implementation*. Here the suggested methods are useful for solving problems. TSI does not really do more than ask the practitioner to move to application, no further advice being given per se.

Within TSI there has been a development in the handling of the incommensurability question. Flood and Jackson (1991a) use the theory of Habermas (1978) on human knowledge-constitutive interests as a meta paradigm. The idea is that there is a set of interests that must be satisfied and that these must be investigated with suitable methods. For example, technical interest is connected to hard systems thinking, practical interest to soft systems thinking and emancipator interest to critical systems thinking. The outcome should be an intervention that is complementary. This position is criticized (see, for example, Jackson, 1997) for creating a meta-paradigm standing above paradigms, thus creating an isolationistic position. In the rework method (Flood, 1995) a more open attitude is shown. Incommensurability is not possible, but what can be hoped for is to create a situation for mutual learning. This standpoint is further developed and argued for through the concept of pluralism.

2.7.3 Pluralism vs. Complementarism

Jackson (1997) calls for a pluralistic approach to multimethodologies, pointing to a number of problems found in more traditional approaches (single paradigm **methodologies**, often with functionalist leanings). The pluralist approach is akin to complementarism but seems to differ on some accounts. Most important is the idea of mapping different problems to different types of methodologies, for example that a social aspect of the problem should be dealt with using some sort of soft systems thinking. The pluralistic idea seems to embrace the difference and the creativity that comes from meetings of conflicting perspectives. There are a number of issues that a pluralistic approach should deal with (Jackson, 1997).

- The basic problem concerns the complexity of the context. The problem situation is heterogenic and the approach must reflect this situation. The complementaristic approach of assigning methods in a mechanistic manner does not answer to these problems. These failures seem to be originating in the use of “totalitarian” theories, excluding alternative ideas about the problem.
- Learning to live with incommensurability, this problem cannot be removed. It can only be handled in an insightful and deliberate way.
- Sensitivity to differences, it is in the discovery of cracks that new insight into the real nature of problems is found. This is preferable to finding methods that complement each other in a coherent whole based on the preconceptions used to select the methods.

- Flexibility in the use of methodologies, i.e., tailoring the use of models and methods to a paradigmatic awareness.
- Pluralism must be upheld in all phases of the process. “Fronting” a hard systems approach with a soft approach, for example using soft systems methodology or some parts of it before a more traditional waterfalls model, is not considered an example of pluralism.

2.7.4 A Critical Dimension

A critical dimension is seen as imperative within the area of multimethodologies in general. The use of the word “critical” in the scientific debate and in the study varies, but central references are often made to the “Frankfurter school” and Jürgen Habermas (Morrow, 1994). Spaul (1997) says that the central theme of critical theory is to create a distance from the current forms of discourse together with a determination not to accept concepts and social roles in their given form.

A number of aspects can be found on the use of critical theory with multimethodologies.

- It is morally wrong not to work in an emancipatory spirit when solving problems. It is not only about the optimal solution in a technical sense, but also, or maybe foremost, about the people affected by the problem-solving initiative (Flood and Jackson, 1991b).
- A critical perspective has been used as a meta-paradigm, the main example of this being the total systems intervention approach that uses Habermas’s knowledge interest as a tool for selecting methodologies.
- A situation cannot be understood without investigations into the power relations of the problem situation.
- The critical perspective is a necessary component in the struggle for attaining the diversity needed to comprehend a messy situation.
- A focus on contradictions, conflicts and inconsistencies is required in an effort to deal with a world where there is no clear answer or absolute truth. Jackson (1997, p. 416) sees this use of critical theory as a “postmodern” view of the world. Here a general reference is made to the criticism of “grand stories” (Loytard, 1984).

Comparing with the discussion on pluralism, some points seem to recur. The ideas of pluralism seem to rely greatly on different aspects of the critical dimension. However, in comparison with the TSI approach some important differences become obvious. Critical theory is used as a moral guide and it brings in a dimension of right and wrong into systems analysis. Here we see two ways of using critical theory that are very different, even though they do not necessarily exclude one another.

2.7.5 Problems of the Practical Application of Multimethodologies

The core of the problems of the applicability of multimethodologies lies in a debate on the role of the agent that uses multimethodology as a tool for creating a suitable problem-solving approach. A probable scenario is a team of competencies that is to be gathered and formatted into a working group for the prompt solution of problems. In this process it is necessary to have a project leader that applies the multimethodology and directs the work. One example of a practical use of the methodology could be choosing group members based on the outcome of the application. This puts a heavy demand on a very broad competence in the leader. An alterative is to use a steering committee as a complement. The central problem is that it is the competence of the user that will decide the final composition of the method to be used.

On the same line of reasoning, the pool of members for the problem-solving group that is accessible and, finally, the people who are selected will very much decide on the realization of the methods chosen.

These are practical questions, and it is arguable if anything can be done from a multimethodology point of view. Jackson (1997:416) gives two general directions. First, the agent using the multimethodology must be aware of his or her own background and biases in order to avoid being one-eyed in key decisions. This could be made part of the multimethodology, first, by putting up clear statements of involved biases and, secondly, to urge for a commitment to the basic ideas of the methodology, be it pluralism or a critical mind.

2.7.6 Two Examples of Approaches

In this thesis, we lean towards a pluralistic approach to multimethodologies. Here two short reviews of two possible approaches are provided to be used as sources for solutions to problems discussed in this section.

2.7.6.1 Reflective Pragmatism

Reflective pragmatism (Bennett et al., 1997) is presented as an approach to a problem-structuring aspect of problem-solving. Bennett et al. discuss a number of principles for combining and selecting methods.

- Paying attention to theoretical underpinnings, accepting the theory that is assumed within each method.
- Accepting that there is no neutral ground where the inquiry begins, because when the task of choosing methods has started it starts from a certain point of view.
- Upholding a high enough standard of understanding the theoretical background of the different methods.
- Not to be fundamentalist while applying methods or parts of methods.
- A dialectic approach to interdisciplinarity.

- Combinations of soft and hard approaches.
- Tackling problems in the project team.
- Encouraging creativity, while imposing structures on the need for creativity to point in a certain direction.
- Thinking about perspectives that have not been raised by suggested theories or methods.
- Knowing and understanding what will be rejected when making choices.
- A synoptic approach rather than a toolbox mentality.

2.7.6.2 Pragmatic Pluralism

Using the concept of "pragmatic pluralism" (White and Taket, 1997), the authors strive for a position where theory and practice are not dichotomies using the concept of praxis. Pragmatic pluralism could be seen as a strategy of mix and match or as a way of operationalizing "doing what feels good" in a structured way. Theory should not be seen as an abstract fundament for the multimethodology, but rather as something practically useful in project work. The idea of pragmatic pluralism includes five points:

- The use of triangulation, in terms of data sources, methods and analysis team.
- Combining parts of different methods.
- Being flexible and adaptive.
- Critical reflection.
- A re-conceptualization of the notion of praxis.

Pluralism is the central principle for the choice of methodologies for White and Taket (1997). White and Taket (1997) argue that to favour a relativistic over an absolutistic approach is not to embark on the road to valuelessness. They argue, on the contrary, that it highlights the need for the analyst to be conscious of consequences and the necessity to make standpoints. Further, Jacques (1989, p. 708) argues that objectivity is a reason for avoiding personal involvement in knowledge production. A post-modern approach is to treat the conflict on ontological or epistemological levels as non-solvable, and that these conflicts should rather be used as a productive tool than seen as a constraint for the problem-solving process. White and Taket (1997) suggest a number of guidelines for the choice of methodologies:

1. Free action from unitarian, totalizing paranoia. Resist the seductive lure of grand narratives.
2. Use a deconstructive practice and develop action by proliferation, juxtaposition and disjunction.

3. Move away from binary thinking. Instead, the following types of concepts might be used: 1) what is positive and multiple, 2) difference over uniformity, 3) flows over unities, 4) mobile over static, 5) nomadic over sedentary.
4. Desire to stay in reality rather than retreat into forms of representation. The problems of representation as a way to reinscribe the disciplinary relations of power must be avoided. The process of representation should be a way of identifying and actively working with such relationships.
5. The group must be a dynamic collection of multiplication, displacement and diverse combinations.
6. Recognize the co-responsible nature of the encounter and the co-participation of the different parties involved.
7. Aim to achieve skill transfer and empowerment of all involved.
8. Recognize difference and work with it, and work non-hierarchically.
9. Break down the expert's stereotypes, and reduce the perceived distance between practitioner and client.
10. Work for consent not consensus.
11. Aim for flexibility and be ready to adapt and work in different ways at different times.

2.7.7 Implication for this Research

A number of ways of dealing with multimethodological problems are proposed. These can be seen as different directions or tracks, each providing a set of principles that provides a clue to how to develop a multimethodology for the planning of support for knowledge management processes. Many of these approaches can be seen as a consequence of the incommensurability/complementaristic/pluralistic argument as discussed above. Another central discussion point can be found in the moral/normative vs. postmodern/creative crossroad.

The multidimensional approach to methodologies seems very fitting for the task of this research thesis of combining diverse aspects on KM and on the problems of structuring a planning approach.

3 RESEARCH APPROACH

This chapter discusses the methodological considerations and decisions made in this research concerning the development of scientific knowledge.

3.1 Introduction

Chapter three deals with the research approach and the research method of this thesis. The main research method used is interpretative case studies. The last two sections of the chapter provide an overview of the case studies of the thesis and how they are evaluated.

A definition of research approach (sometimes also called research strategy) is provided by Cavaye (1996):

"A way of going about research, embodying a particular style and employing different methods." (Cavaye, 1996, p. 227)

This could be compared to the over-arching term of research method, which is defined as:

"A way to systemize observation, describing ways of collecting evidence and indicating the type of tools and techniques to be used during data collection" (Cavaye, 1996, p. 227)

For the definitions, Cavaye in turn refers back to Galliers (1992) and Weick (1984). Nunamaker et al. (1991) use the term research methodology for the same idea about a package of method used in a certain way.

To clear up some further problems with these concepts, Iivari et al. (2001) point to a European/US difference in how these words are used. In short, in Europe the words are used as mentioned above, but are reversed on the other side of the Atlantic Ocean.

The problems of constructing a research approach for the purposes of this thesis are discussed in the following subsections (3.2-4). Then the main research method is discussed based on the field of interpretative case studies (3.5). After that follows an in-depth study of a central part of the research approach: hermeneutic analysis (3.6). The chapter is concluded with a section about the evaluation of research results (3.7).

3.2 Research Approaches: Possibilities and Perspectives

This section looks at possible research approaches. First, it discusses a general problem of using combined research approaches. After that, a decision tree for matching research approach with research objective is presented. Then a framework for combining research approaches is demonstrated as a possible way forward.

In this section, different possible research approaches are looked at and ways of making choices among them. First, some general ways to divide scientific approaches, based on Nunamaker et al. (1991), are described. Then, two approaches to relate or handle different research approaches are presented. The first strategy for choosing is based on connecting the research approach to the research objective. One example of this is Järvinen (2000), who presents a decision tree as support for making such connections. The opposite strategy is also possible, that is combining a number of approaches. For example, Nunamaker et al. (1991) argue that research approaches should be packages or combination of methods. Nunamaker et al. suggest the use of a system development process as a guiding principle. The outcome of this section is an investigation of some different directions in the area of combining different research approaches, and connected problems and possibilities.

3.2.1 Taxonomies of Research Approaches

Nunamaker et al. (1991) discuss a number of ways of dividing research approaches depending on the objectives and the methods chosen for research.

- Basic and applied research. Basic research develops and tests theories in response to the intellectual interests of the researcher.
- Scientific and engineering research. Both traditions try to confirm their theories, but for different ends, in science knowledge is equated with confirmed truth and in engineering the theory must make something work rather than be confirmed.
- Evaluative and developmental research. Here we have different approaches towards problem-solving. While developmental research aims at practical instructions, evaluative research evaluates the effects of these instructions.
- Research and development. Development is an activity where the results of scientific research are transformed into practical knowledge.
- Formulative and verification research. Formulative research aims to identify problems and to formulate hypotheses. Verificational research verifies developed hypotheses.

The major research traditions include a scientific and a technical approach. There are also two ways of understanding the nature of knowledge, including the positivistic view and the interpretative view. These two dimensions can be used to form a matrix (Table 2).

These four boxes could in practice be seen as interrelated, and the results from each could in many ways be an inspiration or in other ways important for research projects rooted in other research traditions. However, the walls between the traditions (especially between positivists and interpretativists) have been high and making interconnections is far from uncontroversial. Within each of these traditions, there is a common research cycle, which could be described as: problem, investigation and result. Traditional hard science speaks about problem, hypothesis, analysis and argument, while engineering talks more about problem, problem-solving and solution. The interpretative approach starts with a pre-understanding, then alternates between understanding new facts in the light of pre-understanding and developing understanding in the light of new facts, the cycle ending in a new set of understandings. For the fourth box, we point to Baskerville and Wood-Harper (1998), who describe an approach to action research that builds on an interpretative stance. Action research/interpretive approach denotes that the research should be driven both by a theoretical and by a practical knowledge interest, while taking an interest in a broader contextual understanding of why and how things work.

Table 2. Research traditions (Numamaker et al. 1991)

Research approaches	*Research objective:* *Scientific knowledge*	*Research objective:* *Technical knowledge*
Positivistic research	1. Hard science	2. Engineering and applied sciences
Interpretative research	3. Qualitative, descriptive interpretations of subjective meaning in perspectives and contexts	4. Interpretative cases and action research

3.2.2 Navigating between Classes of Research Methods

Järvinen (2000) presents a framework covering different research approaches (Figure 5). The aim of the framework is to support the researcher in finding the right class of method by navigating through a decision tree. The choice of method is connected to the type of research objective and the object of research. It should be noted that Järvinen uses the research approach concept when talking about a class of methods useful for the same research objective/object constellation.

The first question about reality or mathematical approach is not very problematic in this research, as there are no ambitions for mathematically based research. The following are more important. The question about “reality” or “artefacts” puts the focus on the difference between the research object and the research objective. In the first case we want to gain true knowledge (research objective) about reality (research object). In the second case we have a knowledge that is verified by a “utility” demand rather than a “truth” demand, and the research object is an artefact (rather than something naturally occurring). There are two directions within the study of the “real”, conceptual analysis and empirical studies, including theory-creating and theory-testing approaches.

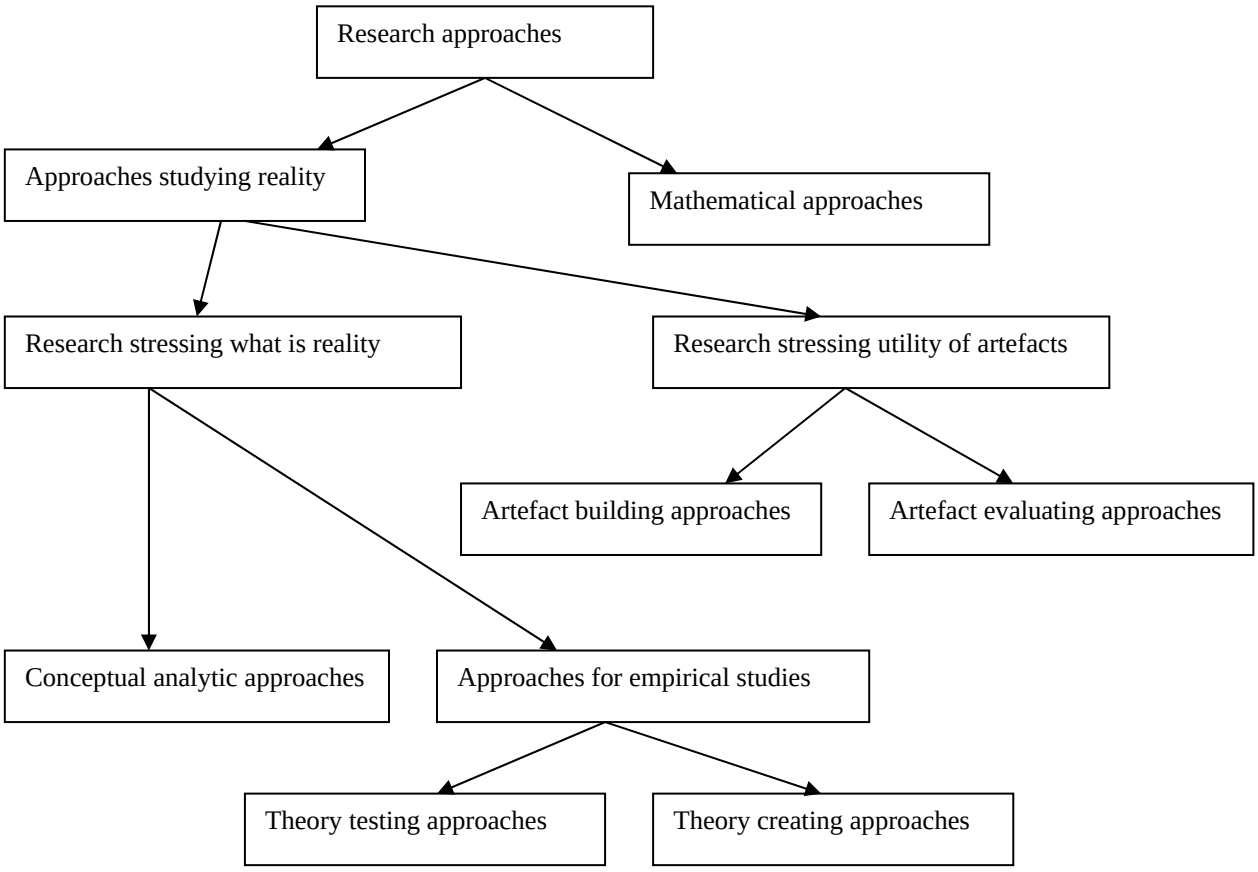


Figure 5. Taxonomy of research methods (Järvinen, 2000)

Järvinen (2000) identifies two streams of conceptual analysis. First, there is one tradition of working with premises and axioms and on the basis of these deriving a theory or framework. Järvinen says that the key question is:

“Which kind of theory concerning a certain part of reality could be derived, if certain assumptions and premises are valid?” (Järvinen, 2000. p. 2)

Furthermore, a second approach is discussed, building on empirical studies. Here four steps are described:

1) Study the basic assumptions of empirical studies.
2) Identify theories, frameworks and models used in the studies.
3) Apply logical reasoning in an effort to integrate them.
4) Try to find a common theory that explains the phenomena of the studies.

An example of this approach is to combine two dimensions into a new set of variables, creating a new framework.

A theory-creating approach might be a case study, ethnographic method, grounded theory, phenomenological study, discourse analysis or hermeneutics. The key question is:

"Which kind of construct or model could describe and explain the observations gathered" (Järvinen, 2000, p. 3).

Järvinen gives an example of research based on content analysis of a number of manuscripts scanned for core concepts that were categorized and related to each other. These categories were in turn clustered on a more general level, creating higher order themes. This kind of study is a second-order study due to the second-hand material studied, not the "real world" directly.

Theory-testing approaches can include methods like laboratory experiments, surveys, field studies, field experiments etc. The study might be based on a method, theory or framework that is taken from the literature or is developed for the study.

3.2.3 Combining Research Approaches: using ISD as a Research Approach

Nunamaker et al. (1991) complain about the science/technology division and claim that a multimethodological approach should be used. This is especially called for in complex research situations, like decision support systems and KMS.

Nunamaker et al. see the system development cycle as way of understanding research in the IS field. Research in information systems needs a multimethodological approach consisting of four approaches or strategies (fig. 6), and the information systems development process should be the central one. The four strategies could also be seen as phases in a larger IS research project, the phases being interdependent and the information systems development (ISD) approach interconnecting all the phases. The four strategies or approaches are: theories, experimentation, observation, and information systems development.

1) *Theory building*. Theory building includes the development of new ideas, concepts and frameworks. Relevance is central in this phase, as well as the connection to the practical ISD process. Theories can also provide guidance for observation or experimentation.

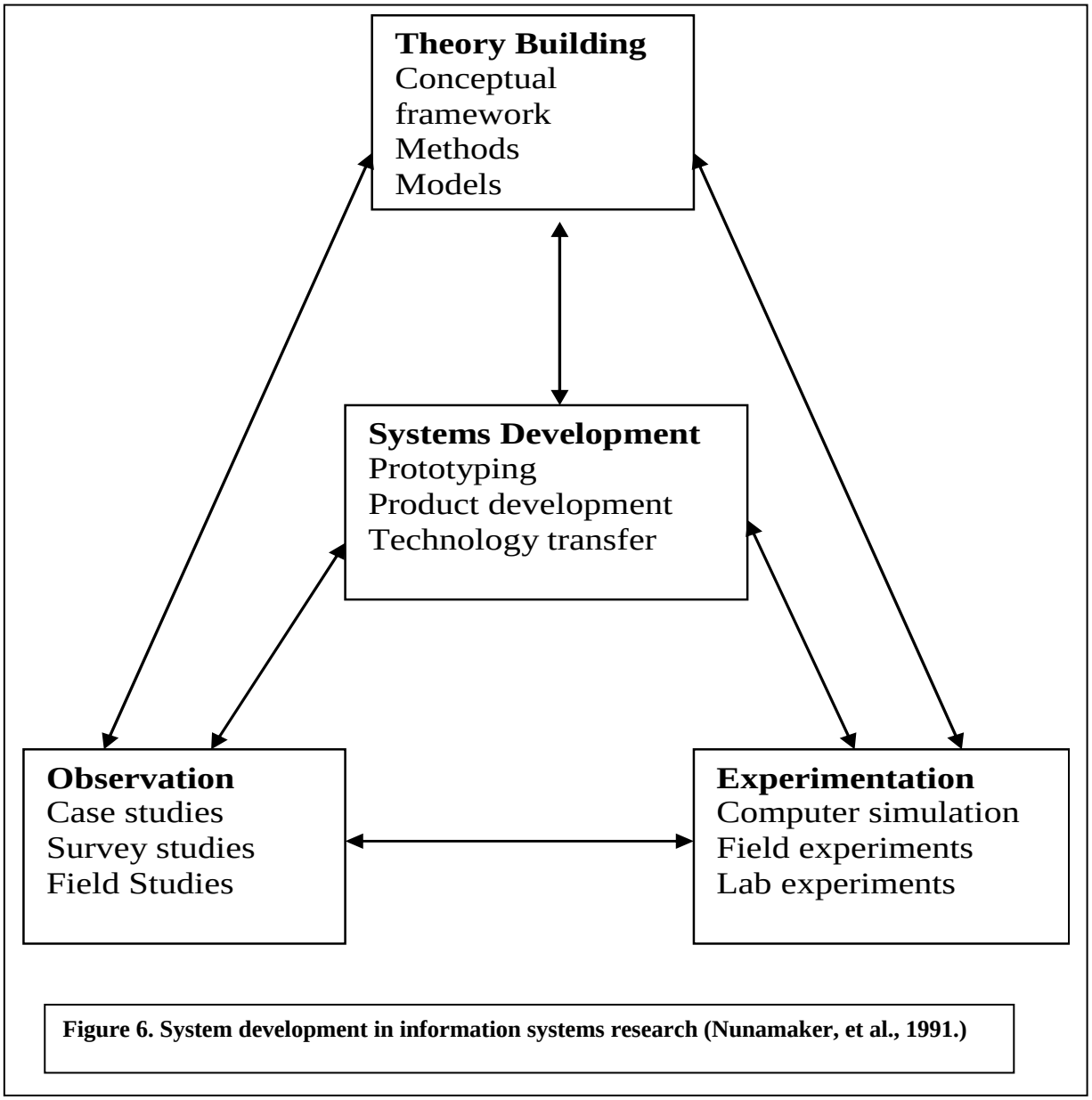


Figure 6. System development in information systems research (Nunamaker, et al., 1991.)

2) *Experimentation*. Experiments can be made, both on the field and in laboratories. Experiments can both be used for the validation of theories as well as refining them.

3) *Observations*. Observation as a research method includes methods like case studies, field studies, and surveys. The research approach is directed towards the natural situation, aimed at gaining a holistic understanding, and as such being more relevant for the problem area. The outcome of the research could both be the generation of hypotheses and the generalization of theory. Reports on the research setting are important, in order to make it possible to understand the perspectives and limitations of the study.

4) *System development*. The research process should include traditional stages such as planning, design, development and implementation. The basic

> research outline consists of the suggestion of a problem, the development of a solution (a program or other artefact) and the test of the artefact in order to understand if the problem has been solved. The success of an artefact is the proof of the validity of the theory. However, it is not the building of the system itself that constitutes the research. This type of research approach has similarities with action research approaches.

Nunamaker et al. (1991) argue that the construction of an IT artefact as such is not a scientific contribution. However, the activity could be the basis for the creation of scientific knowledge. Organizing research as a development project heightens the potential practical relevance of the scientific project.

The suggestion of organizing the research as a combined research effort is relevant for the research in this thesis. Practically, this means a combination of a number of activities.

- The development of a methodology as a process of gaining scientific knowledge.

- Basing the methodology on literature studies.

- Testing the methodology on cases, further evolving the methodology.

One important aspect here is the assumption that there is a similarity between information systems development, the IT artefact and a planning methodology. We think that the development of a planning framework can be compared to an IS or IT artefact. This development effort could be used in a scientific effort. However, it must be integrated in an interactive way with the more traditional approaches of theorizing and making observations.

3.2.4 Summary: Combining Research Approaches

A quick check of the aims and goal of this research reveals that a number of different research directions are indicated. The picture painted using Järvinen (2000) and Nunamaker et al. (1991) is one of both separation and integration. There is an undeniable need of understanding the differences between different research approaches. At the same time, it is necessary to be able to work with some sort of combination.

To conduct the work a mix of activities is needed.

1) *Combining descriptive and artefact research*. A descriptive insight into the use and development of KM systems is the basis for the development of normative planning methods.

2) *Artefact research.* This includes both development and testing. Development as a design process driven by a goal interest is followed up by a testing phase where the framework is confronted with a practical situation.

3) *Combining analytic and empirical approaches*. Analytic approaches are needed when working with the existing literature as a basis for developing a planning framework. However, the empirical input to this process is just as important. It is the

interaction between empirical and theoretical material that constitutes an important aspect of this creative process.

4) *Combining theory testing and theory creation* approaches to empirical research. Here we are looking at a combined effort of creating and evaluating a planning framework.

5) Combining information systems development research and traditional approaches.

However, this set-up raises a number of problems, with a focus on how to put both traditional research and more practically oriented normative research into a single research project. This problem area has been explored by a number of writers with a common interest in design science.

3.3 Design as a Research Approach

Information systems constitute a border phenomenon, with research tradition backgrounds from both engineering and social sciences. Under a general slogan of practical value for industry and a renewed focus on the "IT artefact", a research approach based on the design concept is in the making. A number of more or less related articles can be seen as some kind of core of this movement, including authors like March and Smith (1995); Orlikowski and Iacono (2001); Hevner et al. (2004); Walls et al. (1992); Vaishnavi and Kuechler (2006); Markus et al. (2002). Not all of these papers share the same view on every issue, but they all reside within a general theme of design as science. Here we look a bit deeper into three central concepts: design science (or design research), IT artefact and design theory. The central issue for this thesis is connected to the problem of combining research traditions.

3.3.1 Design Science

Design science is a research approach stressing the practical usefulness as a central demand on new knowledge and the role of artefacts for creating that knowledge. Research approaches with these characteristics are common in technical areas, for example engineering or computer science. The background is a movement of the IS area towards descriptive theorizing and a tendency of forgetting about the IT artefact, which, according to some, would be very harmful for the area. Design science is, in this sense, a call for practical relevance while retaining academic standards.

The central point is that the result is validated, using the standard or goal attainment. It is a teleological truth guarantor (cf. Churchman, 1971). As such, it could be seen as an alternative research approach, compared to positivistic or hermeneutic approaches. The goal orientation differs from traditional positivistic approaches in natural or behavioural sciences. These approaches try to establish how things really are. It might be a study of the natural world and its rules or one of how people behave or how they perceive themselves or their world. In design research, the phenomenon under study is created for a purpose in opposition to naturally occurring phenomena. Another dimension of this is the nature of the knowledge produced in the different approaches. Design science produces normative prescriptions for how to act in the

future, in comparison with behavioural research, which provides descriptions or explanations of how things were. An overview of the situation can be obtained by using a table (Table 3) by Vaishnavi and Kuechler (2006).

Table 3. Philosophical assumptions from three research perspectives (Vaishnavi and Kuechler, 2006)

	RESEACH PERSPECTIVE		
Base Belief	**Positivist**	**Interpretive**	**Design**
Ontology	A single reality. Knowable probabilistic.	Multiple realities, socially constructed.	Multiple, contextually situated alternative world-states. Socio-technologically enabled.
Epistemology	Objective: dispassionate. Detached observer of truth.	Subjective, i.e. values and knowledge emerge from the researcher-participant interaction.	Knowing through making: objectively constrained construction within a context. Iterative circumscription reveals meaning.
Methodology	Observation; quantitative, statistical.	Participation; qualitative. Hermeneutical, dialectical.	Developmental. Measure artefactual impacts on the composite system.
Axiology: what is of value	Truth: universal and beautiful; prediction.	Understanding: situated and description.	Control; creation; progress (i.e. improvement); understanding.

This table describes design as an alternative research paradigm which is different to the more traditional one. This is somewhat at odds with the picture given by Nunamaker et al. (2001), where the design approach is possible to apply both in positivistic and interpretative research. Furthermore, it is not clear, for example, what really makes design different from interpretative assumptions on an ontological level. The idea of design as a separate paradigm has been criticized by McKay and Marshall (2005), who conclude that a design approach contributes to IS research but does not constitute a new paradigm.

What is unique for a design approach is how a research problem is defined (practical needs) and how knowledge is validated (Does the solution work?). Practical knowledge is needed for a problem at hand, and knowledge is accepted when it has been shown to solve problems. There is of course the inherent problem of only researching what is obvious. Practical problems that are clear and present now, might be just indicators of more profound problems that need more careful consideration.

At the same time, there are basic similarities, for example: new knowledge is sought on the basis of design problems. The importance of the desired knowledge in the light of current knowledge must be argued. The validation of the practical knowledge must also pass the test of being true, that is, the claim for success must be valid.

The design approach does not tell us much about the nature of knowledge or the world. It may be possible that design knowledge could be either of a positivistic or an interpretative nature. However, so far design science has had a clear positivistic leaning (McKay and Marshall, 2005).

These arguments point towards a design approach as a special case of research, operating with a focus on what is practically needed. This, in turn, shows a need of working with design like sciences within a more traditional scientific framework. It could be seen as an extra layer of demands added to the traditional approaches.

Hevner et al. (2004) present a number of demands that design research should adhere to:

* Research should focus on an IT artefact.

* Research problems should be relevant for business needs.

* Design artefacts must be rigorously evaluated.

* The research must contribute to knowledge in the area of artefact, foundation, and design methodology.

* The research process must be rigorously performed, using scientific methods.

* The design process itself should be understood as a search process for new knowledge.

* The result must be communicated in both the practical and the scientific field.

3.3.2 The IT artefact

Common to many directions of design theory is that they have the design of an IT artefact at the centre. However, what should be included in the concept is not so obvious. One starting point for this discussion could be the call for a return to the IT artefact. Benbasat and Zmud (2003) present the following view on IT artefacts:

“We conceptualize the IT artefact as the application of IT to enable or support some task(s) embedded within a structure(s) that itself is embedded within a context(s). Here, the hardware/software design of the IT artefact encapsulates the structure, routines, norms, and values implicit in the rich contexts within which the artefact is embedded.” (Benbasat and Zmud, 2003, p. 186) Around this artefact, a number of research questions are possible.

* How are IT artefacts conceived, constructed, and implemented?

* How are IT artefacts used, supported and evolved?

* How will IT artefacts affect the context in which they are embedded?

The central type of IT artefact is a physical object, a piece of hardware or software. Sometimes it is viewed as an instantiation of an idea (theory, algorithm). The conclusion here is that there has to be a piece of information technology present.

Orlikowki and Iacono (2001) take a broader view of the IT artefact.

“Bundles of material and cultural properties packaged in some socially recognizable form such as hardware and/or software”. (Orlikowki and Iacono, 2001, p. 121)

Again the IT artefact is hardware or software that instantiates something, in this case “cultural material”. Orlikowski and Iacono (2001, p.123) take the discussion one step further and investigate how the IT artefact is described or theorized in the IS literature. Here they come up with five different perspectives.

* Tool (what is done using the artefact).

* Proxy (instead of talking about the artefact it is substituted by something else, for example money).

* Ensemble (artefact is a combination of technology, people, activities, resources).

* Computation (the information handling that is performed).

* Nominal (the artefact is forgotten).

Depending on which of these ways of understanding the artefact is used, research will look different. It also indicates that just hardware / software and their properties are seldom interesting per se.

Hevner et al. (2004) have a broad and including view of the IT artefact. They include:

“constructs, models, methods that are applied in the development and use of information systems.“. (Hevner et al., 2004, p. 82)

They argue that it is not possible or desirable to understand it independently of people, organizations or the social context in general. However, the do not include elements like people or organizational processes in the concepts. More interesting is what else they include. The artefact is an instantiation, and the models and constructs that are instantiated into an artefact, are included as a part of IT artefacts. On top of this, Hevner et al. (2004) also include the methods used when developing the information system, that is, the process of instantiation. Design science is a suitable approach for creating these methods and constructs, often through the means of building an IT artefact.

Design research uses the idea of an IT artefact both for the definition of the knowledge interest of the information system area as well as of the focal point for acquiring this knowledge.

3.3.3 Design Theory

The central part of design research is the use of a design theory, that is, the normative knowledge of how to do design. A design theory could be viewed as a connecting point between practical and theoretical knowledge. An attempt at a more formal

definition is given by Walls et al. (1992), who define an information systems design theory as:

"… a prescriptive theory which integrates normative and descriptive theory into design paths intended to produce more effective information systems". (Walls et al., 1992, p. 36).

If one follows Hevner et al. (2004) a design theory should be considered as a part of the IT artefact, as it supports the development of an information system. Hevner et al. (2004, p. 83) indicate this:

"This definition (of an IT artefact) is consistent with the concept of design theory as used by Walls et al. (1992) and Markus et al. (2002)".

However, the exact relation is not clear. It might be that research aiming to develop a design theory should be seen as design research, because it has an IT artefact in focus. It might also be the way that Markus et al. (2002) develop their design theory, which includes using a real time design process to draw the more general conclusions for that kind of system. However, this does not imply that a design theory must be developed using a design science approach. Markus et al. (2002) do not discuss why a design science approach was used or what the alternatives might have been.

Markus et al. (2002) provide an example of a design theory and of design science. The design theory gives an understanding of how to develop a certain class of system (EKP, emergent knowledge processes) with respect to both the process and the content of the system. The focus lies on a number of suggestions for the properties that the system should have. The design theory is developed in close connection to a real-time development project, and in this sense, it is developed using a design research approach. The design theory developed in Markus et al. (2002) consists of a number of design and development principles. A short version of them gives a flavour of what a design theory could include.

The system must:

- be self-deploying,

- translate expert knowledge into actionable knowledge for non-experts,

- induce the user to take offline action,

- integrate expert knowledge with local knowledge sharing,

- implicitly, not explicitly, guide users' deliberations in desirable directions.

The character of these directions is rather diverse; some are about how the system should work, some about how users should behave and some about how to develop the system. They are normative on a general level and they are both easy to use and obvious.

At the heart of a design theory there is a kernel theory, which the design theory draws on for its suggestion for the:

"… formulation of empirically testable predictions relating design theory to outcomes like system-requirements fit." (Markus et al., 2002, p. 181).

A kernel theory can be an academic theory or a practitioner theory-in-use (Markus et al., 2002, p. 181). In this case, a number of kernel theories are used as a basis, including the following:

"1. It is nearly impossible to predict in advance who will participate in the process and which tools they will use."

"2. Knowledge is distributed and includes both general expertise and local context knowledge."

"3. The process is emergent." (Markus et al., 2002, p. 206)

Based on these basic assumptions about the nature of the problem situation, a number of design principles are developed.

"1. Design for customer engagement by seeking out naïve users

2. Design for knowledge translation through radical iteration with functional prototypes

3. Design for offline action

4. Integrating expert knowledge with local knowledge sharing

5. Design for implicit guidance through a dialectical development process

6. "Componentize everything including the knowledge-base" (Markus et al., 2002, p. 206)

3.3.4 Combining Design and Behavioural Research

The design science movement has its focus on the practical, relevant and normative side of research. However, this does not mean that traditional science is left aside entirely. Some authors stress the connections and need for interaction between natural or behavioural research and design science (March and Smith, 1995; Hevner et al., 2004).

Hevner et al. (2004) present a research framework incorporating both traditional science and design science into one picture (Fig. 7).

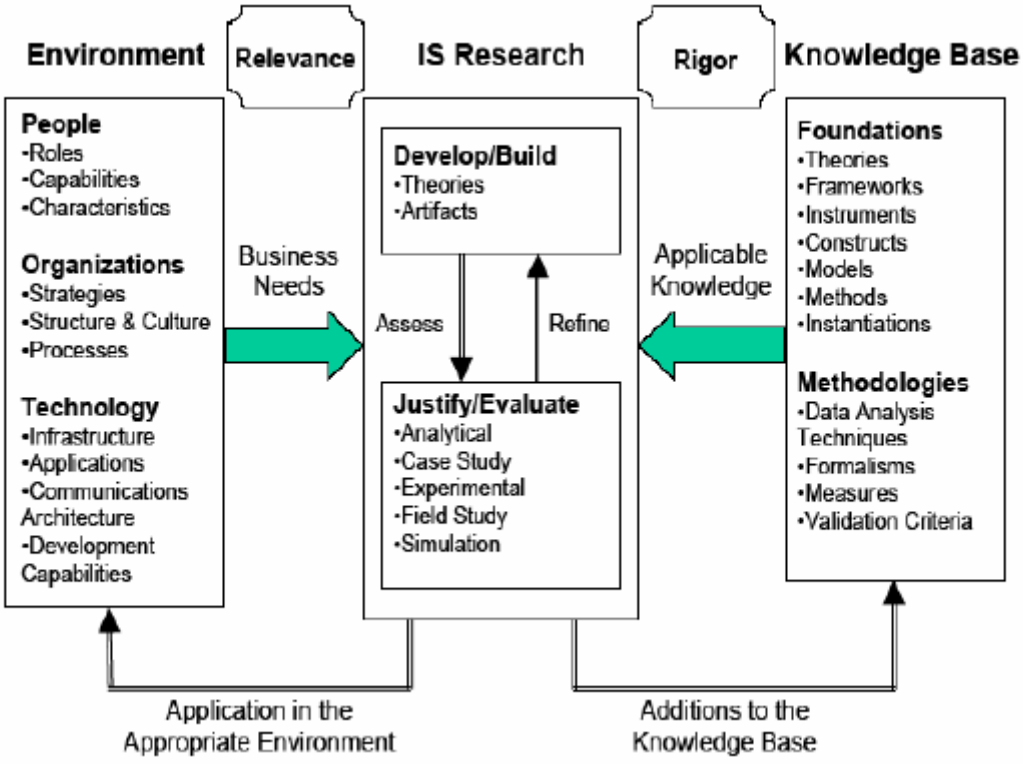


Figure 7. Information systems research framework (Hevner, et al. 2004)

Hevner et al. (2004) express the need of combining behavioural science with design science, calling them two complementary phases.

"Behavioural science addresses research through development and justification of theories that explain or predict phenomena related to the identified business need. Design science addresses research through the building and evaluation of artefacts designed to meet the identified business needs." (Hevner et al., 2004, p. 79-80)

The knowledge base that behavioural science supplies becomes the raw material that is used in the strife for useful artefacts, developed in the design science phase.

3.3.5 Design Theory in Summary

A number of issues in this section are central for this thesis.

* The IT artefact as the study object. We wish to further the knowledge on information systems development methodologies. Hevner et al. (2004) have two important messages, first that the way of development is central (and a part of the IT artefact) and that knowledge around it should be developed in a design mode. That is, it should be researched by suggesting a method, then applying it and drawing conclusions from the outcome of the application.

* Kernel theories are central; just as traditional research is founded on existing theories, design research must be.

* Design theory and system methodologies. Methods usually focus on a number of steps and the techniques that accompany them. Design theory mixes normative statements about the characteristics of the system and the process of development.

* Choice of method and the need of relating different research approach. The important argument is that design and descriptive science are possible to connect, but there must be ways of letting them interact.

3.3.6 Discussion of the Research Approach of the Thesis

The research approach can be summarized as an interpretative research strategy including a behavioural descriptive knowledge interest in combination with elements of prescriptive design research. For the research activities, a set of research methods are needed. To organize these we choose to use an interpretative case study approach as a framework to work within. Some design science aspects are also considered, including the way research objectives are chosen and knowledge is verified. This approach is preferred, due to the theoretical second research question about planning methodologies in general, which feeds on the experiences from the more pragmatic question of concrete planning framework.

The research style could be described as theorizing/interpretative with an interrelated pragmatic/theoretical knowledge interest. The research approach could be described as an interaction between theorizing, experiment and observation in connection with an ISD process.

This approach is used to answer the two main questions of the research, and can be broken down to the following practical steps. The first two steps work with the first question and the last step with the second research question.

- Development of new perspectives and frameworks. Here we look at Järvinen's method-type conceptual analysis, which is building theory by combining existing texts or on empirical experience. In this case, we are building a planning framework. The driving forces in this work are a combination of deficiencies in current theory and current practical needs.
- Empirical explorations of the planning framework using interpretative case studies. The effort includes investigations using both empirical "truth" arguments and more practical "it works" arguments. In a more positivistic research, this section would be about proofing the framework. However, in this interpretative spirit, this section is a further development of the framework and a deeper understanding of problems and possibilities.
- Discussion of the broader implication of the perspective/framework. Here we move back to conceptual analysis in an effort to discuss the underlying theory in the field of planning methodologies and frameworks.

These activities will effectively make up the practical implementation of the research approach.

The interpretative approach is central, as it is the individuals' and groups' lived experiences of their reality that are central for the attention. Practically, this means the experiences of people who plan, develop and use knowledge management systems. Hermeneutic concepts and theory can be used both as an underlying philosophy of interpretative research and as a mode of analysis (Myers and Avison, 2002).

The unit of analysis is texts in a wide meaning (Gadamer, 1994). The central question is "What is the meaning of a text?", and the purpose is to investigate confusing, unclear or contradictory aspects of texts. Three main sources of text can be found in 1) theories about knowledge processes and planning methods, 2) cases of both planning processes and knowledge management systems in general, and 3) planning concepts and methodologies. Here we see the duality between pragmatic and theoretical knowledge as an advantage. The cross-fertilization between two modes of knowledge contributes to a solid and relevant result.

The coming sections will first look at the general hermeneutic principles that are to guide the research (3.5), then in 3.6 it is investigated how these can be integrated under a general approach of interpretative case studies. The chapter is summed up with a more detailed description of evaluation of the research in 3.7

3.4 Hermeneutic Principles

The basic research activity for reaching results is to take something, a problem, a method or a theory, and put it into a new context in order to advance the understanding about it in order to solve problems or develop the desired knowledge. At the core of this interpretative position reside the hermeneutic principles. As often pointed out, this also implies a subjective approach, where the researcher is personally involved. Some consider this as a weakness but others see it as a strength (e.g. Bijker and Pinch, 2002).

3.4.1 Some Notes on General Hermeneutics

This research is approached using an interpretative/hermeneutic research tradition (Gadamer, 1994). This implies an orientation towards the understanding of texts and creating new meaning and understanding. The hermeneutics approach is to interpret texts. This can be an interview or other researchers' reports, theories or concepts. The essential activity is to move between the whole and the parts of the problematic area and to develop understanding in interaction; this is called the hermeneutic circle.

It should be remembered that there are no "facts" or "data", in the sense that they are never pure; they are always the results of interpretations. The interpretations that are made always rely on the interpreter's pre-understanding. The researcher's already existing theories, frames, concepts and values are used in the interpretation. These are also changes when the process of reading and interpretations goes on. These processes produce the "facts" of the research. The facts become facts only in relation

to the whole of which they are a part. This process can be described as a dialogue with the text.

Hermeneutics does not accept the traditional truth concept, which is a static connection between a theory and reality. The results of this research are revelations of what has been hidden in texts. The credibility of hermeneutic research lies in how well argued the results are. The results can be judged concerning to what extent they are reasonable, but all results are always preliminary. The hermeneutic circle is not finished.

In this research, everything is considered as texts that are to be interpreted. Whether it concerns existing methods for knowledge analysis or empirical evidence of knowledge work, they are both interpreted in the light of the problem as a whole. At the same time, the whole (the intended planning methodology) will be reinterpreted on the basis of the parts that are put forward. The empirical material of this work is treated as texts. These are read in relation to perceived problems, the literature and the results that are under development. The totality of these research efforts forms a hermeneutic circle.

A more practical set of concepts is discussed by Sandström (1995). The construction process of interpretative/hermeneutic truth claims/results could be understood using a number of concepts.

1. Truth claims are valid within a *perspective*. The discussion here should be around the choices of perspective. In this research, it could be discussed whether the choice is seeing KMS as a planning problem and not as an implementation or a usage/education problem. Another claim is that the right understanding of the problem situation comes from a reflexive interaction between broad perspectives rather than a detailed understanding of different parts of the problem.
2. Claims are based on human experience, in the "*life world*" of a person. This relates to the use of the individual researcher as a research instrument. In the production of knowledge claims the researcher is the focal point. The problems of how these claims can become more general can be discussed using concepts like intersubjectivity.
3. Truth is *intentional*. The researcher initially directs the interest towards the research object. The researcher always experiences the world with a goal in mind.
4. Research objects should *appear on their own conditions*. The pre-understanding of the researcher should not take over and dominate the meaning produced. This of course must be balanced with the previous statement about the intentionality of meaning. The multiplicity of truth claims, depending on the perspectives, can also be a possibility for validation. The comparison of truth claims between different perspectives and within a perspective can strengthen the validity of the research result.

5. Truth claims are c*onstructed and pluralistic*. It is a process where the experiences are put in a context that produces a truth claim. The pluralism of truth claims depends on the perspective taken and the intentions of the researcher.
6. The goal is to reach a high *degree of agreement* between the truth claim and the research object. This is an experience of the research, and the argument for a general acceptance of this experience is to explain the process that leads up to the experience in a clear and systematic manner.

The goal of these principles is to make a truth claim trustworthy. Hermeneutics is about asking the question "What is the meaning of this research object?" (understood as a text) in this particular perspective. The meaning is a fulfilment of the agreement between the truth claim and the research object as it appears in the researcher's life world, as the researcher intentionally and consciously acts on the "real world".

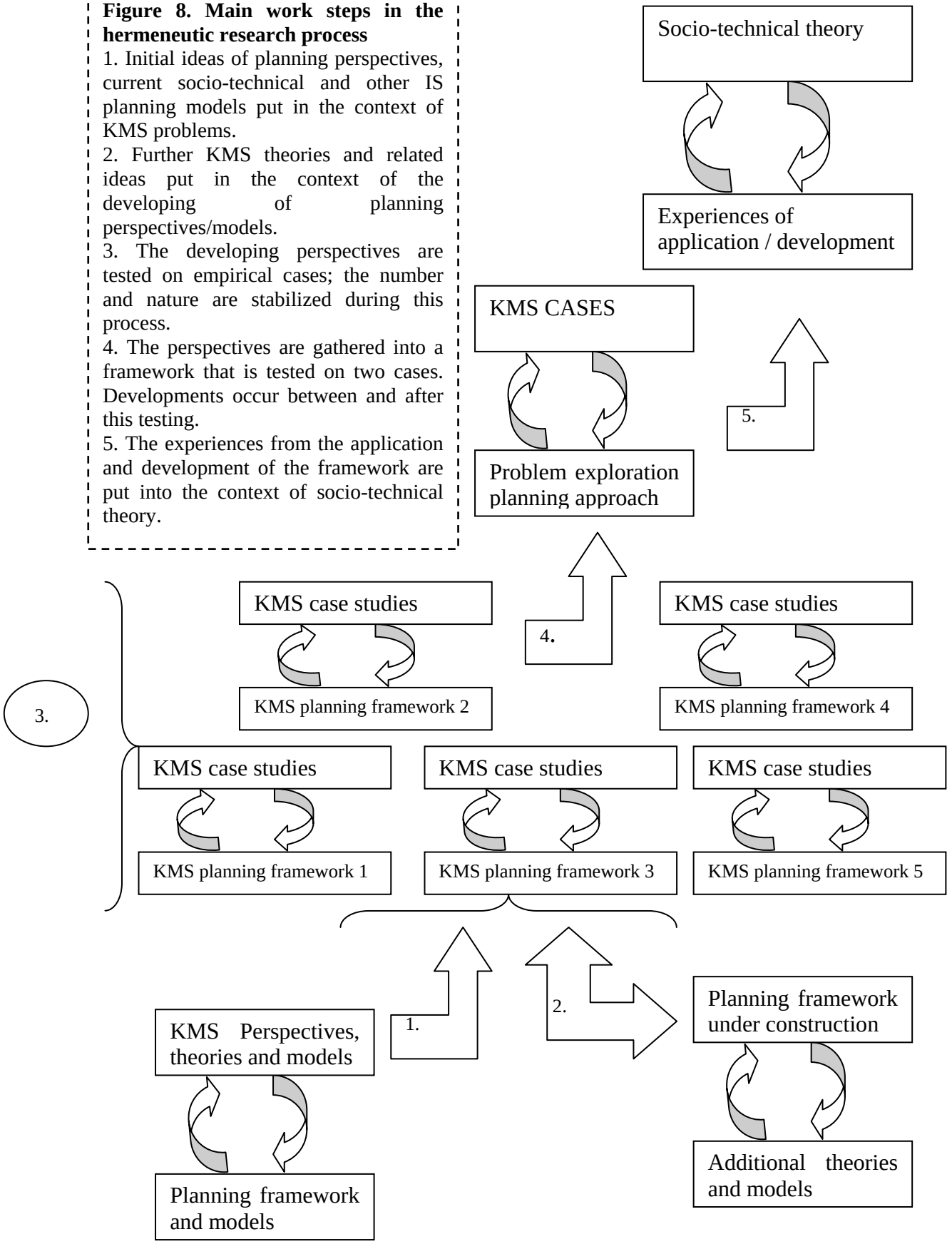
3.4.2 Applications of the Hermeneutic Principles

A number of hermeneutic circles and interpretative case studies can be found on a number of levels. Figure 8 summarizes these levels of research processes.

- On the highest level, the focus is on putting knowledge management methodologies into the context of socio-technical theory.
- In order to make this analysis concrete and detailed, a framework for making a balanced socio-technical analysis of knowledge management systems has been developed. The framework is exemplified in case studies. These experiences are put into the context of socio-technical theory. The outcome from this process is a discussion of some central problems of socio-technical analysis that seem to arise when knowledge management systems are planned and developed.
- The framework is in turn developed on the basis of a series of perspectives on knowledge management support in organizations. The perspectives of the framework are in turn developed using case studies and analyses of theory and models. The preliminary version of each perspective is put in the context of the case study. Questions concerning how applicable and useful it is, are discussed. In addition, the perspective is redeveloped, adding ideas of how to use it and what benefits could be expected from the application in other types of cases. Further theories are added as far as the application seems to suggest it.
- These perspectives are developed from a discussion between knowledge management theories and planning methodologies for information systems. This forms a hermeneutic process, an example of which could be if the soft system methodology is understood in the context of knowledge management problems and vice versa.

Figure 8. Main work steps in the hermeneutic research process

1. Initial ideas of planning perspectives, current socio-technical and other IS planning models put in the context of KMS problems.
2. Further KMS theories and related ideas put in the context of the developing of planning perspectives/models.
3. The developing perspectives are tested on empirical cases; the number and nature are stabilized during this process.
4. The perspectives are gathered into a framework that is tested on two cases. Developments occur between and after this testing.
5. The experiences from the application and development of the framework are put into the context of socio-technical theory.



3.5 Case Study Research

Case study research is the most common qualitative method used in information systems research (Myers and Avison, 2002, p. 8).

3.5.1 Case Study Research in General

An often cited definition that covers the broad understanding of the case study method is given by Yin (1994):

"A case study is an empirical inquiry that**:**

- investigates a contemporary phenomenon within its real-life context, especially when**:**

- the boundaries between phenomena and context are not clearly evident" (Yin, 1994 p. 13).

Yin (Yin, 1994 p. 13) continues defining the case study method, stating that the method is useful when there are more variables to be investigated than there are data points. Therefore, the study must rely both on multiple types of data sources and on the prior development of theoretical propositions guiding the data collection and analysis.

3.5.2 Interpretative Case Studies

Interpretative case studies in information systems research fall in a general sense within the descriptions of case studies by Yin (1994). However, there are many variations; for example, Cunningham (1997) points out nine different types of case studies. Yin's ideas lean towards the positivistic side. This research works with a more interpretative approach to case studies. It is therefore important that the characteristics of interpretative case studies should be explicit as regards possibilities and limitations.

Walsham (1995) provides an overview of the key aspects of interpretative approach, including: 1) philosophical stance, 2) use of theory, 3) how to conduct research, and 4) how to generalize results.

The choice of research approach should always be active and based on explicit arguments. The choice of methodological approach must be matched with the nature of the problem and the ambitions concerning results. Interpretative case studies are needed when the level of multiplicity of complex conceptual structures is high. The complex nature of the theory of KM and the heterogeneous practice of the planning situations seem to suggest that an interpretive approach is preferable to a positivistic one.

The interpretative case studies are used in a couple of ways. The study object of KMS planning approaches is investigated firstly from a theoretical viewpoint. The case study contributes with empirical evidence of current and important problems and phenomena that the approach must be able to handle. It must be noted that theoretical discussions form an important part of the case study approach, and that each

theoretical development is supported by empirical evidence. Thus the research as a whole could be described as a series of interconnected case studies. The case studies both support the selection and the development of frameworks and concepts. Another role of the case studies is to support the relevance of the approach. A complementary purpose is to provide examples of how to work with the approach, making it more accessible and understandable in practice and possible for other researchers to repeat the application of the approach.

3.5.3 Ontology and Epistemology

Walsham (1995) argues that epistemological and ontological questions are important for understanding the interpretative position.

- Non-positivistic stance – research includes both facts and values. This stance acknowledges that facts have their basis in values, often in an implicit and tacit way.
- The importance of the active and explicit influence of the researcher and the subjectivity that comes with the researcher as an individual.

These ideas are well within the ideas of hermeneutics, as discussed in the introduction, and in section 3.6.

3.5.4 The Use of Theory

The roles of theory in case studies are important, and Eisenhardt (1989) suggests three aspects that should be considered.

1. Theory is used as the initial guide to design and data collection.
2. Theory is used as part of an iterative process of data collection and analysis.
3. Theory becomes the final product of the research.

In this research, theory plays a little of all these three roles. The main theoretical constructs are the frameworks. The intent of the frameworks is to capture important problems and contradictions in a KMS planning situation. The case studies contribute both with suggestions of what should be included and practical checks on whether the construction that has been produced is relevant.

3.5.5 Conducting Research

The “conducting research” aspect of the case study method deals with how the collection of empirical material should be performed. Three questions are discussed, the role of the researcher, the evidence from interviews and the reporting (Walsham, 1995).

3.5.5.1 The Role of the Researcher

The main debate concerning the researcher’s role is one of closeness or distance between the researcher and the field or study object. A matrix made up of two dimensions with two options each may summarize the situation (Table 4).

First, there is the general issue of the position of the researcher in the research process. The interpretative approach suggests that the researcher should be subjectively and personally part of the research. Walsham (1995) summarizes the problem that faces the interpretative researcher:

"Interpretive researchers are attempting the difficult task of accessing other people's interpretations, filtering them through their own conceptual apparatus, and feeding a version of events back to others, including in some cases both their interviewees and other audiences." (Walsham, 1995, p. 77)

Table 4. Role of the researcher (Walsham, 1995)

	Subjective	*Objective*
Active	Action research using interpretative case study	Consultant, reporting experience scientifically
Passive	Traditional interpretative case study	Traditional positive research

The researcher becomes, so to speak, the research instrument. The complicated process of interpretation on interpretation could be a source of problems and confusion. The standard answer to this criticism is to make the research as transparent and traceable as possible.

The other dimension concerns whether the researcher wants to contribute actively with solutions to the problem situation. The outcome (the perceived success or failure) should later be used as a means for evaluating research. The combination of action research in combination with interpretative case studies is very much a valid option (Baskerville and Wood-Harper, 1998). The normal interference in a situation that the more traditional case researcher contributes with is not to be understood as action research. The goal is here to gain an understanding, and the research outcome is descriptive.

The position of this research is mainly a passive but personally involved researcher, i.e. a traditional interpretative case study. However, there are also instances where the outcome of active planning activities has been feed back into the case situation. These efforts have ended with the discussion of the result, no practical implementation having been possible within the limits of the research projects.

3.5.5.2 Types of Evidence

The case study should be built up by a selection of evidence types. Yin (1994, p. 93) points at a number of possibilities: documents, archival records, interviews, direct observation, participant observation and physical artefacts. Walsham (1995) suggests

that the interview is the primary choice for an interpretative case study, as it brings the research closest to the interpretations of the participants in the research situation.

The interview situation is a delicate one since the interviewer must hold a balance between distance and engagement in the contact with the interviewee. Too detailed and controlling questions might both bring just the expected answers and generally scare the interviewee. Too much distance might present the interviewer as uninterested in the subject, which might make the interviewee uninterested and the answers bland. A similar problem is associated with the recording method, using a tape recorder and/or taking notes. Walsham (1995) argues that the tape provides better conditions for reviewing the material and a richer material for the analysis, but on the other hand it might deter the interviewee from talking about sensitive matters. In the latter case, the field note might be preferred. However, taking notes might distract from active listening and a dynamic conversation. A combination might be a good thing, making the bulk of the conversation go down on tape, and making reflective notes when ideas or insights appear during the interview.

Again, it should not be forgotten that the researcher as a person is the research instrument and that the evidence collected ultimately rests on this person. In this thesis the evidence of the cases has been collected by the researcher and to complement these other case studies, created by other researchers, have also been used.

3.5.5.3 Principles for Selecting Cases

The central principle for the selection of cases is that they all describe situations that are rich in detail, in this thesis the selection of information systems being used to support knowledge processes. The selection criteria have been the importance and relevance of the cases for the research problem at hand. The selection is made with the well grounded hopes that a deeper understanding would be gained from them. A broad variation has been sought in the choice of cases. For example, both the public and private sector are represented, both technical and more organizational cases, too, and both successes and not so successful cases are included.

A related question is the selection of individual people to be included in the interview series. Generally, the choice of individuals must be relevant for the research question, including the theory in use. McCracken (1988) points out that it should not be understood as a sample in a traditional sense. The people chosen should be strangers to the interviewer. In numbers, the group can include up to eight interviewees. It is most important, according to McCracken, that there is a deliberate effort of creating contrasts among the interviewees. The selection can be made interactively during the research process.

The selection can be informed by collected data or even by direct questions to respondents (Mason, 1996). An example of a selection criterion is to choose people that have great insight and an interest in sharing these insights.

3.5.5.4 Analysis of Data

The data collection and analysis are an integrated process. The findings from the analysis are used in the following data collection in a discovery and review process. It is also an interactive process between cultural and analytic data (McCracken, 1988). In short, cultural data stem from the research situation and analytic data from the literature. A central idea is to let the interview take the time required to allow the respondent to finish talking, and let the interview go on for several hours. McCracken (1988) presents a four-step approach for data collection.

1) *Review of analytic categories and interview design*. This first step is in essence an exhaustive review of the literature. A good literature study sharpens the research ability to catch on to surprising facts. It also creates a healthy level of distance to the research object. The review of analytic categories, through the literature, is the basis for the interview questionnaire. This questionnaire is a list of topics that guides the researcher through the interview.
2) *Review of cultural categories for an interview design*. This stage is about the research reviewing his or her own position towards the research object. From the researcher's own experiences a set of cultural categories is constructed. This is another step in the questionnaire construction. It is supposed to create an awareness of the researcher's own position, which is important when the interview is the effective research instrument. In the best case, perspectives not recognized in the literature could be found and included in the topic list.
3) *Interview procedure and the discovery of cultural categories*. The process of finalizing the questionnaire and conducting the interview entails that the questionnaire should reflect the balance between the need of covering the topics selected and letting the respondent talk freely on his or her own terms. A time for following up questions and incident recollection should be planned for. The best situation is when the respondent with the help of general cues alone reviews the area under investigation, but sometimes direct category questions must be asked. One way of getting the respondent to dig deeper into a subject is to start a discussion around artefacts, for example documents. McCracken calls this "auto-driving the interview". As for the interview, McCracken says that the interviewer should create a benign and accepting climate for the interview. The respondent should feel safe and the interviewer should appear polite and curious. The interviewer should listen actively and find strategies to collect data from all categories. If subjects must be avoided, alternative strategies are needed. This could include, for example, using related aspects or experiences that are important to the respondent. It is also possible to let the respondents talk freely, which might lead them to talk about more than they originally intended. The interviewer must listen for implicit ideas and look for ways of getting closer to them.
4) *Interview analysis and the discovery of analytical categories*. McCracken provides a detailed five-step process, also acknowledging that each situation

probably needs specific, ad-hoc-like solutions. The process starts with a review of the transcript of the interview, which is scanned for initial observations. The observation focuses on utterances that are relevant for the research question, and open up to generalization. Next, the observations are deepened, checked for internal logic and then the observations are related to each other. Then judgments are made on the connections between observations. In this manner, themes or points of view in the interview are created. Themes are organized and systematized. As a last step themes are compared between interviews, whereby the cultural categories of the interviews meet the analytic categories of the literature, creating the results of the research.

McCracken (1988) points to this approach as especially important when investigating an area that is close to the research. This is one central theme of the approach, how to balance closeness and distance throughout the research.

3.5.5.5 Reporting Methods

The reporting of the cases is central for the acceptance of the final result. The basic guideline is that the more insight into how the material was gathered, analyzed and used the better. Walsham (1995) suggests a number of details that should be provided:

1. Details on the research site.
2. Reason for the choice of site.
3. Number of people interviewed.
4. Organizational position and profession of these people.
5. Time period for the research.
6. Data collection method and analysis method.
7. Interaction between theory and empirical studies.

3.5.6 Generalizing from Case Studies

Walsham (1995) suggests a number of possible types of results that may be the outcome of an interpretative case study:

1. Development of concepts. Insights gathered in case studies are summarized in a new concept.
2. Generation of theory. Clusters of concepts, propositions, and world-views are formatted into theories, describing or explaining phenomena.
3. Specific implications, propositions pertaining to the circumstances within special areas or situations.
4. Contributions of rich insight, which can include much of the above, but are characterized by a case that in it self contributes to a deeper understanding of a problematic phenomenon.

Generally, the possible outcome of this kind of research is the generalization of theoretical propositions. These are limited to their nature. They are not predictive and should rather be understood as tendencies that provide some guidance to understanding past data. They are also limited to explanations for the situation of the study, although this can be somewhat extended by connecting to existing theoretical concepts. One way of making this point is to use words like "can" instead of "will", indicating that it is not a prediction.

Interpretative case studies can result in different types of concepts: first-order concepts, found in the empirical material, or second-order concepts that are generalizations building on the empirical material. The first-order concept is generated from, for example, interviews, while the second-order concept is obtained by using good theory and relying on an analytic work process. This research deals mainly with second-order concepts and the planning frameworks could be regarded as theoretical constructions.

The idea of first- and second-order concepts presents some possibilities for this research. This demands some discussions. This research builds on concepts and theories from the KM area and the IS planning area in general. The case studies are used to put concepts in a new context, investigating how they work in a KM planning mode. Concepts from various areas are put in the context of each other and moulded into clusters making up building elements of the final planning approach.

3.5.7 Generalizing the Local vs. the Universal Debate

Sorensen (2002) discusses the problems of case studies and generalization. First, a more general debate on the problems of moving between levels, and then the more specific problem of the generalization of research results. The paper by Sorensen (2002) is an introduction to a compilation of papers of technology management and policy issues, some of which are discussed in Chapter 2.1.

3.5.7.1 Local Conditions and Universal Understanding

Sorensen discusses what he calls the paradox of technology:

"… the reproduction of a dynamic relationship between universal development and local appropriation." (Sorensen, 2002, p. 28)

In short, technology (as a universal factor) is available all over, with the same characteristics, but it is used locally and the outcome differs depending on conditions at the point of use. Conditions on national, regional, cultural, or local levels constitute the contingency problem. Technology is to a certain degree re-embedded (Giddens, 1990) into the local situation. The relationship between the local and the universal cannot be finally determined. It is sometimes assumed that in the long run there will be a process of convergence over time.

3.5.7.2 Usefulness of Cases

There are obvious limitations to the value and usefulness of single case studies, but with this in mind and with an understanding of the possibilities, much can be

achieved. Firstly, one should be clear that universal statements should not be based on single cases. However, Sorensen (2002) argues that used in the right way they may contribute to the development of theoretical agendas and conceptual frameworks that go beyond the instance of the case. To achieve this Sorensen provides a number of ideas that can be used as guidance:

1. In case study research, analytic or synthetic generalization could be used.
2. Case studies can be used to identify important features of technological development projects that could prove to be more general.
3. Case studies can provide important support to the development of conceptual frameworks.
4. Any science that includes humans cannot be completely predictive. Much is about identifying processes and phenomena that need to be observed and taken into consideration.
5. The interactive nature of the relationship between the application and the development of knowledge should be focused on. The basis of knowledge of how information systems are developed is the application of that knowledge.
6. Local stories and narratives can be useful in practical cases.
7. Synthetic work between case studies creates a greater value. By cutting across a number of cases, deeper understandings of the underlying problems can be discovered.
8. Even though a single case just represents a certain time and place in history, some cases come to take on a larger role and become example studies, providing understanding for the complexity of a common situation.

3.5.7.3 Implications for This Research

The problem of contingencies both limits and focuses the results of research that are relevant and possible to achieve. Moreover, in the end it hits back on our construction of information systems planning, development and implementation methodologies. There is a limit to how local the methods might become. If they are too local, then it just becomes a situated model, which is hardly even repeatable within the same company. On the other hand, it may result in meta methodologies, or plain shells that can be used to construct temporarily working methods. Knowledge management models for a certain company might be an example of the first and soft systems methodology an example of the latter.

The local/general debate should also have an influence on the chosen research approaches and serve as an argument for the case approach discussed in this chapter. The case studies should account for local appropriations of a rather universally accepted set of technologies used for knowledge management purposes. At the same time, a set of different types of case studies (size, branch, public / commercial, nationalities) should be used. This leads to the possibility of cross-cutting the case studies. However, this should also reflect positively on the resulting framework.

3.5.8 The Use of Case Studies

One very important side to the research approach is the balance between theory and the empirical aspects of the research. The case studies are focused on the empirical side, but the attention on theory is very central for the thesis.

This research has a focus on the theoretical reasoning and on the construction of a framework. A central part of this approach is an extensive use of cases for exploring and redeveloping the framework. One can see the whole research process as a large interpretative case study research consisting of a number of interpretative processes and case studies. An overview of the research process and the use of case studies is given in Figure 9.

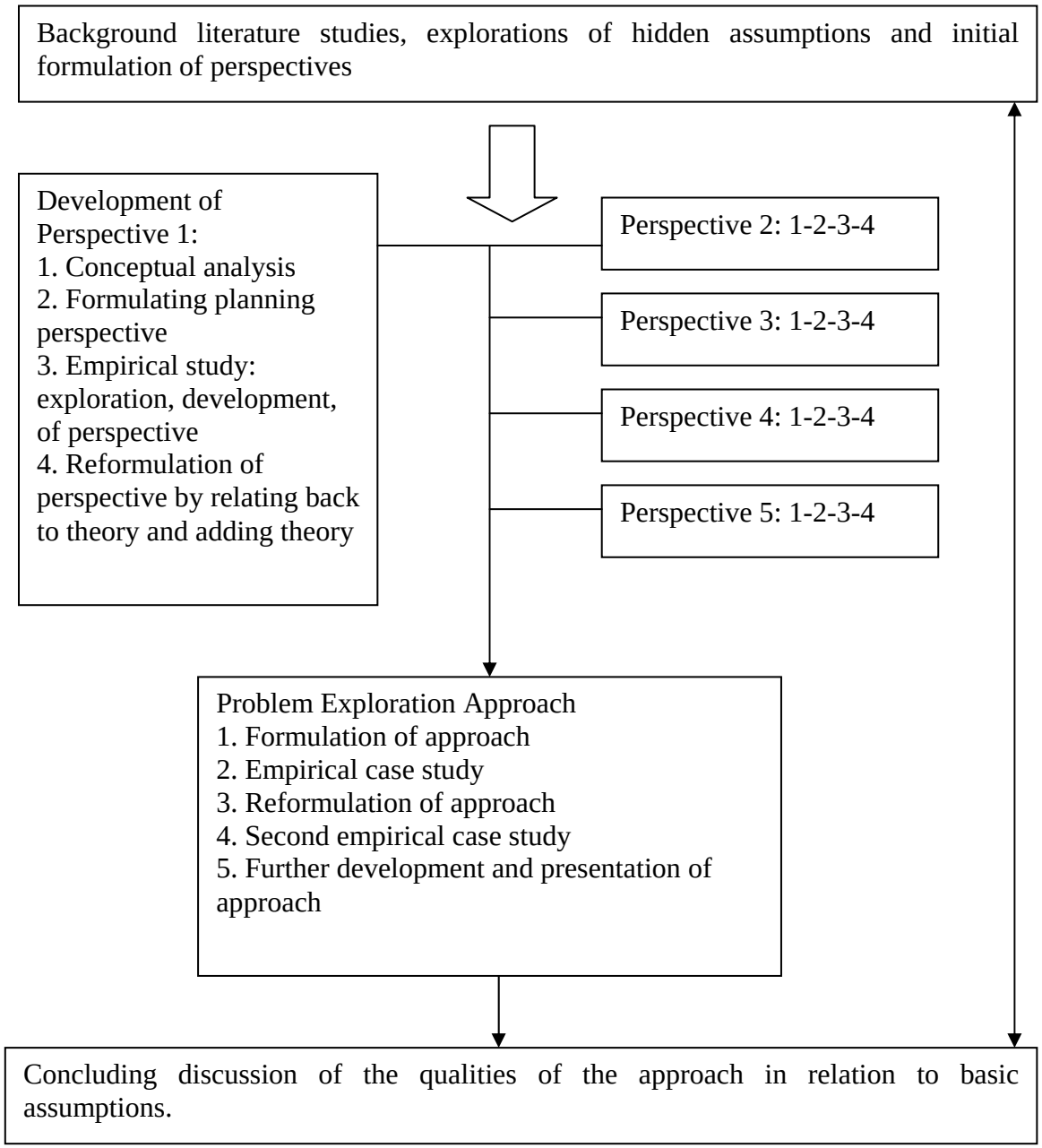


Figure 9. Research process: Interpretive case studies as a research approach: theories and empirics in interaction

3.5.8.1 Overview of Case Studies

A number of case studies of different kinds have been used to develop the results in this thesis. The empirical material consists of a mix of case studies 1) conducted by the author of this thesis, 2) together with associates of the author or 3) reported elsewhere in the IS literature or practice. The point in common for these studies is that they all describe situations where information systems have been used to support knowledge processes. The selection criteria have been the importance and relevance of the cases for the research problem at hand. Here they are presented in a number of tables. First, a table that presents an overview of the cases. Table 5 includes the general source and content of the cases. Then the cases are related to the main research activities, the development of frameworks, and the final planning approach. Finally, the details of the primary cases of the research are given. Six cases have been used during the research process. Three of them build on material from cases reported in the literature. First, an overview is presented of the cases, followed by a detailed description of three of them in tables. Four cases are used for the development of the frameworks and the last two are about testing the planning approach as a whole. First, a summary of the cases, see Table 5.

Table 5. Overview of Case Studies

Case/	*Primary / Secondary material*	*Contribution to planning approach(es)*	*Theme*
E-democracy projects	Secondary material, compilation of existing cases	Framework for theoretical perspectives on knowledge processes, (Aidemark, 2003b)	Summaries of a number of municipal e-gov case studies found in the literature. Applications, their uses and effects are listed. A tentative portfolio is formed, giving an overview of the general e-gov situation.
Governmental Agency	Primary material	Framework: Network and hierarchies (Aidemark, 2002b) AND Flexibility approach (Aidemark, 2002c)	Interview study of knowledge workers of a database of rules and examples supporting them in decisions. Experiences from the work with the system are used to form a number of problematic perspectives on the implementation of knowledge management systems.
Matsushita Industries (Nonaka and Takeuchi, 1995, chapter 4)	Secondary material	Framework for connecting the use of KMS to organizational strategy (Aidemark & Sterner, 2003)	Nonaka and Takeuchi present a case from Matsushita industries. A product development process is described, where the creation and transfer of knowledge form a key component to success.
Systems support workers (Schultze 2000)	Secondary material	Framework for connecting the use of KMS to the organizational context (Aidemark, 2002a, 2005b)	An ethnographic study of systems supporting personnel as knowledge workers. Focus on how support systems are used.
Public hospital	Primary material	Testing and development of approach (Aidemark, 2004a, 2005a) AND Flexibility approach (Aidemark, 2004b)	An interview study of an Intranet implementation project in a public hospital. Members of the project group, from different areas of the organization are interviewed for ambitions for the system and the perceived impact on different groups of personnel.
Printing company	Primary material	Testing and development of approach (Aidemark & Persson, 2004)	An ethnographic study of workers in a small printing company. The work process around the printing machine is followed and described in detail. The focus lies on how the personnel deal with emerging problems and how the knowledge gains are handled and reused.

3.5.8.2 Summary of the Case Study Details

Here the details of the three major case studies are summarized, namely the "Governmental agency case" (Table 6), the "Public hospital case" (Table 7), and the "Printing company case" (Table 8).

Table 6. Details of Case Study: Governmental Agency

Case aspects	*Case: Governmental Agency*
Research Site	
Type of org.	Manages and executes governmental services.
Size	Several thousand employees.
Location	Offices around Sweden.
Research Context	
Background	Research was part of a major development project.
Purpose	Collection of user perspectives as support for systems development.
Relevance of case in this thesis	Understanding of KMS from a user perspective would contribute to a planning approach.
Method	
Approach	Interpretative case study
Data collection method	Interviews. Field notes. Artefacts: documents, screen dumps, project documentation. Group interviews. Participation in project meetings. Systems testing.
Questionnaire	Theme-based, open-ended questions, broad themes based on the KM and ISD literature.
Length	Approx. 1 hour, or letting the interviewee talk until subject was exhausted.
Data recording	Mainly tape recordings, some instances of fields notes at the request of interviewees.
Data analysis	Statements and observations clustered and generalized into perspectives on KMS use and development.
Research object	
Number of interviews	10 interviews + group interview.
Org. position	Administrators, using KMS to make decisions.
Selection of objects	Based on activity in using support systems and interest in related issues. Variation: selection both from a local office and the head office; gender, age, employment time vary.
Research contribution	Case study used to develop one of the perspectives, focusing on a network perspective on KMS.

Table 7. Details of Case Study: Public Hospital

Case aspects	*Case: Public Hospital*
Research Site - Type of org. - Size - Location	 - General hospital serving a local region. - 3000 employees. - Southern Sweden.
Research Context - Background - Purpose - Relevance of case in this thesis	 - Investigation of an ongoing Intranet project on the researcher's initiative. - Evaluation of planning and development process and the outcome effect on the organization. . - Understanding of KMS from a user perspective would contribute to a planning approach.
Method - Approach - Data collection method - Questionnaire - Length - Data recording - Data analysis	 - Interpretative case study - Interviews. Field notes. Artefacts: documents, screen dumps, project documentation, system demonstrations. - Theme-based, open-ended questions, broadly covering perspectives of planning approach in development. - Approx. 1-2 hours. One longer appr. 6 hours /gathered on two occasions. Also two shorter approx. 15 minutes. - Mainly tape recordings, some instances of field notes when requested by the interviewees. - Statements and observations were clustered and generalized into perspectives on KMS use and development.
Research object - Number of interviews - Org. position - Selection of objects	 - 4 interviews + 2 shorter. - Project members, originally from different parts of the organization. - Based on activity participation in project and active work with system. Different perspectives of the project covered. Variation in gender, age, employment time, org. level.
Research contribution	Testing, demonstration and further development of planning approach.

Table 8. Details of Case Study: Printing Company

Case aspects	*Case: Printing company*
Research Site - Type of org. - Size - Location	 - Printing company, typically PR material. - 100 employees. - Southern Sweden.
Research Context - Background - Purpose - Relevance of case in this thesis	 - Masters project (Johan Persson, Växjö University 2003), tutored by the researcher of this thesis. - Investigation of the possibilities of KMS support for on-work learning. - Rich-detail case, displaying problems related to personnel, work situation, organization structure, suitable for illustrating issues raised in the proposed planning approach.
Method - Approach - Data collection method - Questionnaire - Length - Data recording - Data analysis	 - Ethnographic study - Interviews. Field notes, observation of work processes. - General themes from KM literature. - A number of whole-day visits to the factory. A number of hour-long interviews with key personnel. - Mainly observation and field notes. - Citation and rich description were analyzed using perspectives of planning approach. Discussions with data collector over topics and conclusions. Comparison with the original suggestions of systems and development plans. Final discussion on plausibility of conclusion feedback to personnel of the company.
Research object - Number of observations - Org. position - Selection of objects	 - 1 work unit. Interviews with selected individuals in the unit. - Workers in the printing process. - Based on interest in research problems.
Research contribution	Testing, demonstration and further development of planning approach.

3.6 Principles for Evaluation of Interpretative Studies

Qualitative research rests on different ways of understanding scientific knowledge. The production of such knowledge must be evaluated according to those underlying principles. Here two aspects of evaluation are adopted: first, the research approach as a whole is discussed, and a closer look is taken at a central aspect of the hermeneutic principle. These principles lie within the ideas previously presented. However, they provide a more concrete and structured checklist for the validation process.

3.6.1 Evaluating Hermeneutic Research in Information Systems

Klein and Meyers (1999) discuss the criteria for judging qualitative and interpretive case research in information systems. The Klein and Meyers framework is directed towards the hermeneutic type of research.

1. *Principle of the hermeneutic circle*. By this, it is understood that human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form.
2. *Principle of contextualization*. The research should reflect on the social and historical background of the research setting.
3. *Principle of interaction between the researchers and the subjects*. The "data" of the research is constructed in social interaction between the researcher and the actors of the research situation.
4. *Principle of abstraction and generalization*. The material that is collected should be generalized using theoretical concepts. This is done using the principles of the hermeneutic circle and the principle of contextualization.
5. *Principle of dialogical reasoning*. The findings of the research are developed in a dialogue between the preconception of the research and the findings of the study.
6. *Principle of multiple interpretations*. Interpretative research requires an ability to understand a situation from multiple perspectives. Different people see the same thing in different ways, at different times or in different contexts.
7. *Principle of suspicion*. The researcher must be sensitive to the occurrence of biases in a situation, and to the possibility that the whole story does not come forward at once or that some parties might even systematically distort the picture to present themselves in a better way.

These principles are to be used as a guide for this research on a general level. They are also used to validate the outcome. The main principles of hermeneutics underpinned most of the arguments above, as discussed in 3.6

3.6.2 Principles for Validation of Empirical Non-positivistic Research

A framework for the validation of the empirical parts of research is presented by Lincoln and Guba (1985, pp. 301 ff.). The term naturalistic is used to describe an

empirical-oriented non-positivistic research and builds on a number of basic assumptions.

1. The basic view on reality is that it is multiple and socially constructed.
2. The knower and the known are inseparable and interact.
3. The possibilities to generalize results are limited to the creation of hypotheses, which are context bound.
4. The connections between entities of the research are impossible to confine to mechanical cause-effect relationships.
5. The inquiry is value-bound.

Lincoln and Guba (1985) discuss this problem of evaluation research within this approach, using the term trustworthiness, in short, the ability of the researcher to persuade the reader that the findings are worth taking notice of. Traditionally, trustworthiness has been achieved using four key questions: internal validity, external validity, reliability and objectivity. Since the concepts are intimately connected to positivist research, a new set of concepts are presented to reflect the difference. An overview of the differences may be summarized as in Table 9.

Table 9. Positivism vs naturalism/ interpretative research (Lincoln and Guba, 1985)

Positivist Research	*Naturalism/ Interpretative Research*
Internal validity The true value of the research. How certain the connection between an independent and dependent variable is. Builds on the assumption that there is a correspondence or connection between concept and phenomena.	*Credibility*. How credible the representations of the multiple constructions of reality are, which the research produces.
External validity. How generally applicable the findings are. The wider the range of situations the better.	*Transferability*. To what extent a result in one context is possible to use in another context. This is the knowledge of someone that has insights into the "new" context. It is not just a task for the research in the first context. The question is about the similarities between contexts.
Reliability. Deals with the consistency of the research results, whether they are repeatable over time. Will a similar research procedure in a similar research setting produce the same result?	*Dependability*. Two situations are not the same, and the focus should be on emerging insights. The concept takes into account factors of instability and ongoing changes.
Objectivity. Research should be value-free and neutral. There should be a distance between observer and what is observed.	*Confirmable*. The data should be confirmable and not depending on the researcher. As mentioned above, the research is value-based and the researcher is involved personally in the research. This is what is possible in terms of objectivity.

A framework is presented by Lincoln and Guba (1985), organized around four key concepts, each concept being operationalized by a number of possible activities:

1. Credibility. A number of techniques are suggested

1.1 *Prolonged engagement*. The investigator should be involved with a site sufficiently long to detect and take account of distortions that might taint the data. The goal is to gain insights based on multiple influences and to discover a wide range of contextual factors. There is also the problematic balance between staying long enough to build trust and gain deeper access and going native and becoming a part of the situation.

1.2 *Persistent observation*. The ability to identify the most important aspects and factors and focus more closely on them.

1.3 *Triangulation*. The use of multiple sets of either sources, methods, investigators or theories.

1.4 *Peer debriefing*. Exposing the research to disinterested peers, with the intention of discovering aspects of the problem that are implicit in the mind of the researcher. A number of advantages are possible: biases can be unveiled, working hypotheses tested and blind spots could be discovered.

1.5 *Negative case analysis*. Reformulating the hypotheses so that they fit all the characteristics of all reviewed case studies.

1.6 *Referential adequacy*. The data capture should be recorded, using tape recorders or video cameras. This material could then be used during the analysis process to test whether the conclusions are adequate. This material can also be used to further the reliability of the result. Sceptics can use the material themselves to draw their own conclusions.

1.7 *Member checks*. The interpretations and conclusions are fed back to the respondents for evaluation. The process of feedback could be both formal and informal; and it could very well be something that takes place during the data collection process. The result from one group of people could be tested on other groups.

2. *Transferability*. The results of a study are limited to the times and places where it was conducted. To possibilities of transferring it to other situations depend on the richness of the case descriptions, and generally on the level of details of the research in general. The actual transfer is a responsibility of other researches that pick up the hypothesis and try it again. The responsibility of the "original" research is to provide as much material as possible, so that the replication can be made as closely as possible.

3. *Dependability***.** This test consists of some kind of repetition of the study. There are some possibilities of doing this. One is the use of overlapping methods, perhaps in the form of triangulation, as mentioned above. Another way is the use of dual analysis teams, working with the same data and method, and ending with a comparison of the results. A third suggestion is an audit of the material performed by an expert on the field, who assesses whether the study holds a high standard and gives a judgment.

4. *Confirmability*. The process of confirming the research is an audit process, where an external expert checks the material from the raw data to the result. The check is for the quality of the process and the content and aims at confirming that the research holds a satisfying standard.

The goal of this validation framework is to make the research as transparent and examinable as possible (Lincoln and Guba, 1985). A concluding technique using a reflexive diary, where everything is recorded for future inspection, has also been suggested. Overall, these are very time-consuming techniques, but as Lincoln and Guba suggest, not all should be expected to be used in the valuation of one piece of research. Many of these problems derive from the position of the researcher as a person being the main research instrument. The validity of a claim comes from the

possibility of others to do the same thing, and the key to this lies in how detailed the research is presented.

3.6.3 Summary

The Lincoln and Guba (1985) framework makes the unique and context-dependent nature of non-positivistic research clear. The framework focuses on what is possible to do, given the nature of the research. Many of the points fit well into the hermeneutic principles, but have an edge towards empirical studies. The importance of a number of issues shows the connections, including: contextualization, multiple understandings, suspicion against biases/hidden assumptions, and the researcher's personal influences. One aspect differs, the possibilities of generalization using theoretical concepts, which is also to be found in the interpretative case study approach. The hermeneutic approach advocates the positive side of subjectivity, provided that it is openly declared and that the influence of the researcher as a person is clear. Taken all together, the two approaches to evaluation complement each other. Klein and Meyer (1999) provide a framework for understanding interpretative research that is built on theoretical work. Lincoln and Guba (1985) provide a more empirical and practical framework.

4 DEVELOPMENT OF PERSPECTIVES AND FRAMEWORKS

In this chapter, we present the practical development process of the planning frameworks, in form of a selection of the papers. The papers are inserted as sections, with a short overview of the process as a starting section. The papers present as they were published, but have gone through a renewed language review. Some minor changes regarding internal references have been done in order to fit together with the thesis document.

The research process is driven forward through a series of papers, three major types can be found:

- Overviews of the problem area, theoretical papers that develop problems and presents basic literature studies. These papers describe the development of the frameworks. None of these papers are appended, discussed or referred to in any greater detail, most of the relevant material is assumed to be condensed and included in later paper.
- Development of frameworks, further literature studies and presentation of frameworks. These papers are discussed and referenced to but not appended.
- Case studies as tests and further presentation of the frameworks and the final planning approach. These are the key papers and are presented in chapters 4 and 5. The papers appear as they were published. Editorial changes of grammatical errors, dubious use of word etc. have been done.

4.1 Overview of the Development Process and Papers

When the project started a tentative idea for a planning approach was to mix parts of critical success factor approach (CSF) with parts of the soft systems methodology (SSM) and to make it useful for the KMS area. The idea was to find a mix of strategic planning models that stimulated ideas about possible systems, just as in the CSF case and then to work with these in an approach inspired by the soft systems thinking. The use of approaches in strategic planning (Earl, 1989) was a source of inspiration together with examples of how to combine planning models (Ward et al., 1990). However, this was a starting point, and the practical work was conducted by investigating possible frameworks in a series of papers, here we give an overview of this process. To make it easer to read, we use the numbers attached to the frameworks as presented in chapter 1.4.

An early attempt to package a number of planning models/concept into a planning approach (Aidemark, 1998) using the strategic flexibility framework (Evans, 1991), could be seen as a pre study for this thesis. On the start up of the thesis work, this approach was adapted to knowledge management perspective on support of work processes (Flexibility, Aidemark, 2000a). Studies in the KMS field quickly showed

that the field was diverse and just one framework would not suffice. Next, a second framework "Organizational contexts (4)" (Aidemark, 2000b) focusing more on contextual/cultural factors was developed, based on (Huber, 1981).

During these studies, knowledge emerged as very diverse phenomena, a traditional cognitive view on humans as information or knowledge handles, were far from enough. For example sociological theories like knowledge sociology (Berger and Luckmann, 1966) were studied. Macro economic trends including knowledge as a key resource was also studied, in particular Castells, (1996) the rise of the network society seemed very relevant. Armed with these theoretical perspectives a reinvestigation of a case study was conducted. The case ("Governmental agency case") was built on a "knowledge repository" project as support for decision makers, (1995-97). During this project more traditional theories were used, but interviews were conducted using broad themes making the material suitable for reinvestigation (Including perspectives like: knowledge, learning, work support, communication). The interviews were analysed again and resulted in an insight of the need of a broader approach for KMS in general discussed in a list of potential planning perspectives as discovered in the case (Aidemark, 2001). The paper (Aidemark, 2001) was then refined, resulting a more specific framework for understanding KMS in the transitions towards a network organization, (Aidemark, 2002b) (Network and hierarchies, 5). A testing and redevelopment of the "Flexibility (2)" perspective and "Organizational context (4)" perspective were also conducted during 2002. The "Flexibility (2)" perspective was tested against the "Governmental agency case", (Aidemark, 2002c), and later also in (Aidemark, 2004b). The "Organizational context (4)" perspective was tested against a case from the literature (Schultze, 2000) the result was presented in (Aidemark, 2002a, 2005b).

A more traditional strategic business planning perspectives was tackled using the balanced scorecard model. Theoretical developments and testing were performed in a fruitful co-operation with Håkan Sterner during 2002, resulting in a publication in early 2003 (Aidemark and Sterner, 2003). The case use for the testing was taken from (Nonaka and Takeuchi, 1995, chapter 4), based on studies at Matshushita Company. The outcome was a planning framework: "Business strategy (3)" perspective or "Knowledge management strategy" perspective.

In 2003 the "Knowledge process (1)" perspective was developed (Aidemark, 2003b) and tested on a case compiled from E-Government cases (Aidemark, 2003a). This framework is the result from many attempts to deal with the nature of knowledge in earlier papers.

4.2 Perspective 1 "Knowledge Processes"

In this section the paper "Cognitive, Social and Critical Perspectives on Planning a Knowledge Support Portfolio" (Aidemark, 2003b) is presented.

The paper suggests a framework for balancing a set of knowledge support systems. The analysis is based on two dimensions: organizational level and knowledge aspects. On each organizational level (personal, group, strategic/organizational) three aspects (cognition, social and critical) are investigated. The framework presented in this paper is tested on a case study of the field of e-democracy. The outcome is a balanced set of support systems, a knowledge support portfolio.

4.2.1 Introduction

The rise of knowledge as the key source of success both for companies and organizations in general has put information systems (IS) in a new situation. They are expected to support knowledge processes, but the right application of IS demands an understanding of a "knowledge perspective" on the problem area. The planning of IS for the support of knowledge processes should be based on a wide understanding of this perspective. The aim of the paper is to provide a planning framework that can be used as a knowledge support portfolio, thus creating a space where a varied set of needs and problems in knowledge support can be related and discussed. Knowledge can be viewed from three perspectives, a cognitive (Piaget, 2001), a social (Berger and Luckmann, 1966), and a critical (Foucault, 1979) perspective. All three are continuous, human perception taking place within a social discourse that is controlled by a set of powers. Knowledge is what we see, what we talk about and it is also a way of limiting what we may think of. An information system directly contributes to the cognitive perspective, but operates in a field of social interactions and power struggles.

4.2.2 Method

The approach of this paper is an analytic literature study. It is based on the assumption that there are a number of different approaches to organizational knowledge problems. These problems look different depending on what level of the organization one focuses the analysis on. The analysis is based on two dimensions: organizational level and knowledge aspects. On each organizational level (personal, group, strategic or organizational) three aspects (cognition, social and critical) are investigated. This analytic frame (forming a 3x3 matrix) is used to investigate the area of knowledge management. The intention is to provide a framework that can be used to scan the situation before a KM project is started. The assumptions and aims in the different perspectives can be spelled out in relation to the aspects of the matrix. One assumption is that the aims and goals of a KM project are not the same as the built-in assumptions of traditional IS/IT projects, expressed as the knowledge perspective on information systems.

The framework presented in this paper is tested on a case study of the field of e-democracy in Sweden. E-democracy is looked upon as a knowledge project, in the sense that it seeks to educate and engage the public in democratic processes and issues. It tries to affect the way people perceive and take part in local government processes and to help them to form opinions and to participate generally.

4.2.3 Background Theory

4.2.3.1 Theoretical Framework: Knowledge Perspectives and Organizational Levels

The traditional view of the IS area is based on a cognitive perspective (Piaget, 2001) on knowledge. Information is a flow of messages that changes a person's state of mind or mental scheme (Belkin, 1990). Knowledge roughly consists of beliefs that a person has, beliefs that he/she thinks are true and can be justified in certain ways. Here knowledge is looked upon as an object, which is possible to handle outside humans. In (Polanyi, 1958) the tacit dimension of knowledge is presented. The tacit aspect of human knowledge is everything we know but cannot really express, sometimes not even to ourselves. By focusing on a particular issue, knowledge is structured and connected into explicit knowledge, thus making it objective.

A person's knowledge is developed in social interaction with other people, Berger and Luckmann (1966) claim in their theory of knowledge sociology. A sense of reality is given to our awareness through social interaction with others. A person's knowledge is dependent on the social context where that person belongs. The three basic concepts of these social processes are externalization, objectification and internalization. There is interdependency between them, for example at the same time that a person internalizes an objective fact he/she is also externalizing his/her experience of it and contributes to the objectification of the meaning by accepting it in front of others.

From a critical perspective, knowledge and power are intimately connected (Foucault, 1979). Power is the ability to decide what is possible to know. These powers are often not very obvious, and making these processes explicit and visible requires key efforts. Foucault calls them micro powers, consisting of practical decision making shaping the perception of the world. The point is that these ideas are not natural or bestowed by some divine entity but created and changed by man in a series of decisions and for certain purposes. In the area of systems analysis some critical aspects can be found in critical systems thinking (Flood and Jackson, 1991b). Important concepts in this area are emancipation, pluralism and the exploration of hidden assumptions in history (Schecter, 1991).

The organization is viewed from three perspectives, the personal, group and organizational or strategic levels. The personal level focuses on how an individual is affected by e-democracy and how IS/IT can be used. On the group level the focus is on the interaction between people, and essentially on how IS/IT are used to connect them. On the organizational or strategic level, the situation is seen as a whole, as a system. Here we look at the intended contributions that IS/IT should provide and at basic assumptions about the nature of the situation.

4.2.3.2 IS Supporting Knowledge Processes

Knowledge management systems (KMS) are discussed in (Alavi and Leidner, 2001). They are said to be "IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer and application." (Alavi and Leidner, 2001, p. 16). A model of organizational knowledge

processes and the relationships between these processes is presented and used to discuss the potential role of IT.

On the other hand, if the focus is on the knowledge worker, a support system should include all the activities that support the knowledge worker in his/her task to learn and to use his/her knowledge. This perspective on support systems is described by (Huber, 1981), who points out that it is a problem for the general field of decision support systems that it only focuses on the technologies. The support system is defined by its organizational utility, not by the technical configuration. This suggests that a "knowledge support system" could be an aspect of current IS/IT applications used for knowledge work.

The control of what is possible to be known or what is acceptable is a source of power. Setting an agenda and making definitions create a firm grip on a social situation. An information systems development project carries with it a possibility of controlling the members of the organization (Suchman, 1994). There is a politics of categories, Suchman claims. When these definitions are frozen into a computer system, they become even more dominant and very hard to change. The computer system may also hide the logic of the language and separate the origins of definitions from their application in practical situations.

4.2.4 KM Perspectives

4.2.4.1 The Personal Level - the Knowledge Worker

The basic assumption about the knowledge worker is the idea of knowledge as a key resource or production factor. Some people in the organization must be more central for knowledge to be utilized and become important to the organization. Knowledge workers are people that rely on personal knowledge in their work and whose work is to produce new knowledge and information (Stehr, 1994).

In a company, knowledge contributes in different ways (Castells, 1996), value-adding, relation-building and decision-making. In the network society, building relations between members in the workforce and outside the organization is an essential task. Knowledge workers should be "networkers" who create contacts on their own initiative. But what makes this a difficult issue is that culture and identity are no longer based on a hierarchical organization but on the network of people. The basis for knowing from a social point of view is the network and the identity of people based on that network.

From a critical perspective (Schultze and Cox, 1998) a knowledge worker is a person that deals with a resource that has a high symbolic value attached to it, i.e. knowledge. This will create social stratification, i.e. a rift between people that deal with important things (creating new knowledge) and those who are concerned with less important things like physical and repetitive tasks. This is a breeding-ground for a potential new conflict of societies and organizations.

4.2.4.2 Knowledge on a Group Level

Knowledge ecology (Malhotra, 1998) implies a network of individuals where knowledge is shared. In knowledge ecology the focus is on knowledge exchange or knowledge flows. The partners involved in these networks co-operate for survival. Knowledge ecology will prosper only if a diversity of knowledge is allowed. An example of this is co-operative competition. In this context the concept of knowledge markets appears, (Davenport and Prusak, 1998) where the knowledge exchanged between people is based on the expectation of the favour being returned.

One other way of understanding this situation is through the community of practice (Wenger, 1998), (Brown and Duguid, 1991). Communities of practice reflect the general need of humans to share knowledge and to learn from each other. The community acts as a repository of knowledge; by participating in a community we can share our competence with others and partake of other people's competence.

Social control in institutionalized environments by the maintenance of symbolic universes (Berger and Luckmann, 1966) can be a strong barrier to the creation of new knowledge. (Zuboff, 1988) gives an example of a new mailing system introduced in a company to enhance internal communication. The discussion among employees caught on and became a breeding- ground for dissent. The manager who introduced the system became suspicious, entered the discussion and killed it. In (Hayes and Walsham, 2001), this problem is discussed in terms of political free zones, where debate can be open and free.

4.2.4.3 Organizational Level: Knowledge as a Strategic Resource

KM can both be understood as a business strategy by itself or as a supplement to an existing strategy (Davenport and Prusak, 1998). Here KM is discussed as the support of an existing project, such as organizational learning, TQM, decision support or accounting/intellectual capital. Looking at KM as a business strategy of its own, strategies can be of two types (Hansen et al., 1999): codification or personalization.

The first is focused on coding knowledge into databases, supporting the re-use of knowledge and growth. The codification strategy, based on an objective knowledge view, is a way of using a database system to save the knowledge of the organization, for example that of the employees. The knowledge of the organization's operations would then, it was hoped, not disappear when employees disappeared, and would thus help new employees to take on work faster.

The personalization strategy focuses on the communication of knowledge on a personal level, supporting creativity and the customization of products. An example of this is found in (Nonaka and Takeuchi, 1995), with the theory of organizational knowledge creation (OKC). Here knowledge is seen as something basically human, and it is by the presence and actions of individuals that knowledge is created and distributed.

On the critical side, Alvesson and Kärreman (2001) have pointed out the possibility of KM as a means of organizational control. Given the increasing importance and the

personal and intangible nature of knowledge, KM becomes the way for managers to get a grip on this problematic resource. In this sense KM is a way to discipline the knowledge worker.

4.2.5 The Knowledge Perspective on IS

This analysis of different aspects of knowledge in organization and its connections with the planning of information systems can be summarized (table 10). The intention of this matrix is to provide a conceptual framework for the knowledge perspective. Concepts or issues are gathered exemplifying the problems and/or analytic approaches that should be worked on in order to present a knowledge support portfolio.

Table 10. The knowledge perspective on information systems planning

Knowledge Aspects **Scope**	**Cognition**	**Social**	**Critical**
Individual	Perception / Information support Tacit knowing	Identities Sense-making Internalization	Micro powers Empowerment
Group	Co-operation /Competition Technologies for co-operation CMC, CSCW	Communities of practice Sharing knowledge in networks	Institutional control mechanisms and roles, Free discussion zones
Organizational / Strategy	KM strategies Knowledge as a resource	Organization as a knowledge system Knowledge creation	Institutions as instruments of repression KM as a control instrument

4.2.6 Applying the Framework

In (Aidemark, 2003a) an investigation of the current overall situation of e-democracy in Swedish municipalities, i.e. the use of IS/IT as a support for democratic processes, is presented. This study, basically a literature study, describes the current situation in municipalities and the projects and initiatives relating to e-democracy. The outcome of the study is a set of IS/IT systems applied to these purposes, most of which, as systems go, are ordinary systems often found on the web at large. It is their use for distributing and/or creating knowledge in the context of democratic processes that makes them interesting from a knowledge perspective. The outcome of the analysis of these projects and IS/IT systems in use produces the following picture (table 11).

Table 11. The knowledge perspective on information systems support democratic processes

Knowledge Aspects **Scope**	**Cognition**	**Social**	**Critical**
Individual	Homepages, providing protocols, agendas, contact information	E-mail, corresponding directly with politicians, Web-TV broadcasting	Dialogue systems, Making decision-making transparent
Group	Web questionnaires, Citizen panels, providing feedback on current issues	Interacting on discussion forums or chats, creating a feeling of belonging	Defining topics on forums Raizing question on chats, Real-time questions during web-cast meetings
Organizational / Strategy	E-democracy projects for “fast” or “thin“ democracy, Advisory web-voting	Supporting a “strong” democratic process, Community networking	Supporting a direct democracy project, creating a Web party

Some conclusions can be drawn from this picture. The most frequent systems uses were found in the cognitive / personal aspects of the framework. Three different reasons for the existence of IS/IT systems could be detected.

1. From a cognitive aspect, supporting e-democracy is a communication of knowledge, enabling voters to absorb more relevant information and make a more informed choice, and probably also take part in more referendums.

Speed, time and cost are keywords here, making this perspective a very classical IS/IT project. What makes it differ from other IS/IT projects is that the aims of officials and political parties are to teach their citizens.

2. From a social point of view, e-democracy was said by officials to be an effort to make people more interested in taking part in democratic processes and willing to do so. Both direct contacts with politicians and the discussion forum proved very important for this purpose. But a closer look showed that for unknown reasons only 19 % of the municipalities had introduced such systems.
3. From a critical position, the support systems act to enhance to ability to influence the agenda-setting process. For example by unrestricted contributions with perspectives or topics, changing the course of a discussion, by unmoderated forums or by the formation of a party that can act as a platform changing the political agenda.

The analysis revealed a gap between the ambitions of the project coordinators and what the potential users expected. The interest in these systems from the citizens' perspective was very often connected with the level of their actual influence on the agenda, and with the opportunity to affect the course of events. On the part of the politicians, the systems seemed a way of distributing information via a controlled channel, and of gathering opinions from voters.

In this case, different types (Gidlund and Möller, 1999) of democratic processes can be seen, for example

- Thin democracy, focusing on the resources spent, with IS/IT used to reduce the cost of the processes. This implies a knowledge process that is of a cognitive kind, assuming that the information material is understandable to all involved.
- Fast democracy, where the speed of the feedback in questionnaires and referendums are in focus. IS/IT again support cost effective solutions. This process seems to work best within existing domains of understanding.
- Strong democracy, where the democratic discussion and participation of citizens are in focus. The expectation is that IS/IT will contribute to a discussion platform where respect, tolerance, openness and mutual confidence are cultivated. Here we find a view of knowledge as a social process.
- Direct democracy, focusing on the ability of citizens to formulate problems and solutions. More important still is to find ways of realizing these ideas, through referendums or in decision-making boards. IS/IT are used on all fronts, providing facts, promoting discussions and offering a platform for organizing people. Here we find a support for understanding and redefining the contents and processes of knowledge.

4.2.7 Discussion

The suggested framework shows some possibilities for paving the way for KM projects or, as demonstrated above, provides a means of interpreting an existing area of support systems for knowledge-related problems. What the framework provides is:

- Categorizations of IS applications from a knowledge perspective.
- The linking of organizational goals, knowledge processes and supporting information systems.
- A discussion of the basic assumption as regards the contributions of the system to knowledge processes.
- A discussion and detection of gaps between the espoused ambitions behind the systems and actual achievements.
- A discussion of gaps between different understandings of the applications of the systems among different groups of people affected or otherwise involved.

The case of e-democracy introduces dimensions that have been little discussed in profit-making organizations. Here the critical perspective of the conditions under which knowledge is developed has been presented. The e-democracy case was focused on support systems developed by municipal initiatives and on projects, most of which provided facts to people and gathered opinions from them. Most of the systems used are more or less standard applications (except voting systems and security aspects). It is the ways they are used and the rules and aims that direct the use of them that make them into knowledge support. Just providing a forum does not result in community building. A critical approach provides the focus on the mechanism of power (i.e. the transparency of power) and the historical background necessary for interpreting the present. At the same time homepages and a forum would probably constitute a support for these activities. But to make it happen, the systems must be tested from all three perspectives discussed in the framework in order to provide a balanced knowledge support. A set of support systems providing different aspects of the problem, in other words a knowledge support portfolio, is needed. The conclusion is that the knowledge perspective moves the focus of information system planning from technical issues towards the issue of how systems are used and in what context. Generally the KM support portfolio should be understood from all three aspects of the knowledge perspective.

4.3 Perspective 2 “Flexibility in Work Processes”

> *In this section the paper “A Flexibility Approach to Planning an Intranet in Support of Knowledge Work” (Aidemark, 2004b) is presented.*

The aim of the paper is to investigate how a strategic flexibility approach can be used for the planning of information systems as support for knowledge work, i.e. knowledge management systems (KMS). The result of a case study of an Intranet

project is presented, discussing systems that cover the perspectives of strategic flexibility and illustrating the application of the concept. A concluding discussion argues for this approach to knowledge management as a key activity in balancing change and stability in the organization.

4.3.1 Introduction

This paper investigates the usefulness of the concept of strategic flexibility (Evans, 1991) for the planning of information systems as support for knowledge work. Flexibility is an ability that organizations in fast moving environments are in great need of. The concept of strategic flexibility describes a set of manoeuvres that an organization should be able to perform in order to deal with changes and emerging developments. The strategic flexibility concept has been used for planning information systems (Eardley et al., 1997) and understanding the role of information systems for organizational flexibility (Levy and Powell, 1998).

This concept is investigated using a case study of the implementation of an Intranet in a public hospital. The hospital is working in a fast changing environment; patient needs, political changes, money problems, knowledge development in medicine etc. They are also competing with other hospitals in the region. The past 10 years have meant a series of organizational changes that have put strain on the staff and leaders. The Intranet was introduced as a means for coping under these conditions. The aim of the system was dual, both to create an efficient information channel and to contribute to a dynamic learning environment for the organization. The Intranet today works as the main information channel of the organization, but finding the right application to support the knowledge dimension proved harder. A wide range of applications has been developed, including: departmental pages, communication support, document management system, knowledge repositories, and discussion forums. After an initial optimistic phase, interest cooled and ideas for further development became fewer. The problem at hand for this investigation was to suggest further knowledge applications of the Intranet, and the flexibility concepts seem to fit the problematic situation. The practical aim was to support the process on a local level and to get the flow of ideas going again.

The aim of the paper is to demonstrate how the strategic flexibility concept can be used to investigate possible knowledge management systems. Knowledge processes i.e. knowledge creation, codification and transfer/use (Grover and Davenport, 2001) support the core processes of the organization (in the case a treatment process). The question is how this core process can become more flexible by developing related knowledge processes and their support systems. The planning perspective is on a strategic level, that is, a high level discussion about which application that should be developed and what the contributions to the organization should be.

4.3.2 Theory

Evans (1991) discusses the concept of strategic flexibility as the ability to change strategies when circumstances change. The aim is create a wealth of possibilities by

Table 12. Strategic flexibility (Evans, 1991)

Flexibility	Offensive	Defensive
Pro-active	Pre-emptive action	Protective action
Re-active	Exploitive action	Corrective action

systematically preparing a number of sets of actions and to develop a readiness to switch between them. To guide this planning process, Evans presents a framework with four principal types of actions or strategic manoeuvres (table 12). The framework is based on two dimensions: acts in advance or after the event and acts that are offensive or defensive.

The key to the understanding of this model is the focal or triggering event that the manoeuvres are aimed at. In the case study the core processes are signing in patients, treatments and signing out of patients.

Eardley et al (1997) use the strategic flexibility framework to investigate how a flexible portfolio of information systems can be planned (cf. McFarlan, 1984). Levy and Powell (1998) used the same framework for investigation of the assumption that small and midsized enterprises (SME) are flexible. The outcome of that study showed that factors other than information systems are important, and for that matter it is rather SME's as a group that are flexible rather than individual businesses.

4.3.3 Method

The framework of strategic flexibility, combined with knowledge management concepts, was used in a case study as a planning framework. It was used to structure the present set of planned or implemented knowledge management systems. It was also used to provoke new ideas concerning how the Intranet could support knowledge work. The organization is a public hospital in Sweden, with an ongoing Intranet development project. The focus in the initial stages was to develop a paper system for internal communication, information transfer and to support knowledge work. The Intranet was introduced in an optimistic mode and quickly met the expectation of fast internal communication. The process was centrally guided but the needs of the organization were the guiding light of the project. However, further development of the project proved harder. Ambitions to support the knowledge organization were expressed but proved hard to realize. To be able to continue development, the initiative was reconstituted on the departmental level. People involved in knowledge creation and distribution were asked to fill the system up with useful material. Departmental IT-developers and web-editors were given the task to further the use

within the departments by looking for opportunities and encouraging use. The target for this research was an IT-developer of one department at the hospital. The department was the emergency room with about 300 employees.

Data collection consisted of a number of deep interviews and e-mail exchanges for clarifications. The questions asked were first of a general kind, “how was the Intranet used to support work at the department”, “what projects are in progress or are being planned?”, “Are there any problems surrounding the work process?”. These discussions were then followed up by questions building on the four perspectives of the strategic flexibility framework in combination with the general knowledge management process. The focus of the investigation was the core process of the emergency room, i.e. accepting patients, providing treatment, and signing out the patients to other parts of the hospital or back home. The analysis focused on existing or possible systems that seemed relevant from a flexibility perspective. Then the knowledge aspects were examined, (if there were any), and how support could be provided.

4.3.4 Case study

4.3.4.1 Pre-emptive Action

Here we look for systems that increase the number of possible actions that prepare the organization to do things the right way.

A key component in the work process is the knowledge base, an extensive collection of documents (in the organization these are called “Memos”) specifying all types of treatments that the staff of the department need. These were a central part of the Intranet development and are today fully digitalized. One problem that was discovered was that these documents, the Memos, were locally developed and publicized on departmental pages. The format for the document varied between departments and disciplines. The Intranet contributed by making it clear where to find the latest version and generally to make documents more accessible. A key knowledge process is found in the development of Memos. The hospital library provides support by supplying medical information; typically, a search system for scientific material. This process ensures a steady development of new treatments. In connection to this there are search systems and databases for Memos that are developed on a regional or national level. From the flexibility point of view the document should have links to alternative or associated treatments. By connecting the Memos, knowledge transfer and use could be improved. This support might affect the department’s agility, making it easier to switch between directions of treatments.

Today, information about incoming patients is handled using paper systems locally at the emergency department. A system for handling this information is discussed. This would not be a clear knowledge project, for example it would not make the priority between patients, but just provide facts in support of judgments by a senior nurse. The system would provide a better overview of the treatment process and could be a step towards more effective personnel planning. However, for the system to be really

effective, a change of the use of competences at the department would be necessary. There are doctors and nurses in the emergency room from different disciplines, taking on cases that fit their competence. As a part of the implementation of the system, teams put together from different specialties would take on any incoming patient. This would require that everyone could deal with most of the problems that usually come to the emergency room. In turn higher demands on knowledge transfer between specialties would follow. In the end this could mean higher agility in the use of the departments' competences and more effective workflow in the work organization in general. By transferring a core of knowledge to more people each one becomes a more versatile knowledge worker. The Memos and the Intranet might have a small role in this process, but not an important one, as a person-to-person mode of knowledge transfer is preferred in the hospitals knowledge culture.

There is no overall system for keeping track of staff competences and strategic or tactical development of competences. Much is up to the manager of the department and ward leaders to handle these issues. When it comes to deciding whether to hire new staff and what competences are needed, personal knowledge is a key factor. Connected to these issues there should be some instrument for planning the courses that personnel should be sent on, when and why. Such a system should make the department more able to meet the right challenges, thus becoming more versatile. In the end this should mean that the staff in total could perform a wider range of treatments. To make the provision of competences more effective, the Intranet could be used for an internal job market for the hospital at large. Wards could announce that they need a nurse of this or that specialty in the next 24 hours if anyone wants to work overtime.

Today, the Intranet provides means for drawing attention to news about new treatments, by announcing it on the first page of the Intranet or distributing news by e-mail on demand. These news services should be extended; this could be done in context of the patient handling system. When a patient is admitted, and symptoms and /or diagnosis are made, news about these issues should automatically be retrieved. This would enable the department to incorporate new ways of work faster. It would also affect the agility aspect of knowledge transfer, i.e. the users of the Memos can change their work methods more rapidly.

4.3.4.2 Protective Action

Here we look for systems that support actions taken in advance in order to avoid problems.

The Memos, the know-how documents, are aimed at getting things right. From a protective perspective the advice could be to implement "do not do this" warnings. The Memos could highlight dangers and known traps that might lead the treatment in the wrong direction. As support for this aspect, there is material from an incident report system that could be used. Everyone in the hospital is supposed to register things that have gone wrong into this system. The reports are then evaluated and corrected for example by changing memos. But a faster feedback on potential

troubles by associating the report to the Memos, and explicitly saying “do not do this” might contribute to a more robust work process.

Today there is a training version of the patient journal system. This can be used if the nurse is unsure about how to handle the system and wants to try it in a safe way. This is a general and good example of how to spend some extra resources, slack, to avoid problems. This is a pattern that could set examples for other situations. Training close to the work situation is practical and effective.

Probably the most important way of ensuring against problems or doing the wrong thing is to have extra personnel that oversee the procedures. The most common example of this is doctors in training who have a senior doctor, an auscultator, to help out and ensure that everything goes well. This is not something suitable for computer-aided support, but rather points in the opposite direction. This is an example of the knowledge culture among doctors at the hospital, that is, knowledge as personal and local, transferred through person-to-person contact. The personal contact is necessary to verify the abilities and create a trust for this kind of work. The possibilities for computer support are limited; a suggestion might be to start an electronic community for auscultators, for planning or sharing knowledge of this key activity.

To provide educational videos for practical procedures is strait forward knowledge transfer support. This might not give more information than the Memos, but give extra reassurance for staff that feels insecure. This should not be the main channel for knowledge transfer, but rather a complement to personal-to-person knowledge processes. Today many complex treatments are videotaped and could be made available. This could be used in many situations; a simple example of this was an Intranet page dealing with a new type of Dictaphone connected to the computer. To get started with a new technology some extra support was helpful, in order to avoid problems and to prevent doctors resorting to old technology. This is also an example of providing several ways of doing the same knowledge task, a form of hedging.

Checklists are important in emergency situations, such as those compiled in catastrophe plans. The checklist specifies actions on different levels of the problematic situation and what different categories of people are expected to do. These are found on the Intranet, but for all practical reasons everyone also carries them in the pockets. When they are needed no one can expect to be able to log on a computer. Basically these instructions should be known by heart, but when things move rapidly, the checklists are helpful. The support might be handheld devices with wireless connections to the Intranet. This might not be a real possibility as the hospital has invested heavily in stationary computers. But this points into an important direction for development of the flexibility of work in general and the use of the Intranet in particular. A major problem today is access to computers. They are often stationed centrally in the ward or in offices. Even though there are many or them, there may be many people wanting to use the same terminal.

4.3.4.3 Exploitive Actions

Here the focus is on systems that help the department to take advantage of opportunities in order to improve the situation when the event is completed.

Today there is support for taking care of lessons learned through an incidents report system. This system consists of templates, a database and e-mail connections and is used to gather reports of failures or potential failures. Each and every person that experiences a problem or a potential hazard is expected to file a report to his or her supervisor. This person should make an analysis and decide if the report should be taken further or the problem is too simple. If the problem is deemed important enough, changes are suggested and the problem is saved in a database. This process is supervised by a third person that makes sure that there is progress in the handling of the problem. This manoeuvre supports a knowledge creation process and adds to the organization's adaptability.

The patient journal is the major system for retaining knowledge about treatments and the hospital has a complete digital system for handling these. This works well, but what could be investigated further is the capabilities of eliciting knowledge from the experiences made during the treatment and how the database is used for research and learning. Knowledge elicitation could be supported by the use of more elaborate questionnaires. The current set is rather general. The knowledge created by research on these files is used in the development process of Memos, in this sense this is a part of the organization's adaptability.

An important part of the department's knowledge and learning processes is staff meetings. Here time is given for presentations and discussions on current issues and problems. An obvious support for this kind of activity is discussion forums and the Intranet does contain a number of such forums. However, these are very little used, for example a specialist forum was established, but there is no up to date online activity. This might be explained by the use of e-mail or personal meetings for communication. The nature of the discussions might be more suitable for these forms of communication. This support would be focused on knowledge transfer and can in the best case become an arena for creative discussions and the development of new knowledge. If Intranet support is not used, the possibilities of creating a knowledge repository are lost, together with possibilities of wider dissemination of the knowledge that is developed.

4.3.4.4 Corrective Action

Here we look for systems that support actions taken in order to minimize the effects of emerging problems, after the event.

A system, implemented within the Intranet project, keeps track of free beds in wards throughout the hospital. This is an important system for the emergency room, not least if it fills up and it is necessary to move people quickly in order to make room for incoming patients. The system is updated at least every fourth hour, if not there are personnel that will call the ward and gather the information. From a flexibility point of view this is important, but from a knowledge support point of view it is not

directly relevant. The best case is if it frees the minds of knowledge workers from practical problems. But together with the system there are rules for how to use hospital beds if there are shortages. This is an important instrument for making difficult decisions. Further, it changes the climate of co-operation between specialties. The system helps the organization to be more resilient; it helps to cope with extreme changes.

A more traditional way of providing competence for the emergency rooms is telephone lists. Today a digital telephone system is in use, which can call a large number of people depending on the situation. Here the Intranet is useful, with a page for sending a text message using SMS as a means to get the information out. If the problem is of a more special kind it is up to the individual doctors to use their informal network to know whom to call. Here the experiences of the people at the telephone central are useful, or the secretary on duty at the ward of the specialist area. These human sources might give quick answers about whom to contact. Development of support systems that affect these workgroups and automating work might decrease these knowledge functions. For example, a doctor used to have a single secretary that wrote the journals. Now a system of digital journals is breaking up this relationship as the audio files are sent to a general pool of secretaries.

4.3.5 Contributions of the Framework

Some general observations on the planning framework can be concluded.

The organization chooses to leave the development of large parts of the Intranet to departments or local groups. The planning framework contributed with a way of structuring diverse projects, applications in daily service and ideas that different people might have about future systems. This overall view was lacking in the organization.

The analysis put a focus on the knowledge base and how it is developed, structured, coded, transferred and used. This central knowledge process is not systematically supported by the Intranet or other support systems.

The flexibility framework is process oriented, it focuses on the core activities and how to the support them. The organization is very traditional and functional in its very nature. The flow between disciplines and functions is not very well organized. It also proved to be a way of relating the work processes with the knowledge processes.

Flexibility is something that emerges out of the combination of the four strategic perspectives. The application of the model shows the necessity to interconnect between the systems in the four perspectives, that is, between different kinds of knowledge management approaches. This is important both when it comes to the different suggestions that affect the same issue and also how different issues are interconnected.

4.3.6 Discussion

This investigation has brought forward a number of more general concerns regarding KMS. Three issues are discussed here, first a knowledge management/human resource planning (HRM) connection, then a KMS connection to other uses of IS, and lastly KM as balance between change and stability in the organization.

The development of a knowledge base must be planned together with the competence provision processes (HRM). A combination of these two aspects of knowledge management is the key to flexibility by the management of knowledge processes and support systems. The importance of connecting the two major directions of knowledge management became clear. Both aspects have roles to play in each of the strategic manoeuvres. Technology serves both as a retainer of knowledge for performing work processes and of meta knowledge for the planning of capabilities. The focus on the work process and the flexibility problems, rather than the knowledge work and knowledge management processes, contributes to this.

The situation that surrounds the knowledge work must be planned together with knowledge support systems. The Intranet is used in support of both knowledge work and more traditional information work. Sometimes the same system supports both aspects depending on who uses it. Knowledge workers also have essential non-knowledge related work tasks that affect their situation and these must be taken into account. Supplying information support to knowledge workers gives them time for their essential work tasks. Sometimes changes in the support of knowledge workers will have consequences for the situation of other groups of people and their use of information systems. Changes in information systems for work tasks with low knowledge content might change the conditions for knowledge workers. In short, it is hard to distinguish a clear line between knowledge support and other forms of information system uses.

To achieve flexibility using KMS, a trade off between knowledge creation on one side and codification and transfer on the other must be found. Flexibility implies a balance between change and stability. Some of the manoeuvres of the strategic flexibility framework are aimed at achieving enduring changes in the environment, while others are aimed at facilitating changes in the organization as a response to new conditions. Knowledge is not just a strategic resource; it is the balance point between stability and change. Personalization of knowledge must be achieved, that is, the right way of performing a task must be transferred to the worker. This becomes a stabilizing factor in the organization, ensuring that the same standards of operations are used throughout the organization. This is a learning process and can be achieved by experience or by using rules. Knowledge creation processes are central to change, to discover and externalize new behaviours in order to adapt in a changing world. This can also be seen as personal learning process where problems give rise to a need to develop new solutions. All too often, knowledge management seems to be focused either on being creative or on the distribution of existing knowledge to groups of people in the organization. In this paper we argue that the knowledge perspective

should deal with the balance between them both. Discussions using the flexibility concept might provide a vantage point that enables the organization to strike the right balance in the mix of KMS.

4.4 Perspective 3 "Knowledge Strategy"

> *In this section the paper "A Framework for Strategic Balancing of Knowledge Management Initiatives" (Aidemark and Sterner, 2003) is presented.*

This paper investigate the need of Enterprises to understand the impact of different types of knowledge management (KM) approaches on business strategy, and how they interact with other types of initiatives to produce synergistic effects. The hypothesis of this paper is that a model based on the balanced scorecard approach (BSC) can be used to balance the diverse set of KM approaches that are described in the KM literature. A literature study has been carried out connecting general examples of BSC objectives to KM approaches and applications. The resulting framework indicates that each of the major aspects of KM has its place in the BSC model, and thus has a role in the success of the company from a strategic viewpoint. A KM strategy according to this perspective should articulate how a company intends to strike a balance between different KM approaches. Contributions of the framework to related theory are discussed and illustrated by using a rich case from literature.

4.4.1 Introduction

Enterprises need to understand how different kinds of knowledge management (KM) approaches relate to business strategy and interact with other types of initiatives to produce synergistic effects. Existing strategic frameworks for KM (e.g. von Krogh et al., 2000) provide conceptualizations regarding the role of knowledge as a source of competitive advantage and what can be done in general terms to leverage organizational knowledge resources. However, they do not substantiate the practical implications.

Different groups and individuals within organizations hold diverse and often conflicting views regarding what kind of knowledge is important, who should control it, and how knowledge should be shared and managed. Such tensions are often implicit in organizational life but tend to be actualized by efforts and initiatives to manage knowledge resources. If the different knowledge perspectives are not recognized and legitimized, the KM initiative becomes a "lightning rod" that brings about conceptual confusion and conflict instead of value to the organization (De Long and Seemann, 2000). De Long and Seemann depict a social-political process by which a commitment to strategy-supporting KM initiatives must be established throughout the organization, which includes explicit consideration of subcultures and existing key performance-improvement methodologies.

We believe there is a need for a suitable instrument to facilitate such a process of strategic alignment in knowledge management. To this end we are considering the balanced scorecard (BSC) approach, which has been suggested as a means to facilitate coordination of different kinds of change programs by linking them to business performance indicators and corporate strategy (Kaplan and Norton, 1992, 1996). Our hypothesis is that a model based on the BSC approach also can be used to balance the diverse set of KM approaches that are described in the KM literature. The aim of the paper is to investigate how different KM approaches can be organized using the BSC model. The following research objectives can be formulated:

- To attempt to organize and balance a broad set of KM approaches and ideas using the perspectives represented in BSC.
- To investigate how the resulting framework can be used in the design of KM strategies and suggest applications that are strategically aligned.

This paper is organized as follows. In section 4.4.2, we give a brief presentation of the field of KM approaches and applications that are to be organized from a strategic perspective. The balanced scorecard (BSC) approach is presented in section 4.4.3, including an outline of the process of strategic alignment through BSC that has been proposed by Kaplan and Norton (1992, 1996). In sections 4.4.4 and 4.4.5, we develop connections between BSC and the KM approaches and applications, which are summarized in a tentative framework in section 4.4.6. In section 4.4.7, the 'KM/BSC framework' is then applied to a rich case in order to investigate how it may contribute to new insights concerning the strategic role of different facts of the case. The results are put together in section 4.4.8, followed by conclusions and a discussion of areas of further research.

4.4.2 Background

There is a large and growing literature stressing the importance of organizational knowledge and learning. We have identified four general paradigmatic approaches that are represented within this literature:

- Systemic. Organizations can be understood as knowledge systems (Holzner and Marz, 1979), consisting of a set of interrelated and socially enacted knowledge processes: knowledge creation, organization, storage, distribution, and application of knowledge. Here, KM deals with questions of the design and re-engineering of such processes and their interactions, and to control mechanisms of knowledge validation. Organizational knowledge is seen as a social construction, embedded in the tacit knowing of individuals, in routines, technologies, and culture.
- Resource-oriented, aiming at measuring and auditing knowledge as an organizational resource. The notion of "intellectual capital" (IC) has been suggested, recognizing the importance of both human and structural components (Sveiby, 1997).

- Technical, where knowledge is seen in an objective sense, as something we can gather, represent, manipulate and transmit using computers or other technical devices (e.g., Wijnhoven, 1998). This view stands in contrast with the systemic approach where knowledge can be 'transmitted' only in the sense of being reconstructed at the 'receiving' end.
- Organizational, theories on how to organize for increasingly turbulent business environments, where globalization of products and markets implies a need for constant innovation and flexibility throughout the organization (e.g., Drucker, 1988; Nonaka and Takeuchi, 1995)

Within the area of information systems, KM has tended to be seen as a field of application, with a focus on IT-based systems and tools as support for knowledge processes. From an organizational perspective, it is relevant to ask what organizational ends that are served by KM initiatives. Here, Binney (Binney, 2001) presents the following set of organizational application types that has been connected to KM in the literature.

- Transactional KM, where the use of knowledge concerns transactions between agents, e.g. help desk and order entry applications.
- Analytical KM, providing interpretations of, or deriving patterns and new knowledge from, vast amounts of disparate sources of data, e.g., business intelligence- and customer relationship management (CRM) applications, and data warehousing.
- Asset management KM, focusing on processes associated with the management of knowledge assets in the form of codified knowledge (e.g. document management applications) and intellectual property (e.g. patent management).
- Process-based KM, deals with the codification and improvement of processes, e.g. work-practices and procedures. This category includes 'best practice' applications, and formal process engineering.
- Developmental KM, aiming to increase the competencies or capabilities of an organization's personnel in order to improve potential for future business performance. This category corresponds to investments in human capital, and includes applications related to skills development, teaching and training, and competence management.
- Innovation/creation KM, focusing on providing an environment in which knowledge workers, often from differing disciplines, can collaborate in teams in order to create new knowledge. The most common focus in literature on knowledge creation is the development of organizational capabilities and product innovation. Applications within this category include discussion forums, networking and virtual teams.

Binney links a set of computer-based technologies and techniques to the different KM applications that can be used in attempting to manage the knowledge involved. For instance, one way of managing the knowledge related to a help desk function may be to embed part of it in software for customers to use, e.g. by means of a rule-based system to control the choices available at different stages of the process. However, for the purposes of the present paper, we would like to emphasize that the notion of 'KM application' must also include something other than computer-based means and initiatives to improve the management of knowledge. In the case above, other ways to support the management of transactional "help desk knowledge" include organizational and social means, as when creating systematic training programs, competence development possibilities and new career paths for support personnel. Here, the role of information technology and computers may still be important (supporting knowledge bases for help desk operators to use, on-line skills development courses, etc), but is removed from the centre stage. This example also shows that Binney's KM application types tend to overlap in complex means-ends patterns. In this case we find elements of process-based and developmental KM applications that are utilized for transactional KM.

4.4.3 The Balanced Scorecard Model

The design of performance measurement systems is an important issue for top management as they are important means for influencing and guiding the behaviour of personnel and other stakeholders in the business. Traditionally, performance measurement systems have been concerned with financial and operational objectives, often with emphasis towards one of the categories. Reflecting recent management trends of customer orientation, quality, organizational learning and innovation, the balanced scorecard approach is suggested as a basis for the design of more effective performance measurement systems. A balanced scorecard provides top managers with a fast but comprehensive view of critical business factors, expressed in terms of objectives, measures and targets. It is designed to provide answers from four perspectives (Kaplan and Norton, 1992, 1996).

- Financial; "to succeed financially, how should we appear to our shareholders?" Typical measures include return on investment, profitability and revenue growth.
- Customer; "to achieve our vision, how should we appear to our customers?" Measures that can be relevant here concern things like market share, customer retention and customer satisfaction.
- Internal process; "to satisfy our shareholders and customers, what business processes must we excel at?" Here, common measures concern supplier performance, quality, production efficiency, and key operational processes.
- Learning and growth; "to achieve our vision, how will we sustain our ability to change and improve?" Relevant measures concern employee satisfaction and retention, as well as competence development expenditures.

The financial perspective deals with the results of past business actions, while the other three perspectives are seen as drivers of future performance. Thus, the balanced scorecard provides a tool for linking and balancing long-term strategic issues with short-term actions. Kaplan and Norton (Kaplan and Norton, 1996) define four important processes in BSC-based strategic planning. First, the vision and strategy of a particular business needs to be translated into objectives, measures and targets along the four perspectives. Second, one of the most important functions of a balanced scorecard is that it should communicate the strategic intent in a way that makes it possible for managers and employees at different levels to understand the necessary targets of achievement. Here, departmental and individual objectives must be developed in alignment with the balanced scorecard. Third, they propose that the business and financial plans needs to be integrated through a process of business planning, where the diverse set of change programs and initiatives that are undertaken is linked to the scorecard. Fourth, a process of feedback and strategic learning, where strategy is evaluated in the light of recent performance. This process corresponds to the well-known concept of double-loop learning (Argyris and Schön, 1978).

4.4.4 Connecting General KM Approaches to BSC

The financial perspective can be connected to the area of intellectual capital (Sveiby, 1997) as IC statements aims to present measures of knowledge-related assets (typically concerning employees, customers, processes and technology) to shareholders and other resource providers as a supplement to the traditional financial statement. Judging from IC statements from a number of companies, Mouritsen et al. (2001) note that the presented measures and numbers only have indirect relations to bottom-line financial figures. They make sense by being presented together with "knowledge narratives" telling about the value-creating capabilities of the firm. This corresponds closely to the need to connect BSC objectives and measures to vision and strategy according to Kaplan and Norton (1996).

The customer perspective generally points in the direction of learning about the customer's needs, related to measures such as lead time, quality, performance and service. The technical KM approach is relevant to this perspective, corresponding to needs of analyzing vast amounts of data generated around processes of sales and marketing. For example, the company may attempt to discover new patterns of customer purchase behaviour as an input to processes of innovation and production.

The internal process perspective refers to the design of the organizational knowledge system (Holzner and Marx, 1979). An important area in which companies must excel is product development, which can be understood in terms of organizational knowledge creation processes (Nonaka and Takeuchi, 1995). Important perspectives include knowledge transfer between experts in 'Communities of Practice' (CoP) (Wenger, 1998), and the formation of multi-disciplinary groups for breaking frames of mind and lateral knowledge development (e.g. between sales- and R&D departments). The use of knowledge embedded in artefacts is essential for

transferring knowledge between different individuals and groups for internal process efficiency.

The learning and growth perspective deals with the change capability of the organization. One approach to KM is to create a learning organization (Swan et al., 1999), promoting a culture that values people's ability for change and renewal. Nonaka and Takeuchi (1995) claim the whole organization must be re-designed to facilitate the dynamics of innovation. They propose a "hyper-text" organization, where an important idea is the design of multi-disciplinary teams around emerging projects to facilitate knowledge creation. The notion of the information-based organization is another approach to creating a learning organization from a knowledge perspective (Drucker, 1988), cutting time by putting decision-making closer to the field of operations.

4.4.5 Connecting Corporate Strategy to KM Applications

Using the general examples of BSC objectives presented by Kaplan and Norton (1992), connections to KM applications can be made. Here, Binney's framework (Binney, 2001) is used, which maps general application types to examples of specific technologies.

The financial perspective is about expressing organizational activities in economical measures. Three application types in Binney's framework are relevant. The first is asset management, focusing on getting a grip on knowledge resources. This is enabled by technologies such as knowledge mapping tools and document management systems. The second is developmental applications targeting the 'human capital', e.g., human resources management (HRM) applications. These systems contribute to the annual presentation for shareholders, but often not in monetary terms. An exception is found in Dekker and De Hoog (2000), presenting an application for measuring the financial value of knowledge. Here, costs of knowledge are compared to the revenues that can be traced back to knowledge resources of the company. The third type is analytical applications such as management information systems (MIS), data mining and decision support systems (DSS).

The customer perspective has goals like "on-time" delivery, which requires understanding of the customer's expectations. Analytical KM applications support this type of objectives. Today a central concept is CRM, with a number of related technologies such as point-of-sale systems, data warehousing tools, etc. aiming at acquiring knowledge about customer behaviour. Web communities have also become an important technique for getting closer to customers, generating large amounts of 'soft' data that can be analyzed. Another aspect often included is measures of the competition, e.g. if we have a vision of becoming the competitive leader in customer satisfaction. This external perspective has traditionally been dealt with by means of business intelligence systems. A third type of goal can be response time for service calls, which can be supported by transactional applications like help desk systems and order entry systems.

The internal process perspective is mainly connected to Binney's process- and innovation KM application types. From the process side, central KM activities focus on productivity and quality of production. Process engineering/-improvement applications support codification of knowledge in routines and procedures for effective retrieval and application. Examples of applications are FAQ- and 'best practice' systems. These systems help the company to reuse knowledge making fewer mistakes and solving recurrent problems faster. Other ways of distributing knowledge may be through video conferencing, for instance when a rare problem occurs that requires expertise that is not locally available. Development of new products is a knowledge intensive internal process supported by creativity tools (Ruggles, 1997) and communication support for specialist groups.

The learning and growth perspective is coupled with organizational learning, i.e. presupposing that people change their worldviews and know-how. Binney's developmental KM applications can support these efforts, as we frequently have to upgrade competencies and staff new projects. In addition, innovation/creation KM applications such as discussion forums can support rapid reconfiguration of project teams. Aspects of KM focus on culture or organizational structures rather than on different applications. A central KM issue is the development and use of new concepts as parts of a new way of doing business (Nonaka and Takeuchi, 1995).

4.4.6 The KM/BSC Framework

The results from the analyses performed in the previous sections are summarized (fig. 10). Typical objectives of each perspective are connected to a KM approach and a set of KM application types.

The framework shows potential to give the following contributions to KM:

The problem that the BSC model aims to address is the dangers of information overload that a too complex planning model presents. The results show that the BSC model can be used to structure the field of KM. In order to create a complete

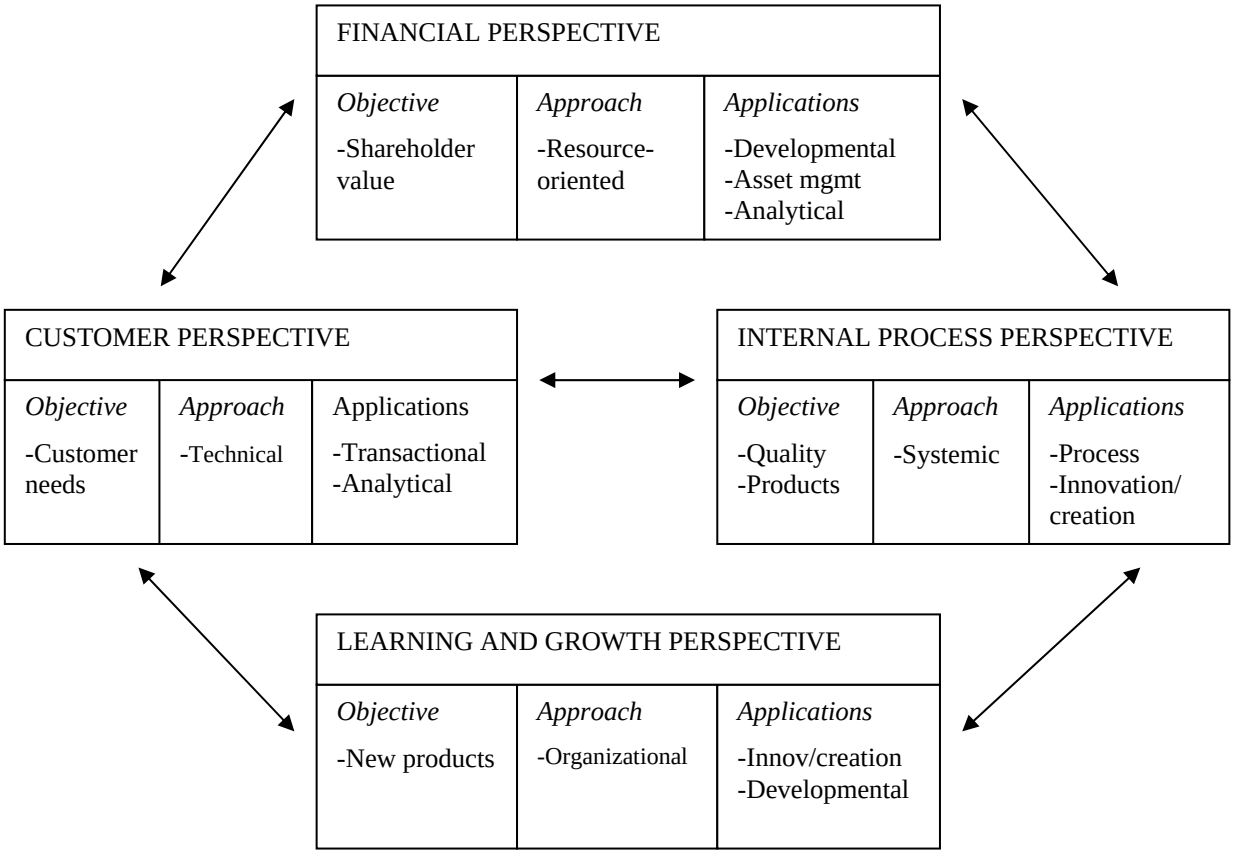


Figure 10. The KM/BSC model

knowledge management strategy all four perspectives must be considered:

· From a financial perspective, a KM strategy should include initiatives to manage organizational knowledge and competence as resources.

· From a customer perspective, a KM strategy should contain processes that help us create knowledge about customers.

· From an internal process perspective, a KM strategy should support efficient production through creation, codification and distribution of knowledge about best practice, together with support for development of new products.

· From a learning and growth perspective, a KM strategy should focus on activities that create a learning culture.

A KM strategy should articulate how the company intends to strike a balance between external and internal issues regarding the company's knowledge processes (cf. considerations of effectiveness vs. efficiency). At the same time, we need to create a learning organization to make the continuous change possible. The KM strategy should also balance the need for a stable image towards shareholders with needs of investments in change capabilities.

4.4.7 Applying the Framework

In order to demonstrate possible uses of the framework, we will investigate how it may support and contribute to new understandings of a rich case that involves aspects of KM: the case of Matsushita's strategic transformation in the 1980's. Our account of the case relies on the well-known description in Nonaka and Takeuchi (1995), featuring the development of the Home Bakery as a prototype for what became a corporate-wide success pattern. With "theory of organizational knowledge creation" (OKC) Nonaka and Takeuchi intended to explain the dynamics of organizational knowledge creation as a constant interplay between tacit and explicit forms of knowledge through processes of knowledge conversion, involving socialization, externalization, combination and internalization. Also, a model of organizational knowledge creation was proposed, including the processes of sharing tacit knowledge, creating concepts, justification, building archetypes and cross-levelling of knowledge. We will use Nonaka and Takeuchi´s case description to investigate how their knowledge processes can be interpreted and related to the KM/BSC framework.

4.4.7.1 The Case of Matsushita

The background to the case is that a part of the Matsushita Electric Industrial had problems, and had initiated a three-year plan in 1983 called ACTION 61. This strategic initiative had the objectives to improve Matsushita's position in core businesses through cost savings and marketing, and to pull together resources necessary to enter new markets. As part of ACTION 61, three divisions were integrated into one (Cooking Appliances Division), following a combined strategy of cost savings by reducing duplicate resources and creating conditions for synergistic effects between the represented fields of competence in rice cookers, heating appliances and food processors. The first two years following the integration did show some improvements in profitability due to elimination of excess capacity, but sales were declining. Employees in the new division felt that they needed to create an innovative, best-selling product.

Here, Nonaka and Takeuchi highlight the role of concepts, prototypes, and metaphors. The concept of "Easy and Rich" was formed at the level of the division by looking at trends in the US and Japan; it was observed that there were "more working women, increasingly simplified home cooking, and poorer diets" (according to Masumura, Strategy Planning Section chief, in (Nonaka and Takeuchi, 1995 p. 98), hence attractive products should simplify cooking and produce tasty, nutritionally rich products. A bread-baking machine was suggested as a suitable appliance for meeting this concept. The objectives for the new machine were set high; it should bake bread from ordinary basic ingredients, it should work in typical home environments, and the bread should compare favourably to that produced by professional bakers. In addition, it should meet a certain price point in order to be successful on the market. The development process resulted in machine that became a great success for Matsushita, the 'Home Bakery'.

4.4.7.2 Analysis of the KM/BSC Perspectives

The financial perspective appears to have been the initial driver of the strategic transformation process. They performed a critical evaluation and analysis of the business, and it was decided that it was not possible to continue in the same direction due to a harsher business climate. The case displays clear connections between this financial analysis and needs to manage competencies and knowledge resources, where IC and HRM activities became central means to achieve the needed transformation. An assessment was made at the corporate level that the three divisions should be integrated into one. The personnel of the new division were assumed to have a suitable mix of competencies. The choice of producing a baking machine was based on internal factors: it was simply a reasonable target given the set of available competencies in the division. Clear targets were given of what was financially expected of the baking machine, both in terms of pricing and in terms of how it should perform on the market, thus connecting to measures in the financial and customer perspectives. The head of the Cooking Appliances Division formed a pilot team for the development of the Home Bakery, with members assembled from a wide number of functions within Matsushita; Household Appliances Laboratory, an R&D unit serving four divisions including Cooking Appliances, a mechanical designer and a software developer. These examples indicate that effective management of knowledge resources was an important element in Matsushita's successful strategy, at several organizational levels. However, no explicit models or methods (at least not made visible in the description) were used in this process; rather it was a result of good management and deep business knowledge that can be attributed to the CEO's of the company.

The learning and growth perspective is also an essential part of the success, initially driven by the integration of the three divisions. The financial situation gave rise to a sense of crisis that was transmitted to the newly formed division, urging them to come up with fresh ideas that could be transformed into successful products. The organizational change introduced a 'creative chaos' and a strategic mix of competencies. A common language was needed to communicate and exchange knowledge effectively between the different cultures represented in the product development group. The creation of organizational melting pots was essential for effective knowledge creation and transfer. Organizational learning was facilitated by concepts that were developed in a process called 'cross-levelling' of knowledge. For example the concept of 'Easy and Rich' that proved so successful was lifted up to the corporate level in the form of 'Human Electronics', together with the idea of multidisciplinary teams.

The efforts in the learning and growth perspective continued following the success of the Home Bakery. This led Matsushita to initiate a process of formulating a corporate vision for the twenty-first century in 1989. Nonaka and Takeuchi call this "the second knowledge creation spiral", which took place at the corporate level. The main work was carried out within the 'Human 21 program", by a committee consisting of 200 "stars" in their 20s and 30s that were picked from a large pool of applicants within

Matsushita. Approximately 20 teams were formed throughout the 12 companies in the Matsushita Group. The output from their meetings was then sent to another committee composed of upper-middle managers, who selected the most promising suggestions to be adopted by the company. The new corporate vision was partly based on the concept of 'Human Electronics' that was considered highly powerful. The vision also contained concepts that captured the spirit of how the corporate culture and organization should develop e.g. 'active heterogeneous group', and 'multilocal and global networking environment'. The concept of 'voluntary individuals' was coined in alignment with these ideas, representing qualities of the future employees as voluntary, ambitious, creative, and mentally productive. They also had to be good businesspersons and citizens, family members, and individuals. To achieve the objectives working hours had to be reduced and a pilot project was initiated under a program (called MIT'93) in order to experience the practical effects of significantly reduced working hours.

Regarding the customer perspective, the concept of 'Easy and Rich' gave the broad constraints for the development project. This concept was formed by creation of knowledge about customers by sending teams overseas to visit the markets and by analyzing statistics. Supporting information technology is not made very visible in the case, but the process in this part of the case could be characterized as traditional business intelligence, implying the need for applications and tools for analyzing large amounts of data. At a later point, when the decision had been made to make a bread-baking machine, this high-level concept was expressed in a set of parameters that could be called a 'customer satisfaction index' for the machine. The method of applying the different parameters for testing prototypes appears to be largely ad hoc; project members simply took the prototype home to their families for trial, for their spouses and children to make bread with the machine and provide feedback.

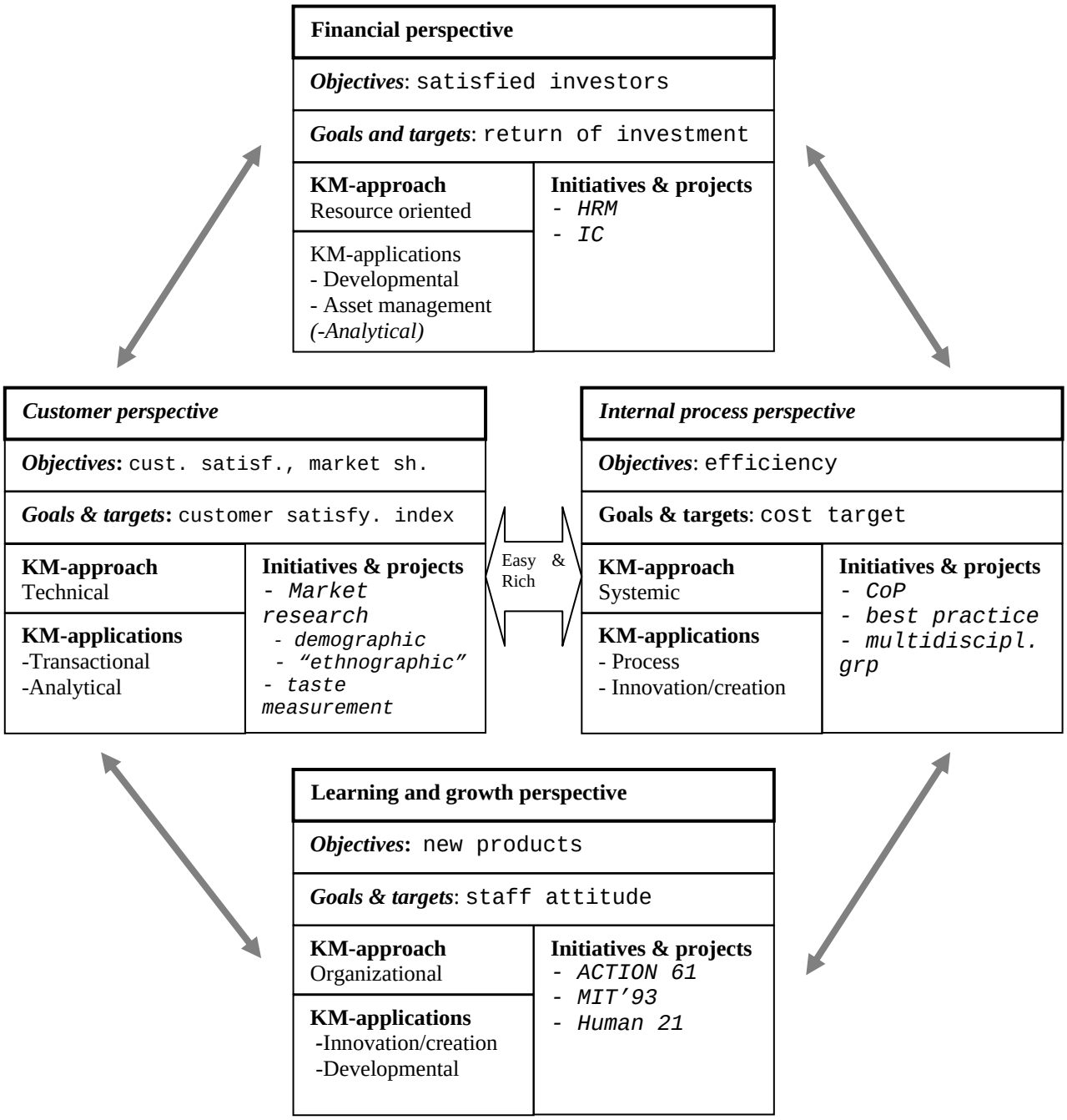


Figure 11. KM/BSC model applied on the Matsushita case

Product innovation belongs to the internal process perspective in BSC. Nonaka and Takeuchi describe how the tacit knowledge of a master bread-baker was transferred to the software engineer during a period of apprenticeship, who was able to externalize this knowledge through the concept of a "stretching twist". This concept could then be internalized and used by the technical engineers in the physical design of a prototype that could actually make tasty bread. The case shows how the promising product was moved from the prototype stage into commercialization, implying issues of industrial design, cost reduction and quality stabilization. This required that the project was transferred from the lab to the division, with substantial additions of marketing and manufacturing competence and resources to the design

team. It is noted that almost all of the original members remained on the expanded team so that their experience and tacit knowledge could be utilized.

4.4.7.3 Summary of Case Analysis

The original analysis by Nonaka and Takeuchi focuses on knowledge creation. The analysis based on KM/BSC framework broadens this perspective, displaying more perspectives of KM being active in creating success (fig. 11). There are also important relationships and interdependencies between the KM approaches, which must be clarified (fig. 12).

The analysis indicates that all four KM approaches can be applied to the case description. In figure 11, the KM-approaches and KM-applications represented in the KM/BSC framework can be substantiated by examples of objectives, goals, initiatives and projects found in the case (written in courier). KM application types that could not be identified in the case description are put within brackets. Projects and initiatives are complex, containing a mix of KM application types. The case also

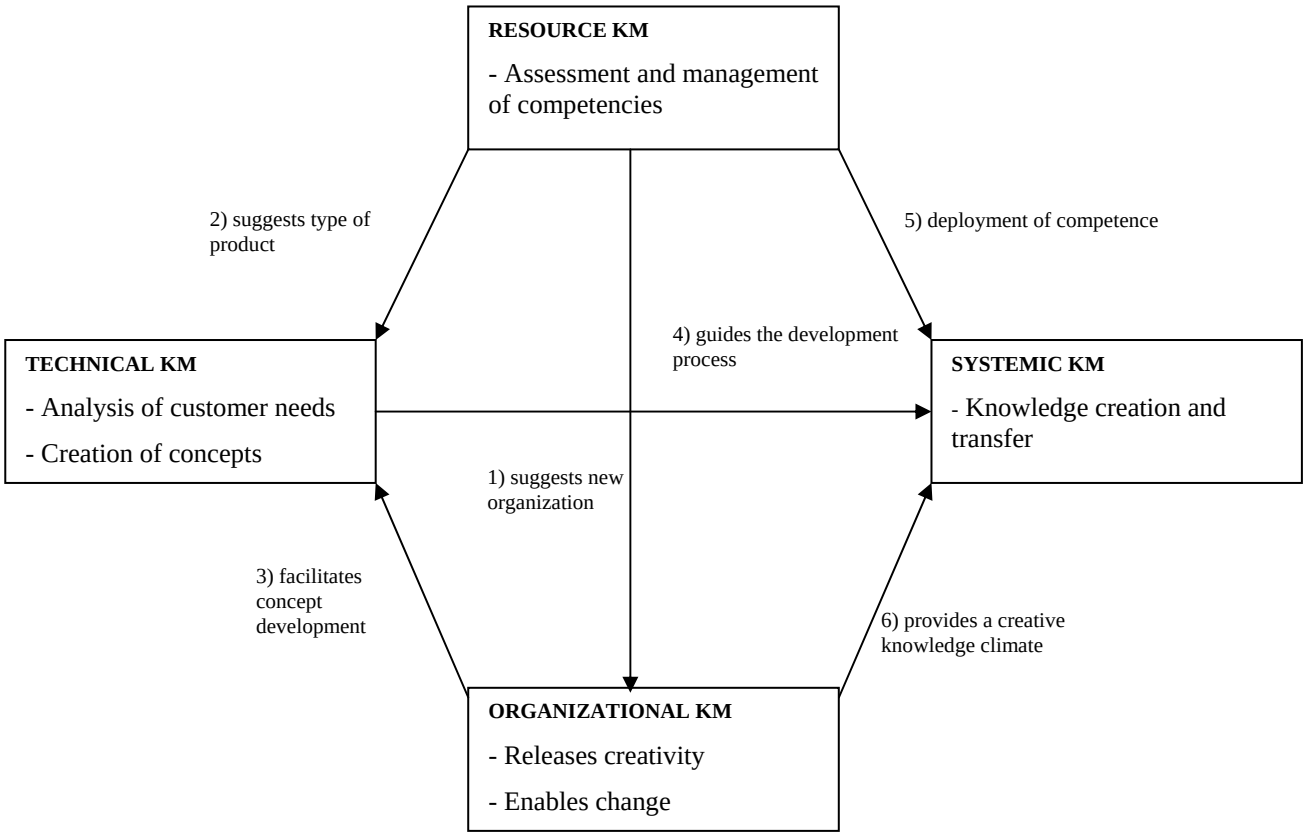


Figure 12. KM strategy at Matsushita

shows that it is difficult to identify distinct borders between the different perspectives in the framework, for instance between the customer- and the internal process perspective. The KM-approaches and applications that are associated with each of the

BSC perspectives in the KM/BSC framework are to be considered as dominant, implying that others can be present and relevant as well (for instance, the ad hoc prototype testing procedure which should be characterized as systemic KM).

Relations between the different KM perspectives were very important. The internal process perspective was balanced with the customer perspective through the concept of "Easy and Rich" (fig. 12:4). The concept was used to transmit desired basic values of the new product into the product development process, where it served as criteria for selecting technical solutions and assessing product performance. By having an accurate perception of available competence areas within the organization, a learning environment was created through the ad hoc formation of multi-disciplinary groups, which connects the resource-oriented with the learning perspective (fig. 12:1). Here, the competencies put at the disposal of internal processes constrain the possibilities for innovation and knowledge creation (fig. 12:5). In addition, the understanding of available competencies indicated what kind of products that were reasonable targets for future success (fig. 12:2), thus directing efforts of analyzing customer needs. There is also a connection between organizational- and systemic KM, in that the new organizational structure provides an enabling climate for knowledge creation and transfer (fig. 12:6). This culture also supports concept development in the customer perspective, augmented by technical KM (fig. 12:3).

These initiatives and relationships taken together can be perceived as a coherent KM strategy, in this case as an emergent pattern in organizational activity rather than a premeditated plan (cf. Mintzberg, 1994).

4.4.8 Concluding Remarks

The KM/BSC framework emphasizes connections between different knowledge-oriented aspects of the organization, and how different kinds of KM initiatives may interact to produce synergistic effects. These can be seen in the case description by Nonaka and Takeuchi, but are not explicated from an overall business perspective by their OKC theory.

The objective of the paper was to test the BSC model against the KM field. The outcome supports the hypothesis that the BSC model can be used as a means to link KM approaches to a company's strategy, thus displaying their role in the total success of the company.

Often KM projects are suggested to be lead by one approach or another, but making just one aspect of KM work does not necessary bring success to the company as a whole. The Matsushita story of success showed that all of our four paradigmatic KM approaches were deployed, and that they were interacting in a complex pattern. In Nonaka and Takeuchi's description of the case, the knowledge creation process is targeted as the main KM effort of the organization. Our study shows that other aspects of KM were present and important for the success, thus forming what we would call a KM strategy; a coherent set of knowledge-oriented initiatives that are aligned with high-level business objectives and vision.

De Long and Seemann (2000) caution against incorporating KM into contemporary change programs such as TQM and BPR. While it may ease the acceptance of the rhetoric that signifies some knowledge perspectives, successful KM requires much broader perspectives of knowledge than what is furthered by such change programs. Our model shows promise to be an instrument to assess the function of KM change programs in relation to a broad array of business goals that are linked to strategy, and to ensure that multiple perspectives and interests are taken into account.

Although we claim that Nonaka and Takeuchi's description of the Matsushita case is rich enough to enable a second analysis, we must stress that it was designed to illustrate their theory of organizational knowledge creation, not to cover the KM/BSC perspectives. What we have done is to compare two frameworks for knowledge management. Some potential problems that we expose in our framework appear to be unproblematic in the case. For instance, the case does not show any conflicts between the knowledge perspectives of different groups, rather the contrary. Nonaka and Takeuchi claim that the Japanese view of human relationships is collective and organic; a Japanese person sustains this view by relating her/himself to other things and persons. Another feature of the Japanese organizational life is that managers have often worked in a number of functions and positions throughout the company, in principle down to the shop floor. This can be expected to render the use of formal HRM systems unnecessary, and to facilitate communication between different experts to a great extent. In the case description provided by Nonaka and Takeuchi many of the problems of balancing different knowledge perspectives appear to be solved by the Japanese conditions of language and culture. Our point is that these aspects of knowledge management are not made explicit in OKC. In other settings where these special conditions are not present, the KM/BSC framework may help address and balance the business perspectives and KM approaches. Future research will be directed to explore how the framework contributes to understanding such cases.

4.5 Perspective 4 "Organizational Contexts"

> *In this section the paper "A Multiple Perspectives View on Knowledge Support Systems and Their Organizational Contexts" (Aidemark, 2005b) is presented.*

This paper investigates a framework for planning decision support systems (Huber, 1981) from a knowledge support perspective. The aim is to rethink the framework in order to make it useful for the planning of information systems as support systems for knowledge workers. The framework is based on the assumption that an understanding of the organizational context should guide the design and use of information systems. These are investigated using a set of perspectives on knowledge in organizations. Together the contexts and the knowledge perspectives form an extension of the framework. The framework is tested on an empirical case reported by Schultze (2000).

4.5.1 Introduction

Information systems are expected to support the critical organizational issue of management of knowledge. Alavi and Leidner (2001) present a model of the connections between knowledge problems and information systems. But, when is a certain knowledge problem important in an organization? The initial assumption is that a broad approach to a problematic situation is needed, reconnecting knowledge management to a realistic view of the organization. This goes both for views about the organization and about knowledge work. The aim of this work is to provide a framework for guiding the analysis of an organization in order to understand important knowledge problems and their connections to the organizational context. A better organizational fit is the overall objective of this report. To solve this problem, an investigation of a framework for planning information systems for the support of the decision-making developed by Huber (1981) is performed. This framework is adapted to the area of knowledge support by introducing a set of knowledge concepts. To support this development a case study (Schultze, 2000) is used to test the ideas.

4.5.2 Background

The background to knowledge management is the change in the business environment toward globalized networks (Castells, 1996). To counter this, different approaches have been suggested for example flexibility and the ability to achieve continuous change (Galbraith, 1997). Drucker (1988) points out that the crucial element of the self-governing of experts is dealing with changing environments. An additional problem in this development is the effort to meet economic crises with leaner organizations. This has, in turn, depleted organizations of knowledge and made them ‘lean and mean’ (Castells, 1996). This is the pretext leading to the need for knowledge management. Instead of changing and adapting, competitiveness is based on internal resources, such as knowledge. The knowledge problem was first tackled from an IT perspective. But the problems of a technological approach (Swan et al., 1999), pointed at the possibility of knowledge management as the next fad to forget people. These problems initiated a move towards organizational and human aspects of the field (Nonaka and Takeuchi, 1995) and a focus on knowledge theory (e.g. tacit knowledge Polanyi, 1958, 1966). Alavi and Leidner (2001) presented a framework for connecting knowledge processes to organizational processes to use IS/IT. They suggest four knowledge processes: Knowledge creation enables processes like combination of knowledge sources supported by data mining and learning tools. Knowledge storing / retrieval, enables processes like inter group knowledge access and individual and group memory to be supported by bulletin boards and databases. Knowledge transfer enables processes like internal communications networks for faster access to knowledge sources, supported by bulletin boards, discussion forums and knowledge directories. Knowledge application enables processes like applications in many locations and faster application of new knowledge, supported by expert systems and workflow systems.

4.5.3 Perspectives on Knowledge in Organizations

A set of concepts is presented that refers both to perspectives on knowledge and on aspects of knowledge processes. These concepts are the starting points of a discussion on how knowledge is used and handled in an organization. The concepts are chosen as representative of different levels of analysis; an individual (Polanyi, 1958, 1966), group (Berger and Luckmann, 1966) and an organization (Ackoff, 1989). These sets of concepts also provide different aspects of the nature of knowledge, i.e. cognitive (Polanyi, 1958, 1966), social construction (Berger and Luckmann, 1966), organizational resource or artefact (Ackoff, 1989).

Nine concepts are discussed, including:

1. Tacit knowledge (Polanyi, 1966); is the dimension of an individual's knowledge that is not made explicit, i.e. the base for sense making.
2. Personal knowledge (Polanyi, 1958) is the perspective on knowledge as something that depends upon the actions and perceptions of the individual person. This is a way of perceiving knowledge as the identity of a person.
3. Explicit knowledge (Polanyi, 1966) is when a person puts words to knowledge and is actively aware of it. That is, a process of making knowledge articulate and workable by logical means.
4. Wisdom (Ackoff, 1989) is the ability to make judgments based on personal preferences. The concept deals with the problems of how to tell good from bad. This is the basis for establishing facts, in discussion with others or as a consequence of the use of power.
5. Know-how (Ackoff, 1989) is knowledge useful for doing things. This is knowledge as facts that are turned into something a person can act on.
6. Externalization (Berger and Luckmann, 1966) is the process of making personal knowledge accessible to others.
7. Objectification (Berger and Luckmann, 1966) is the process of making knowledge accepted by the people in a group. It is a social process of making knowledge something that is taken for granted and regarded as the truth.
8. Socialization (Berger and Luckmann, 1966) is how a person is taken into an existing social knowledge world, accepts its objectives and takes it for granted. The socialization process is a process of creating an institution.
9. Internalization (Berger and Luckmann, 1966); a knowledge process of creating personal knowledge of the outside world.

4.5.4 Analysis of Organizational Contexts

This section discusses a model of organizational decision environments (Huber, 1981) from a knowledge support systems perspective. This framework works in a tradition of, for example, (Morgan, 1986) where it is argued that the use of different images provides a deeper understanding of an organization. In this paper a more

compact framework is preferred, mostly because it makes the analysis more directed, while retaining a broad diversity. The choice is supported by experiences reported by Huber (1981) of how multi perspective frameworks can be used in information systems planning. The design of the information systems should be adapted to the organizational environments that the information systems are supposed to function in. The same can be assumed for knowledge work and the use of information systems as support for knowledge workers. For this analysis the word context seems more appropriate, it is the circumstances that knowledge work is performed under, and provides the meaning of the work. The four contexts are: “garbage can”, “political”, “rational” and “program”. In the garbage can environment, (March and Olsen, 1976), decisions are made by chance and it is up to the ability of the knowledge-worker to see opportunities and exploit them. In this context, the knowledge focus is on gathering experience as openly as possible. In a political environment, decisions are made in order to reach the goals of the group or of the individual decision-maker. The central knowledge issue is to understand one’s own values and the values of others. The knowledge needed here is about under-standing why and for whom. In a rational environment, the aim is to make a rational choice among possible solutions to a problem. This implies gathering information, forming alternatives and making a choice among the alternatives that satisfy the preferences in the best way. The environment works in a similar manner as when Kuhn (1970) describes normal science. The effort is put into the task of proving and refining the current paradigm. This means to put knowledge to work, which includes externalizing the knowledge and making it useful in the decision-making process. Creativity is difficult in this environment. In a program environment, decisions are made according to clearly stated rules. The explicit knowledge of solutions will be formed into pro-grams and then given to people in the organization in the form of instructions or rules. These will be used to make organizational processes more effective. The big problem is how to be an authority that is trusted and how a climate is created where the people feel safe to act according to the programs they are given.

4.5.5 A Case Study

Schultze (2000) presents three ethnographical studies describing practical problems of knowledge workers (producing or reproducing information or knowledge). For the testing in this paper we use one of these case studies. It is suggested by Schultze that the cases should be used to develop knowledge management models and methods, drawing on their rich descriptions. The result of the study was that the basic problem of knowledge work could be captured in a subjective and objective duality. The plot is as follows; the knowledge worker adds value to the information by putting subjectivity into the work. However, at the same time objectivity must be maintained in order to keep the trustworthiness of the information intact. If the consequences of the use of the information do not satisfy the receivers of the information, the knowledge workers will be criticized. Objectivity is therefore needed in order to avoid criticism, in order to be able to show what has been done and that the proper actions have been taken. In the case, a group of system administrators gives support

to hardware and software problems. These people were contracted consultants and were not considered as a part of the organization that they were advising. Their services were considered as commodities and easily exchangeable. They lacked a natural advocate in the organization and generally had a somewhat difficult situation.

4.5.6 Analysis of the Case

The analysis is made in four steps, first an initial search for problems (section 4.5.6.1) and then an in-depth study with a defined problem in mind (section 4.5.6.2). In section 4.5.6.3 we look at the developed solution from the remaining three contexts. Finally in 4.5.6.4 the broader implications for the organization are looked at. This approach marks a clear difference to the Huber approach where a certain situation seems to make a certain type of information system more appropriate. Here we work in a more reflexive and interpretative style drawing on a hermeneutic tradition (Gadamer, 1994).

4.5.6.1 Searching for Problems

There is a clear element of rational decision making, with elements of a creative and unstructured work method. The knowledge workers' personal knowledge is in focus. The use of trial and error methods is common. This reflects a more creative approach to the knowledge work. The other aspect that is clearly visible is the political dimension. The knowledge workers are working as external consultants. A tension between the knowledge worker and the organization is reported. A great deal of energy is put in to work that is de-signed to prevent criticism. It is a fear that the problem owners that call the knowledge worker will be dissatisfied with the services and put the blame on the knowledge worker. Knowledge activities are aimed at articulating the work practice. The program context also seems to be an important perspective on the knowledge work of the case. Different types of databases, for example, a problem-solving guide and project management systems are used. But, in the case it is argued that the databases are also used for the legitimization of decisions and the direct use of the decision is not always in focus. It was important for the knowledge workers to be able to point at an instruction that says how the problem should be solved. Objectification of knowledge is important, because of the lack of trust in the situation. From the garbage can perspective, some interesting ideas were found. The knowledge workers were involved in problem-solving of an ad hoc kind. The general impression of the knowledge workers is that they had a high level of personal knowledge and commitment to learning. Problems were solved using trial and error and trusting hunches. But, they did not always display these work methods. The knowledge workers preferred to justify their work using established methods. The general problem seems to be connected to political aspects of the situation. It includes problems associated with the relations between the consultants, consultants and managers and between consultants and problem owners. The organizational cultures for learning and knowledge exchange seem to be working within the group of consultants. The group constituted a form of community of practice (Wenger, 1998).

4.5.6.2 Reinvestigating the Case Focusing on the Identified Problem

From a political perspective, the knowledge problem stems from the fact that the knowledge workers are seen as external to the organization. It seems to be that the exclusion from the knowledge process of creating assumptions about bad or good leaves these contractors or consultants in a void. They contribute to the knowledge development of the organization but are not included in the cultural sphere of the organization. This is what creates strange knowledge behaviour and makes the use of the support systems quite different from what was intended. In a political context, the essential knowledge concept is wisdom. This means that we must gain understanding of the basic values that guide our actions and those of the persons that are around us and affect our work. The knowledge workers rely on objectification of personal knowledge in order to get a clear interface to the organization. Better understanding of the wisdom aspect, what the organization thinks of as good or bad, might enable the knowledge worker to understand the situation better. This includes knowledge about how the organization works, which persons are involved, how they work, why they would be targeted and by what personnel groups. Here an ethical conflict web (Wood-Harper et al., 1996) could be used as an analysis technique. The political context can be viewed from both a conflict and a consensus perspective (Huber, 1981). From a conflict perspective, getting to know and understand these potential foes might help the knowledge worker to behave in a more informed and rational way. From a consensus aspect, a possible solution could be that the view of knowledge workers as external consultants would have to be change. This could be done either by changing their connections to the organization or by creating communities of practice (Wenger, 1998). This could be achieved by creating a new knowledge community, consisting of knowledge workers and the systems users of the organization. This community would be based more on trust than on contracts.

4.5.6.3 Looking at the Focused Problem from the Other Contexts

From a program perspective there is a problem connected to the division of objective knowledge in the databases and real problem solving. When objective knowledge is created by putting it into a database it will be separated from its tacit origin. The problems around this aspect are discussed by Polanyi (1966), and are clearly stated as being a disaster from the personal knowledge perspective, as the connection to the tacit knowledge is broken. If the databases are used in a program mode for more automatic problem solving, then the user will be unable to judge if the knowledge is valid. The consequence will be that others than the people who created it cannot effectively use knowledge. From the rational point of view, the current situation would appear as a very good one. The pressure put on the consult-ants makes them explicate knowledge, by being formal and spending lots of time on documentation. The case states that the databases are filled with the correct accounts for use in work practice. A removal of the political dimension of the situation might decrease the use of support system and time spent on documentation. The garbage can perspective focuses on ad hoc solutions to emerging problems. Generally, a focus on formal problem-solving would tend to decrease the time spent on creative problem solving.

However, the big problem is that this kind of work is discouraged and that these very important skills are not allowed to be developed. Less creativity and adaptive problem solving is to be expected. Fixing the conflict situation should open up this situation, allowing a casual approach to knowledge work.

4.5.6.4 Broader Organizational Implications

The knowledge workers deal with organizational problems using two types of informing practices. The actual problem-solving is performed in an informal way, but externally these experiences are expressed using a formal account of the work. The information systems are used in a control mode, i.e. to discipline the workers. But in turn the workers that use the information systems defensively, to counter this strategy. Support systems become tools in a politicized (conflicting goals of different groups) struggle. The solution should lead to spending less time on making work that is politically motivated more rational. Time should be spent on developing useful knowledge and solving problems closer to the clients needs, making the service more efficient. At the same time, the current situation seems to have efficiency benefits for the organization. What seems to be a not so rational use of information systems has a rational explanation from a higher organizational perspective. The organization has deemed this knowledge as not so important and outsourced it. The best knowledge solution might not be the most productive solution for the organization.

4.5.7 Results

Based on the discussion above, a framework for "organizational knowledge contexts" can now be formulated. It is intended to help information systems analysts to make sense of a problematic situation that can be anticipated in a knowledge work context. The analyst should be able to recommend changes to the knowledge system and to discuss how the use of knowledge support affects the situation. It should be used in the problem identification stage of a knowledge support systems development process.

4.5.7.1 Organizational Knowledge Contexts

The framework can be summaries as follows:

1. In the "garbage can" context the primary knowledge process is to discover possibilities in an unstructured flow of events. This points towards internalization, (creating a personal meaning), and towards personal, tacit knowledge processes. The tacit knowledge of the individual is the interpretative frame that is used for sense making. As a secondary knowledge process this tacit knowledge should be made explicit and useful know-how in ad hoc decision making. A dimension of encountering new and unknown situations might suggest that making judgments from general insight about what is good or bad. This should include wisdom as an important concept in this context. In Alavi and Leidner's framework this points toward knowledge creation and enabling combination of knowledge. They expect databases to be the main support, but in the garbage can environment unpredictability is the main problem. From this perspective a broad collection of information from

diverse information sources should be sought. For example, taking part in both internal and external discussion forums in order get a broad view of the development of the organization and its external environment. The idea of Alavi and Leidner to recommend data mining could be very useful, if the set of data-bases covers a broad area and includes both internal and external sources.

2. The "political" context is about making different standpoints clear by making them explicit (expressed in words). A second focus is on the wisdom (the ability to make judgments) perspective of knowledge and includes under-standing both personal preferences and the preferences of others. To under-stand the preferences mentioned above, as they probably come from other worldviews, demands are put on the process of internalization and on the ability of shifting worldviews. From a consensus perspective externalization (making knowledge available for others) is necessary for free and fair communication to take place. From a conflict aspect, the creation of objective knowledge can be used as a competitive weapon. Using Alavi and Leidner's framework, the political context has knowledge transfer as the key knowledge process. This is getting people to access and understand the world in just about the same manner. Using electronic bulletin boards for arguments is probably a good suggestion. This should be complemented by e-mail for one-to-one discussions. A basic knowledge problem here is to develop trust within the process, and it is a good question if tit is possible to use IS/IT support for this. Another aspect is transparency, that is, an open access for all involved to all background material is necessary. All this assumes commitment to a consensus view. If hidden agendas and using knowledge as a weapon arise, then the situation becomes very different. In this case, the knowledge process will probably be masqueraded as a rational process.

3. In the "rational" context, there is focus on making knowledge external (accessible for discussion with others) and objective (accepted by others). It is also important to convert it into know-how, that is, knowledge that supports action. A second aspect is the creation of new knowledge, connected to the building of tacit knowledge and the externalization of it. The focus here is on the creation of new aspects and challenging accepted knowledge. Unlike in the garbage can context this is a process within strict boarders. Using the concept from the Alavi and Leidner framework, the rational context has knowledge application as the key knowledge process. Expert systems or workflow systems make knowledge useful for a broader set of people.

4. In the "program" context, the key knowledge process is objectification of knowledge, for example developing rules and to internalize rules (to make them personal by trusting and using them). Internalization is a learning process and the outcome is focused on making the knowledge useful and explicit, turning it into know-how. Support of these knowledge processes is directed towards storing and retrieving knowledge. Alavi and Leidner (2001) suggest support by bulletin boards or retrieving knowledge from databases or other knowledge repositories.

4.5.7.2 A Working Method

Based on the case analysis made, some working steps can be suggested for the use of the framework. The four steps correspond to the four subsections in section 4.5.6.

1. Problem identification. The goal is to locate problems in a knowledge work situation. The outcome is a statement about the dominant organizational context and how this context influences knowledge work and creates problems. The framework "Organizational knowledge contexts" provides a set of concepts for a multi-dimensional analysis.

2. Problem investigation. The knowledge problem is investigated to obtain a deeper understanding. The defined problem context provides a perspective for a further investigation. Key concepts of the chosen perspective are used to create explanations of the problem and to develop solutions.

3. Reinvestigate using other contexts. The problem is revisited from the other three perspectives in order to understand this particular problem from these perspectives. Here a look at the consequences of the solutions is taken from the viewpoints of the three other contexts.

4. Organizational implications. Changes in knowledge processes, in their contexts, can have broader implications for the organization as a whole. The case demonstrated that the analysis very rapidly came to involve more general or strategic issues. Therefore it seems necessary to put the knowledge perspective in a larger picture. A perfect knowledge solution might not be desirable from a strategic point-of-view.

4.6 Perspective 5 "Networks and Hierarchies"

In this section the paper "Perspectives on the support of knowledge work" (Aidemark, 2002b) is presented.

This paper discusses information systems as support systems for knowledge workers. A case is presented discussing the introduction of two types of information systems into an organization as support for knowledge workers. The case is interpreted using a set of theories from knowledge theory and the area of knowledge management. The aim of this report is to give empirical input to the understanding of the conditions of knowledge work and information systems. An interpretative framework is presented consisting of a set of perspectives on knowledge work and the use of information systems.

4.6.1 Introduction

Knowledge workers can be seen as symbolic analytical workers (Reich, 1991). This perspective on the problem area is based on a traditional view of organizations as information entities (Galbraith, 1967) where cognition is one central problem. This perspective is also present in the concept of the knowledge worker, for example in the works of Malchup (1962). Knowledge workers are people that rely on personal

knowledge in their work (Davis and Naumann, 1997) and their work is to produce or reproduce knowledge and information (Stehr, 1994). Davis and Naumann (1997) see knowledge work as including acquiring knowledge, designing knowledge output, decision-making and communicating the designed output. Support systems should be able to help these activities and be implemented as human based activities or as information technology solutions. Knowledge can also be viewed from a social perspective, for example as constructed in social processes (Berger and Luckmann, 1966). Knowledge workers have been discussed from this perspective (Lave and Wenger, 1991, Blackler, 1995, Hayes and Walsham, 2001), focusing on variables such as social context, political aspects, communities, power, human action and so on.

The aim of this paper is to deepen the understanding of the problem area of knowledge workers and information systems. The goal is to gather understanding of how these two perspectives can be used to understand knowledge work. It is assumed that both of them are more or less present in every knowledge work situation and understanding both aspects is crucial for the correct application of the right mix of support systems. The research approach of this paper is to investigate a case and to draw some conclusions regarding the important factors that determine the development of support systems and their success or failure in organizational use.

4.6.2 Method

The empirical material of this paper is based on a project at a Swedish public organization. The scientific approach is to interpret the case in search of the important perspectives that influenced planning, using theories of knowledge and knowledge work. This research is approached using the interpretative/hermeneutic research tradition (Alvesson and Sköldberg, 2000). This implies an orientation towards an understanding of texts and creating new meaning and understanding. The main part of the empirical material consists of interviews with administrators, together with personal observations and written material from the organization in general and the project in particular. This empirical material is considered as a text that is interpreted and reflected upon. Further, the case is presented in a typified way. The dominant features of it are brought forward in order to illustrate certain problems and challenges for understanding the problem area.

4.6.3 Background Theory

4.6.3.1 Context of Knowledge Work: General Developments

The general background is the change in the environment towards increased turbulence (Huber, 1984) and globalization (Castells, 1996). As countermeasures to these trends, better information handling has been suggested (Huber and McDaniel, 1986) as one approach. Flexibility (Evans, 1991) and the ability for continuous change (Galbraith, 1997) are other suggested approaches. Drucker (1988) points at the crucial element of self-governing of experts in dealing with a changing environment. All these point to the individual and personal knowledge and the

knowledge processes that are implied by these perspectives. An additional problem in this development is the effort to meet economic crises with leaner organizations (c.f. BPR Hammer, 1990). This is the pretext leading to the need for knowledge management, which is a set of strategies to make knowledge into an organizational resource. Then, the failures of a technological approach have spawned a personalization of the field (Nonaka and Takeuchi, 1995) and a focus on personal knowledge theory (Polanyi, 1958, 1966).

4.6.3.2 Aspects on Knowledge

Two central perspectives can be applied to knowledge. First, the level where knowledge is studied either on a personal level or on an organizational level. Second, how we understand knowledge from a cognitive aspect or from a social aspect. A similar view on the latter is the subjective and objective perspectives on knowledge investigated, for example, by Schultze (2000). Knowledge from an organizational aspect is a resource (Grant, 1996) that is used for producing goods and services. In Polanyi (1958, 1966) knowledge is discussed as something personal. Here an epistemology is outlined, which includes two kinds of awareness: focal and subsidiary. From these two types of awareness, Polanyi shows that two kinds of knowledge are possible, subsidiary/tacit and focal/explicit. Focal/explicit knowledge is knowledge that we can express explicitly, in some form, and subsequently transfer to other people. The subsidiary knowledge is every thing we know but cannot really express. This is the tacit dimension of human knowledge, a complex web of clues that we use in order to interpret and produce explicit knowledge. Explicit knowledge is not possible to have without subsidiary/tacit knowledge. From the social aspect, knowledge is developed in social interaction with other people. In their theory of knowledge sociology, Berger and Luckmann (1966) claim that a sense of reality is given to our awareness through social interaction with others. A person's knowledge is dependent on the social context to which that person belongs. A more cognitive perspective on knowledge systems is gathered from Ackoff (1989). Here the knowledge problems are divided into two aspects: knowledge and wisdom. Ackoff presents a model of a knowledge/wisdom system, where data, information, knowledge and wisdom are essential concepts. Wisdom is the ability to know what is right or wrong (Ackoff, 1989, p. 6). This demands an ability of judgement of what is good or bad, based on areas of ethics and morals.

4.6.3.3 Knowledge Management

The central knowledge management perspective is that it is the art of creating value from an organizational resource (Grant, 1996). Two essential knowledge management approaches are recognized, a technology focus and a people focus (Alvesson and Kärreman, 2001). From the technology aspect a functional point of view is taken. Here the key question is how to use IT for the support of the key knowledge management processes of creating, acquiring, capturing, sharing and using knowledge (Prusak, 1997). A more people-oriented approach is given by Nonaka and Takeuchi (1995) who explore the possibilities to arrange work in an organization for knowledge creation. A special focus lies on how tacit knowledge can

be created and converted into explicit knowledge and by that into a useful organizational resource. Creating knowledge is mostly about giving people possibilities and encouragement to experience and learn. The organization directs this learning effort into areas that are useful for the organization. This planning step is based on the founding values of the organization and directed by problems encountered in planning processes or other activities of the organization. The values of the organization are developed by top management and shared by the whole of the organization in a spirit of co-operation.

4.6.4 Case Study

In a public organization ("the organization" in this text) in Sweden, an IT solution for managing the information environment was developed. The approach was a technical one, with a "cheaper and better with IT" mentality. The general approach was to change the technology for distributing internal information, from paper to IT. We can characterize this as an information distribution system. As a side project another information system was developed, focusing on communication and connecting the people of the organization.

4.6.4.1 About the Organization

The organization of the study is organized with one central organization (CO) that supervises a number of local (county) organizations (LO) that deal with individual issues. The decision in the individual cases is made by administrators in local offices within the local organizations. The outer frame is the law, which the decision-makers must follow when they decide on cases. It is the duty of the central organization to insure that these laws are upheld. The CO is responsible for auditing and supporting the local organizations. The administrator responsible for a decision can be seen as a knowledge worker. It is the ability of the knowledge workers to stay informed, to understand and apply the laws that will determine the efficiency and effectiveness of the organizations operations.

4.6.4.2 Problems in Public Administration

There is a general productivity problem in public organizations. The problems with public service are pointed out by Castells (1996) as an essential factor of the economic decline during the 1970s, which lead to market reforms and privatization later on. Castells also points out that the effects of IT on productivity have had problems in reaching the service sector in general. One major problem in the current organization is that the variations over the country as a whole as well as between different kinds of decisions are considerable. The problems have been and still are substantial. The general solutions proposed by the CO are the development of information technology based support systems.

4.6.4.3 Analysis of Interviews

This section presents some of the empirical material of the project (table 13). The analysis process involved selecting and generalizing interesting comments from the transcript. These were then classified into one of three categories. 1) Practical

problems that make knowledge work harder. 2) How can work be supported? These are examples of how people experience what is good support. 3) The role of information systems or application of information technology as support for knowledge work. This is a mix of wishes and these are to some extent satisfied today. Then a two-way split of the material was made, into one cognitive aspect and one more social aspect on knowledge. The three categories were then aligned so they corresponded to each other.

Table 13. Interview opinions on problems, possibilities, and information systems

Problems	Support activities	Information systems (IS)
A cognitive view of knowledge		
Changing organizational environment, internationalization and globalization.	Avoiding information overload.	Information systems as a mean to personalize information sources.
Knowledge and information age quickly and it is hard to keep pace with updates and changes in personal knowledge.	Need of spreading news quickly.	IS for faster transportation of information, making updating of information or knowledge more frequent.
How to combine different areas of knowledge, such as different laws.	Background sources, explaining the basic arguments and giving a broad understanding of the problems and rules given	To make it easy to search databases or other information sources.
Time to process a case vs. quality of the decision.	Support of routine work, how to fill in a form, conduct interviews, make a request and so on.	Traditional symbol manipulation – important to make it easy to use the support system.
A social view of knowledge		
Relationship with higher levels of the organization, guiding knowledge work.	Communication compensates for problems in written sources Communication is a part of work	Telephone and personal meetings still important media for learning and information sharing among individuals.
Knowledge is often personal and confined to individual workers.	Need for answers from experts.	E- catalogues for organizational competence.
Examples do not support solving complex, difficult and unusual problems.	Conferences – meeting with peers from other parts of the organization and with experts. Providing a more diverse set of information and examples.	IS for bringing people together, sharing experiences and spreading the latest knowledge on a topic, e.g. e-conferences.
Consistency in decision making over the organization as a whole.	Cases are used for knowledge sharing within workgroups.	Supporting collaborative work, sharing knowledge resources.
Consistency between work process description and information/knowledge sources.	Texts combining the work process and references to information sources.	Coffee meetings, talking to nearby co-workers, local and situated learning.
Problems of language, for example, natural language vs. formal or judicial language.	Examples are important for the support of learning and are used to verify personal knowledge	Case databases with comments and a discussion forum for interactions with others.

The empirical material shows that it is possible to construct two perspectives on knowledge work support. These are the cognitive and the social aspects of

knowledge, which should be supported with respect to their special views on knowledge. At the same time it must remembered that this is an analytical picture, in the problem situation many of the problems are interconnected. Each problem has a cognitive and a social side and the support of them must be in tune with each other. The support systems must be in line with the aspects that they support without interfering with other aspects.

4.6.4.4 Knowledge Management Situation – Problems and Support

The organization could be understood as a knowledge system. This implies a number of knowledge processes and activities that must be in working order. These are supported by written material (for example, different kinds of books, articles, examples and so on) for distributing the necessary information to the administrators. The main direction is from the CO to the LO and the administrators. Conferences and courses are also arranged to spread knowledge about how laws should be applied in individual cases. These activities and material aim at increasing the quality and productivity of the organizations output, that is, the decisions. Some major knowledge processes can be identified. One knowledge process is the creation of knowledge about how laws should be applied. This process takes place at all levels, not only at the CO level. Then there is the process of distributing knowledge to the administrators. Connected to this, there is the use of knowledge by the administrators. In the case, the existence of the information was assumed to be enough to enable the administrator to create personal knowledge. Looking at the support side, an essential element was the handbooks, which provided both facts and procedural knowledge. The idea was that the administrator should just follow the book, and the decision would be correct. This provided a sense of security at work. Another text that was constructed by the central organization was a mix of examples and law text and was very popular among administrators. This provided a learning environment for the administrators. The problem was that the texts were hard to keep updated and they were not very suitable for a changing world. This support situation was threatened by the introduction of some new information system.

4.6.4.5 Information Distribution Supporting Knowledge Processes

An information distribution system that provided a series of information repositories was put into place for administrator. The aim was to decrease the need for detailed handbooks, instead letting the administrators search for the required information using the new system. These sources of information could be called “potential knowledge sources” if they are regarded as for being a source for learning. The set of texts that was included in the system was impressive; most of the written sources were facts, from law texts to old cases. The system was text-based and the user friendliness was not very developed. The time to compile and to construct the handbooks was saved and instead the worker dealt with the material directly. In addition, there was a hope that more flexibility would be added to the work when the rules approach was abandoned. The big change was from an information push principle to an information pull principle. The administrator must find the information that was needed, instead of it being provided by some expert. The

administrators did not easily accept the support system, the focus was put on the information logistics between the centre and the LO's. The focus was not on the knowledge worker or on knowledge creation and use.

4.6.4.6 Communication Support System and Knowledge Creation

As a support system for the creation, storage and sharing of knowledge within the organization, a "suggestion support system" was developed. It was christened "The box", associated with the manual box where staff could put their suggestions outside the boss's office. The basic outline of this is to capture ideas in operative parts of the organization that are gathered and used to improve the organization's work. A manual system of this kind existed and the development of an IT-based support system aimed at the automation of the existing process and in improving it. This system was an extension of the current system in that it could provide one-to-one discussions all over the organization, over geographical distances and organizational levels. The idea was that both problems and solutions were to be submitted into "The box". These suggestions were structured to force entry of certain information in order to ensure their usefulness. At the same time, a "free-text" approach was used in order to get close to ordinary and natural human use of information. In connection to this, a thread of discussions of the issue could be conducted, in order to debate or to enhance the suggestion. The full form included both a problem and a solution. However, just one of them was required, that is, good practice could be described just to inform others of it. Good suggestions could be rewarded, the originator being given some benefits depending on the usefulness of the suggestion.

4.6.4.7 Summary of the Case – an Initial Interpretation

This case displays a series of difficulties associated with knowledge work, support systems and information technology. The outcome of the projects at large was twofold. First, the big information distribution application was not used; it did not seem to be in touch with the demands of the potential users. To some extent, this was caused by the technology that was used and how the system was introduced. At the time, when the system was introduced and this study was performed, very few actually used it or even knew what it was good for. On the other hand, when the communication support system, "The box-system" was demonstrated for potential users, it immediately caught people's attention, and was praised by users. Due to a lack of consistency with the technological platform, the system was not brought into use, at least during the lifetime of the project. "The box" was aimed at the part of knowledge work that is suitable for social aspects of knowledge by the support of communication between organizational members. The distribution system was aimed at solving a necessary problem, i.e. the cost of moving texts. However, the usefulness of the texts depends on the ability to understand them. The administrator develops this by evaluating personal experiences and juxtaposing them in social interaction with others. "The box" provided a virtual arena for these discussions, which could complement existing face-to-face meeting at their workplace or at conferences.

4.6.5 Perspectives on Knowledge Work

The case highlights and exemplifies a series of difficulties in planning support systems. An analysis could provide us with a set of perspectives leading to understanding the consequences of the use of the systems, both direct and indirect.

4.6.5.1 People and Technology

One problem that has been recognized is that knowledge management has often been seen as a form of information management (Swan et al., 1999) and a technical problem (Scarbrough and Swan, 1999). In the case the basic problem observed was the split between the technological aspect of support and the knowledge work aspect. From a technological perspective, the information distribution system would bring a faster pace of work. In a sense, this was the case, less time and effort in transporting facts was needed. However, from a knowledge perspective a new work situation was constructed, a new structure of the knowledge work was created. The problem is to understand the knowledge work not just as a problem of moving data but also as an interpretative act. This falls back on the view of knowledge as subjective and personal (Berger and Luckmann, 1966, Polanyi, 1958). The problem is that these social and personal knowledge processes must also be supported by data/technology-focused solutions. It is the duality of knowledge work and the subjective aspect that must lead the way. A perspective on this is that some of the administrator's work is repetitive and is possible to deal with in a structured way. In a structured situation, information becomes synonymous with knowledge, the interpretation is uncomplicated and institutionalized (Berger and Luckmann, 1966). It is in an unknown and complex situation that the knowledge perspective becomes problematic and activities outside the common use of information systems are necessary. This is about fitting the right type of support system and the contribution of IT, to a special situation. In a situation when an administrator handles a standard case, the support should be adapted to this situation. A complete set of basic texts might not be the best support; it could be a hinder if they began to search databases, resulting in time consuming work. Standard forms and simple rules are probably better. The support must fit the person's knowledge work situation. In an unstructured case the big database is an important complement but does not help interaction and building personal knowledge. These are social processes; the knowledge work must not only assemble facts of the case, but also construct a personal understanding of the case and then externalize it in the social/professional context of the work. The unstructured aspects are becoming more common in turbulent situations where time constraints are important issues.

4.6.5.2 New Realities – Turbulence and Flexibility

A rapidly changing world makes knowledge work harder. Both the time for learning and the time span when the knowledge is useful are becoming shorter. Many factors should be considered such as, globalization, IT, new financial realities and people changing behaviour more rapidly (Castells, 1996). Globalization affects the organization. For example, people from Sweden move around Europe but keep

contact with the Swedish systems. In interviews, this was pointed out as an increasingly difficult area. Change is the only thing that is certain (Galbraith, 1997). A turbulent environment is sometimes thought to be cured by increased information handling capability (Huber, 1984). This strategy seems to be used in the discussed case. Another type of solution is to give more responsibility to the individual knowledge worker. One approach to this strategy is presented in Drucker, (1988), where the concept of "information-based organizations" is discussed. In this vision, the organizations are carried forward by expertise. The organization must actively create a learning environment that fosters these experts. Providing more facts to the administrator will not necessarily create experts. Using IT will, in the worst case, only add to the increased speed of work, leaving even less time for personal learning. The creation of experts turns the problem into how to support the creation of new knowledge and issues concerning learning.

4.6.5.3 Conditions of Learning

In the case, the work practice of administrators was changed. Handbooks that combined a work process and necessary facts were replaced with a selection of databases providing information. Following rules is not necessarily a knowledge intensive process, but the rules were replaced by information support. In this "new world", with change as the key factor, knowledge work becomes important. In knowledge work, personal knowledge activities come in focus, including processes where facts are perceived, interpreted, and internalized as new knowledge. These processes are personal which means that the interpretative frame of the individual becomes the central part of the process. In this situation, more and faster information is not always a cure, it can even add to the inability to learn and change interpretative frames (c.f. information overload, Ackoff, 1967). The database searches provided to them were not seen as something bad, but a complement solution. The law text, as a book, is an example of the way that an essential knowledge source was handled. This is a trustful companion of any administrator. But, what made it useful was the personal knowledge developed during working with it. The administrator noted these experiences in the margin of the book. Here, the experiences from individual decisions were recorded. There was not an automatic step forward when the texts were made available in electronic form.

The personal nature of learning and knowledge development is well investigated (c.f. Nonaka and Takeuchi, 1995). The active processes in learning are the interface between the person and the problem situation and face-to-face meetings between people. This falls back on not only the idea of personal knowledge (Polanyi, 1958), but also on the concept of knowledge as socially constructed (Berger and Luckmann, 1966). Polanyi shows knowledge as something in the mind of the individual and rooted in that person's tacit knowledge. Berger and Luckmann claim that people do not know anything before it is reaffirmed in their social environment. Reality becomes real in interaction with others. At the local organization, people who had sticky problems dealt with them at group meetings or in discussions with colleagues over a cup coffee. Social interaction with others seems to be an important part of

learning for the administrators, both locally and together with other local organizations around the country. This points to the need of supporting creation of groups and the phenomena of networking.

4.6.5.4 Communication and Networking

The case indicates that there was an interest for the communication-based support system (The box) from the administrator's side. The system would support problem-oriented knowledge development and transfer to the organization as a whole. Both vertical and horizontal communication would be involved. It showed a promise to be an effective aid in turbulent times, meeting demands for faster development of new knowledge to rapidly changing conditions. A parallel to the "Garbage-can" model (March and Olsen, 1976; Cohen et al., 1972) of organizational decision making can be seen. The system creates a meeting place for people with similar knowledge interest, creating subgroups of the organization. Meeting places as such are not new, as courses and conferences always have been important in the organization. The contribution of the system is the flexibility of the creation of the groups. It is done in a network manner, people connecting around a common, emergent problem. These networks become places where a common understanding of a problem can be developed (Lave and Wenger, 1991, Brown and Duguid, 1991). These fast moving networks are harder to control and predict in the organization. People at the central organization, who were responsible for developing and distributing information/knowledge, suggested distribution of special information to certain groups of people by e-mail. A key issue according to them was to distribute the news about changes. This works in a group of people that have the same frames of reference. Here two approaches to the problems of turbulent environments are displayed. One organized centrally and one around current problems, the other around emerging problems in a distributed manner. The downside of this network building is the problem of excluding people (Castells, 1996). Personal knowledge is local knowledge and the same problem was built in to "The box"-system. The consequences are inconsistencies and problems with control.

4.6.5.5 Knowledge for Control or Flexibility

One approach to control in organization is to make rules and in these code the knowledge that guides the activities of the individuals in the organization. The employees are paid to follow rules and this is the guarantee for the stability of the organization. In times of greater ambiguity and a more complex and rapidly changing world, flexibility is needed more than stability. This is achieved by letting the personnel closest to the turbulent environment take a greater responsibility for the business, as discussed above. In turn, this implies that they have to take responsibility for organizational knowledge creation. A monopoly of the higher levels of knowledge used for control is not viable in this scenario. But on the other hand flexibility is not only about change, it is a balance between change and stability (Evans, 1991). An understanding of both the changing conditions and the basic values must be weighed against each other for flexible action. Again, detailed rules that specify action, needed for good decisions about keeping to the plan, can be hard

to apply. More general ideas about the basic ideas of the organization, as expressed in visions and policies are needed but above all an ability to apply them in the special situation is required. The case describes a long knowledge process, starting in the social and financial reality interpreted in a political environment, expressed in law making, transported through the organization and finally applied in decision making by the knowledge workers. By the time, this process has reached its conclusion the world might have changed. The individual administrator might see the effects of "old" laws that they have to apply in a new environment, maybe knowing that a new law is under development. For an insight into basic values, a wisdom dimension is necessary. The knowledge and information that earlier were spread very much as a control mechanism, now must serve as a means for fair survival in a turbulent world. Here the knowledge workers must rely on their personal knowledge and ability of "wise" judgement (Ackoff, 1989).

4.6.5.6 Power and Knowledge

The control over what is possible or acceptable to be known is a source to power (Suchman, 1994). Setting an agenda and making definitions creates a firm grip over a social situation. When these definitions are frozen into a computer system, they become even more dominant and very hard to change. The computer system also may hide logic of the language and separate the origins of definitions and their application in practical situations. If the persons using a rule are not involved in the making and the background of the rule it becomes harder for them to adjust and adopt them to the circumstances of a problem situation. In the case this process is a central problem area. The information distribution system can support this problem, in so much that extensive material on the background of a law, fresh examples or hard to find examples can be located in databases. The problem is when it comes to understanding and internalizing this information and how to externalize it into socially accepted knowledge on the subject (Berger and Luckmann, 1966). Practically this is probably done in the local context, creating more local knowledge. The basic problem remains, the input to this process, the text stored in the database, is out of the reach of the administrators. To really get under the skin of a complex and ambiguous case one must interact with the people responsible for the rules and interpretations of these rules. This argument falls back on the works of Foucault (1979), who views knowledge as a construction by certain persons for certain purposes. Words and interpretations are constructed intentionally and they are means that people are given to understand a situation. Also, they will limit people's ability to act (Burrell, 1998 talking about Foucault). These means of interpretation are sometimes summed up as identity (Castells, 1996).

4.6.5.7 Identities and Information Technology

As a logical extension, of the above identified aspects on information systems and knowledge work, ideas about the role of identity and information technology, as presented in Castells (1996) can be discussed. Castells argues that the identity is a basic organizing principle, and that information technology is changing how identities are created and uphold. The basis for interpretation and understanding is a

person's identity and as such the basis of knowledge. An identity is how a person recognizes himself and is built on a number of cultural attributes. The symbolic communication between people, will, over the time, become crystallized into cultures. As noted in the preceding section, information can be used both as organizational control and personal creativity. Castells (1996) argues that the globalization trend based on international information systems creates new identities. The existing social interactions within a physical workplace with its cultural spheres will be jeopardized. New social relationship without boundaries like time or geography will produce new identities, which are disconnected from the physical environment. The design and the development of the culture of a community will be an important determinant for how knowledge work is done (c.f. Schein, 1996). The question for the organization of the case is what happens if more and more of the sense making activities and identity building are re-located to a virtual place. In the case, opinions of the importance of closeness to the organizations customers/clients are put forward by some administrators as the key source of knowledge for the correct decision in each individual case. This situation is based on its special assumption embedded in that section's culture, i.e. a collective identity (Castells, 1996). New kinds of networks will be developed, depending on how electronic media are used. These networks will support the creation of different collective identities, and thus different sets of knowledge. These different kinds of knowledge cultures will play a central role in knowledge work and subsequently how it can be supported.

4.6.5.8 Narratives and Rules – Learning as Telling Stories or Deduction from Texts

Two approaches to the creation of knowledge seem to be present, one based on stories or examples and on more oriented towards rules. One example of the importance of narratives in creating organization knowledge is Boland and Schultze (1996), where accounting is viewed from two perspectives, narration and calculation. Boland and Schultze (1996), citing the works of Bruner, (1986, 1990), discusses two modes of cognition, one dominant from cognitive psychology and one based on narratives. The first focuses on logical processing of information and forming of abstract concepts. The second concludes that the narrative approach is a powerful way of making sense of a situation, basically by putting actors and events in a meaningful sequence. This division is reflected in the case, two knowledge interests are present: on one hand about the case and how to understand it and on the other hand, understanding the rules by reading law texts and the background work for that law.

4.6.6 Discussion of the Result

The argument of this paper is that in order to understand the need of information systems for the support knowledge work a dual view of knowledge, both social and cognitive, should be used. The case of this paper contains examples of attempts to support knowledge work. The communication support system ("The box") was directed towards human knowledge problems and the social construction of knowledge. The system for distribution of information, with databases and search

functions as technical features, support the cognitive perspective, i.e. logical information processing based on concepts and abstractions. If a support system is not aligned with the dominant aspect of the knowledge processes, problems will arise. At the same time, the cognitive and social aspects of the knowledge processes are both necessary. The goal must be a knowledge support solution that respects and cares for both aspects.

The social / cognitive dimension was used for the analysis of knowledge work and information systems, but it was not fully explored. The fact that humans develop their knowledge by both perceiving their world and discussing the result of this cognition with others is rather straightforward. Just by looking from these two perspectives, different views of the information systems emerge. Some examples of the perspective discussed include:

- From the knowledge workers perspective, the human perspective, the information system can support problems of cognitive limitations. However, to create knowledge an interpretative process, that is connecting meaning to objects, is needed. This brings in the social perspective; here meaning is constructed in social interaction between people. If the result of cognition is within what is all ready known this not such a big problem. But, if this is the case then we are not talking about knowledge work.
- From a globalization perspective, information systems can overcome distances in time and space, at least from a cognitive perspective. The same goes for the speed that the world is developing. Information systems are also suitable for overcoming a higher change rate. But the distances between people can only be bridged by social interactions, when it comes to sense-making and understanding of other peoples' view points. To create new knowledge or to transfer knowledge between people there is a need for a culture or identity that can make sense of the new knowledge and can be used to bind the participants of knowledge exchange together. The flexibility needed in this new environment comes from the ability to change fundamental ideas about the world. Changes on this level are about changes in cultures and basic assumptions and this is done in social interaction between the people that uphold these cultures.
- Learning is a key element in knowledge work; either it is learning something new or learning from other people. Getting the facts, like searching databases or getting reports from all over the world is easily done with information systems. This is just a part of the learning process, to act on the information one must trust it. This trust (Polanyi, 1966) or sense of reality (Berger and Luckmann, 1966) comes out of social interaction with others.

These are some examples of how the cognitive/social dimension can be used to analysis information systems. Both perspectives can be supported using information

systems, the cognitive may be to a greater extent and more easily than the social. More work is needed both into the theoretical background and into the application.

The use of the theories and stories related in the research should be put into work in practical use. This means incorporating it into existing methods for solving knowledge problems using information systems or building new ones. One approach is to form a methodology focused on information system used for knowledge workers. Implementation strategies or methods answer questions like: “what is the problem in this organization?”, “what is the desired new state of the organization?”, “what activities are needed to get there?” (for example soft systems methodology, SSM Checkland, 1981). But, many methods, just like soft systems methodology are too general; they do not contain knowledge of the problem area. The idea is of course that the method helps the analyst to understand the problem and that a senior consultant with experience from the problem area is often the key factor for success. Knowledge management strategies (c.f. Davenport and Prusak, 1998) provide insights on the problem but do not give much practical advice on how to use it from a method point-of-view. A method or planning approach for this class of information system should be combinations of problem solving methods (for example SSM, Checkland, 1981) and theories on knowledge work.

Already at this stage, some general characteristics of such a method or planning approach can be discussed. The essential ideas that should be focused on include: human aspects, multi-perspective and interpretation.

- The closer to one gets to the human side of technology the more complex it seems to be. The success of the IT-system becomes less a question of technical function and more about how they are used. Understanding the user and the situation of the user will be crucial for designing the technical artefacts and implementing them into the organization. This seems to be extra important when it comes to knowledge work, obviously connected to the creation and recreation of meaning, which is a human affair. Ethics (Mumford, 1983) is one method that can provide steps that deal with understanding the human perspective.
- To be able to understand the complexity of knowledge workers, a multi-perspective approach should be used. The outlines for these perspectives have be the main objective of this paper. A framework built around these perspectives should be developed. The aim for such a framework would be to facilitate the interpretation of the possible impact of information systems on knowledge work.
- A method must include steps or techniques that enable interpretations of the problematic situation, knowledge work and the use of information systems. One example of a methodology that incorporates such features is the aforementioned SSM. It advocates several learning cycles, moving between abstract analysis using system concepts and empirical investigations of the problem. Looking for new viewpoints and paradigmatic shifts are important parts of the methodology. The intended planning approach for knowledge work should take the full step and use

theory from the field of hermeneutics as a base for creating interpretative steps (c.f. Ricoeur, 1981, Gadamer, 1994).

The future work in this research area should be continued in a number of directions. First, work on the perspectives, their theoretical base and their interconnections. In connection to this, the social/cognition dimension should be made more explicit, likewise the application. Second is the empirical side, this could, for example, mean to come back to the organization and to look at the development in order to get a richer picture of the problems of knowledge workers. A third line of investigation is how these findings should be incorporated into methods for planning and development of support systems.

5 EXPERIENCES OF THE APPLICATION OF THE PROBLEM EXPLORATION APPROACH

These sections summaries the experiences from two applications of the frameworks. The frameworks discussed in chapter four are here brought together into a planning approach, for testing and further development.

During 2004 two cases ("Public Hospital case", Aidemark, 2004a, 2005a and "Printing company case", Aidemark and Persson, 2004) were used to test the approach and provide input for further development. There were a progression between the two cases, and the "Public hospital case" came first and inspired the analysis of the "Printing company case". The combined experiences made in both of these cases contributed to the presentation of the planning approach in this thesis.

5.1 The Public Hospital Case: Implementing Intranet for Social and Cognitive Knowledge Processes

In this section, the paper "Implementing Intranet for social and cognitive knowledge processes" (Aidemark, 2005a).

The paper discusses a social and cognitive approach to the planning and implementation of knowledge support systems in a healthcare organization. A case study is presented and then discussed using a broad theoretical frame of reference gathered from the knowledge management field. The discussion is an illustration of the delicate trade-off between social and cognitive perspectives of a development project. The assumption is that these two aspects must be handled in an interconnected and balanced way. The aim of the paper is to illustrate the use of multiple perspectives as a tool for understanding how this problem can be dealt with.

5.1.1 Introduction

Knowledge has been hailed as the basis for economic growth (Teece, 1981) and knowledge management is a way of levering this asset (Teece, 2000). But knowledge in organizations is a complex matter (Blackler, 1995) and knowledge management might become the next fad where people are forgotten (Swan et al., 1999). This paper examines the fine balance an organization must have in order to gain the advantages while avoiding the problems. An analysis of a case study is presented, describing the implementation of an Intranet system for the support of effective internal control and communication together with an organizational environment of learning and development. The study took place in a public hospital, which can be understood as a knowledge organization. This is not a dedicated knowledge management project, but many aspects of it do concern the practicalities of creating, coding, and disseminating organizational knowledge. It also tackles the problems of a coherent organizational

culture, something that is well-established as a key component for successful knowledge support.

The problem of the case could be summarized in a citation from the interviews “here we have the technology, now we must fill it up with content”. The problem area is to get the technology used by focusing on human and organizational development. Here we find a theoretical problem of the knowledge management area - the subjective/objective dimension of knowledge. Opinion within knowledge management is divided into different camps on this issue. One example is “cognitive versus community perspectives” of knowledge support (Newell et al., 2002), (Carter and Scarbrough, 2001). Hansen et al. (1999) connect these two knowledge processes to different organizational strategies, arguing that an organization must choose one over the other. Unique products developed for individual customers are associated with social knowledge processes and a personalization strategy towards knowledge management. Standard products could be supported by cognitive processes and a codification knowledge management strategy. Hansen et al. (1999) give examples of different organizations in the health care sector, arguing that both strategies could be used successfully. Bates and Robert (2002) explore how knowledge management concepts might contribute to the development of public sector quality improvement initiatives. They argue that a more social or community approach must be used to achieve sustainable effects from knowledge management projects.

The concluding discussion on the present study is an illustration of the delicate trade-off between the cognitive and the social aspects of a development project. The aim of the paper is to illustrate how the use of the multiple perspectives as a framework for understanding this problem of knowledge management can be handled.

5.1.2 Method

The case study concerns the planning and implementation phase of an Intranet in a Swedish public hospital. The choice of this organization is mainly due to the fact that it is a knowledge organization, something that the hospital itself maintains in the discussions. The choice of interviewees was limited to people within the project team. The case is built on a series of deep interviews with people involved in the processes who represented different perspectives and interests. Five persons were interviewed comprising areas such as information, IT, a medical department, and competence development. There is one limitation to the study. The medical staffs were not interviewed. This lies ahead in a follow-up study. The interviews, conducted in offices, took the form of discussions and were recorded and transcribed. The respondents seemed quite interested in talking about the issues and were encouraged by the attention paid to their problems. The focus was on getting the respondents to give their views on the process and central theoretical issues of special interest were brought up if they did not appear by themselves. In this sense the theory and the empirical material were interconnected from the beginning. A lot of time was given for the respondent to speak freely. The interviewer tried to provide personal examples (experiences of using Intranets or memories from hospital visits) to make the

structured questions more accessible to the respondent. Direct observations of the system in use and documents associated with it as well as the development process were also important sources for the research.

5.1.3 Theory

The basic problem of the subjective/objective division of knowledge management should be understood from a number of perspectives. Within the knowledge management field there is a set of research directions that could be used as a starting point. Here we present five issues or perspectives that the knowledge management system must be related to.

1. Many knowledge management models and approaches are focused on the knowledge management process (Rubenstein-Montano et al., 2001), typically incorporating creation, codification and transfer/use of knowledge (Grover and Davenport, 2001).
2. Knowledge management is a support process for the organization core processes, it has no value in itself (McDermott, 1999), for example, to develop new products in effective ways (Nonaka and Takeuchi, 1995).
3. The knowledge management process depends on the organizational situation or culture (von Krogh et al., 2000).
4. Knowledge is seen as a strategic asset and as a way for organizations to compete (Grant, 1996). A company's knowledge management strategy should reflect the competitive strategy (Hansen et al., 1999).
5. The ways organizations structure themselves and interact with other organizations are changing, (Carlsson, 2003). Castells (1996) discusses the development towards a network society where the traditional hierarchical organization is developed towards a network type of organization.

An organization that initiates a knowledge management project will probably be looking at developing a set of knowledge management systems (Alavi and Leidner, 2001). The set of systems should be investigated in relation to the five perspectives. In the next five sections these perspectives are explored and complemented with a multi-perspective model.

5.1.3.1 Perspectives on Knowledge Management Processes

The knowledge management process can be approached from a cognitive or a community/social perspective (Carter and Scarbrough, 2001). The social approach (Pentland, 1995) focuses on knowledge as an interaction between people, while the cognitive approach sees knowledge as an information process of the human mind. Nonaka and Takeuchi (1995) focus on understanding fundamentally different views of the knowledge process and how they are interconnected in their theory of organizational knowledge creation. That is, how personal knowledge (Polanyi, 1958) is created, socialized through the organization, finally ending up in a product. To understand the conditions that these processes operate under, a critical investigation

of the reasons and goals should be conducted. The critical perspectives of the knowledge process have also been discussed (Styhre, 2003); here issues of politics and power become an outer frame or condition for the rational process. 1) A cognitive perspective that treats knowledge as a thing and can be obtained by the human sense (Piaget, 2001) and could be supported by database type technologies. 2) A social perspective where knowledge is an agreement among people. Knowledge becomes the constituting process for a society or an organization (Berger and Luckmann, 1966). 3) A critical perspective where knowledge is seen as the nexus of organizational power. Here knowledge support has political dimensions (Hayes and Walsham, 2001) or in itself constitutes a management control technology (Alvesson and Kärreman, 2001). These three perspectives are layers or parts of a knowledge management process. The cognitive view works on condition that social interactions have turned out as an institutionalized understanding of the documents that are being handled. The people involved see the documents as a part of their everyday knowledge. This social process of creating common knowledge has a political or power struggle between different views behind it. These aspects are investigated in the critical perspective. This power game must come to a balanced state before the institutionalization of common knowledge can be concluded.

5.1.3.2 A Strategic Knowledge Perspective

Strategy is the driving force in the knowledge management area. Nonaka and Takeuchi (1995) argue that knowledge creation is the key to competition. Here we have chosen to use the balance score model (Kaplan and Norton, 1992) as a framework for understanding knowledge support from different strategic aspects, the argument being that a knowledge support environment must consider all the dimensions of scorecards. The scorecard is used in the process of implementing strategies. Four perspectives are discussed: 1) Financial; “to succeed financially, how should we appear to our shareholders?” 2) Customer; “to achieve our vision, how should we appear to our customers?” 3) Internal process; “to satisfy our shareholders and customers, what business processes must we excel at?” 4) Learning and growth; “to achieve our vision, how will we sustain our ability to change and improve?”

5.1.3.3 Perspectives on the Work Situation: a Flexibility Approach

A given work situation or process is the focal point of knowledge support, i.e. the knowledge processes and knowledge work pertain to the productive work of the organization. Knowledge management seems to have both a creative and an efficiency side to it, which corresponds to a stability and change dimension. Creating new knowledge enables change (Nonaka and Takeuchi, 1995) but transfer of established routines is also an important aspect (Sieloff, 1999). To enhance a processes analysis, a flexibility analysis is suggested as an initial view of the work situation. The aim is to get a multiple view of the process before the detailed analysis begins. As the background concept, the strategic flexibility concept (Evans, 1991) is used. The outline of the argument is that knowledge support should deal with actions both before and after the event and have both a protective and an opportunity dimension. By combining these two dimensions, four general types of flexible actions

can be formulated. 1) Corrective manoeuvres: defensive action taken after the situation. 2) Protective manoeuvres: defensive action taken before a situation. 3) Exploitive manoeuvres: pro-active action taken after the situation. 4) Pre-emptive manoeuvres: pro-active action taken before the situation.

5.1.3.4 Perspectives on the Organizational Context

Generally, the design of information systems should be adapted to the organizational environment where the information systems are supposed to function. Nonaka et al. (2000) discuss the shared context of a knowledge management process, using the concept of "Ba". The basic argument in many such discussions is that the right culture must be present or developed if knowledge management is to be successful (Davenport et al., 1998). In this research, we use a multi-perspective framework to understand the situation of the knowledge management process. The focus is on the circumstances or logic where knowledge work is performed. This, in turn, provides meaning for the work. Building on analysis of decision environments (Huber, 1981), the framework includes four contexts: "garbage can", "political", "rational" and "program". Huber used the framework to understand the organizational conditions for use of decision support systems, a class of systems similar to or even included in the group of knowledge management systems.

5.1.3.5 Perspectives on Organizational Structure: Networks or Hierarchies

A transition towards a "network society" (Castells, 1996) implicates a move from hierarchies as control technologies to a more dynamic and organic situation. It is assumed that there will be a change in the patterns of interactions between people and organizations. A key aspect is the process of integration and diversion that the network logic brings. This is a process of identity building along new lines of network connections that are not visible or controllable by hierarchical structures. This points towards the creation of subgroups, both within and spanning across organizational borders. A new breeding ground for organizational culture might arise. New possibilities for new viewpoints and experiences emerge and, in the best case, a base for broader and more flexible decision-making may be created.

5.1.4 Presentation of the Case Study

This case study is based on the implementation process of an Intranet in a Swedish public hospital. The process began with a planning and implementation phase that took about two years, but had a background of several years of loose discussions. During the second year, the system was commissioned but it was in the third year that the usage really picked up speed. The study was conducted during the third year.

The board of the organization initially started the Intranet project. The decision was part of a wider organization development process. A key feature of this change was greater autonomy for the board of the organization towards the political system of the region. A number of goals and policies were formulated more or less explicitly. Two goals were defined. First, to create an environment for learning and growth. Second, to provide the organization with an effective communication channel for information

exchange. As a general guideline for these goals there was a policy decision that all documents were to be digitized in the coming two years. The aim was to make the Intranet the main information channel of the organization. Together with this, an information pull policy was established, i.e. staff had to find information on their own. There were some hopes of gaining some productivity effects from the cost of internal communication, focusing on the costs of material and personnel.

In connection with these main goals some additional positive effects were expected. For example, that the use of the Intranet would support the development of a coherent organizational identity. In light of the organizational change the project would mark the advent of a new type of information policy as a sign of the new organization. The Intranet was also hoped to be a direct and useful tool in the change process, providing a more open and direct communication. Getting the correct facts out rapidly would facilitate the process. From the information technology or work support point of view the Intranet system is anticipated to become the central point for computer aided work support for all personnel. The Intranet is today the main channel and most types of documents are available in digital form. The usage of the system is widespread but not complete. Much information is only available on the Intranet and for those who complain about it there is often a tough answer: “get used to it”. Today this is complemented with e-mails and sometimes even paper reminders or word of mouth are needed to get all the messages out. But these messages direct everyone to look at the Intranet. The general goal of creating a communication channel is complete, at least at a basic technical level. The learning environment is still under development.

5.1.5 Analysis of the Case

5.1.5.1 Perspectives on Knowledge Processes

The project has tackled all three aspects of knowledge laid out in theory. Support for cognitive perspective is in place; electronic documents and search systems have made work more efficient in the organization. Work on templates, indexing and information structures that support knowledge codification and transfer is under way. The Intranet was established as the main information channel of the organization.

The project worked hard on the social aspects of the Intranet system. A lot of effort was made to support a strengthening of organizational identity and generally bring the organization closer together. Department pages were open for anyone in the organization to visit. This helped to build connections between personnel who generally did not meet. There was an active focus on social events, getting photos of people, personal accounts and so on. A project of cultural networking was in progress, promoting common interests in movies, the arts, music and theatre. This implied a fundamental change; as a rule, departments and sections had kept their documents and meetings to themselves. However it was difficult to make real changes. For example, electronic forums were launched for ethical discussions but were very little used. The tight boundaries between departments and work groups proved difficult to bridge.

The Intranet played a role from a critical perspective. It was used as a fast and reliable information channel during the process. Pride was taken in delivering facts that could be trusted by the whole of the organization. This became a way of cutting through the organizational hierarchy and thereby creating a new form of organizational openness. Mid-level managers were cut short from their information control positions. The Intranet project also led to a clearer expression of organizational structures. Open forums were used as places to air concerns, though not anonymously. Questionnaires were sent out to get quick replies about organizational issues. From this perspective, the Intranet system worked as a management system, as a tool for top management to take control over knowledge workers.

5.1.5.2 Perspectives on Knowledge Strategies

Knowledge management systems must align with the general strategies of the organization. The hospital used a locally developed balanced scorecard to define and implement their strategies. The scorecard was not systematically used, but some of the goals were clearly used to justify the Intranet.

The financial aspect was an issue for the Intranet. One goal was increased productivity by reducing administration, i.e. moving papers around. But hopes for rapid effects were not that high as investment and maintenance costs were considerable. In the long run, the system was expected to contribute to greater productivity.

The main objective of the project was to develop internal processes. Product quality and process development were particular targets of the scorecard. The Intranet also contributed to the quality of internal processes through better internal communication and accessibility to documents. Internal communication contributed to a deeper understanding of organizational goals among large groups of personnel. Changes in work are facilitated if there is an understanding of overall goals. A sense of belonging to the organization among marginalized groups was hoped to contribute to greater efficiency. Learning and growth were important aspects of the scorecard, especially with the connection to organizational change. The existing resources (mainly library functions and education programs) were not developed actively in the project. There was also a focus on personnel competences and how to develop them, but there was no support for these goals. The customer perspective was not actively dealt with. A lot of ideas were discussed, but not much was actually done. A series of hot spots were discussed such as information services for clients, for example, journals and booking systems. A formulation for effective organizational intelligence was present in the scorecard but nothing was really done about it.

5.1.5.3 Perspectives on the Work Situation

The framework for strategic flexibility can be used to examine the contribution of knowledge management systems to creating a balance between stability and change in the core work process.

The basic support function is the knowledge database, a repository for memos about treatments. These are descriptions about how to perform a work task. From a flexibility perspective this is a pro-active instruction for how to get the job done correctly. It is also a stabilizing force, and the support system builds on a cognitive view of knowledge. The knowledge database could be developed further by discussions on features based on the other aspects. From a pre-emptive perspective, the memos could be complemented with descriptions of how things could go wrong and how to avoid such problems. This information could be derived from reports from an incident reporting system. Currently, these systems are not connected and access to the incident reporting system is limited. From an exploitive aspect, descriptions of how to behave after the treatment could be suggested. This should include learning support that helps gather lessons for the future, providing input for the development of the memos. From a corrective point of view, there is a digital telephone system for calling in extra competences in the case of an unexpected emergency. This represents a competence catalogue type of system.

The examples given are of a cognitive type. This is mainly due to the fact that treatments are performed within a specialty where social interaction works around the written material. Within these groups, the main communication is person-to-person interaction, leaving little room for the Intranet to support social interactions.

5.1.5.4 Perspectives on Organizational Contexts

Organizations can be understood from different points of view. Here we try to understand the organizational context for the Intranet project from four perspectives. The Intranet system was developed mainly with a program context in mind. The focus was on supporting the distribution of facts and how-to knowledge in a more centrally controlled and streamlined way. However, there was a political logic involved as the Intranet was used in a larger organizational change process. There was also a symbolic meaning attached to the system, it signalled a new attitude among top management. More important for the analysis are the consequences of not tackling the rational and the creative (garbage can style) contexts. Rational processes, (to create new knowledge, develop solutions, make decisions, etc.) were in the background of the project and had yet to show through. Concentrated efforts concerning process analysis and the focus on the needs of knowledge workers were to be the next step. There were also clear ambitions to support a more creative organization. The creation of arenas for unexpected meetings and problem solving in a “garbage can” style were hoped for. The strong organizational culture of departments and knowledge areas is not easily loosened up.

5.1.5.5 Perspectives on Organizational Structure: Networks or Hierarchies

A central part of the project was to achieve more interaction and understanding between different parts of the organization. There was surprise over how few connections and understandings there were between seemingly related areas. At the same time there appeared to be strong indications of invisible networks both within the organization and with external connections. The efforts made towards network

building included an open information policy, creation of forum systems, transparency of the organizational structure, provision of contact information, and displaying interesting people, thus making them easier to approach. However, not much network building was seen; an example of this was the non-use of electronic forums. Strong existing networks and cultures of cooperation might be part of the answer to this. A piece of this puzzle was the lack of interest of medical doctors and the active interest of other staff. But this was not a homogenous picture, for example, younger medical doctors seemed more interested in using the Intranet.

5.1.6 Analysis and Discussions

The study displays the complex and contradictory nature of organizational knowledge processes. If these knowledge management systems are going to work, they must be accompanied by social processes where people can come to terms with new ways of working. These processes reside in local groups and specialist communities, which take little interest in what top management might do or think. The management knew very well that these processes took place in local groups of experts who generally preferred to do things as they always had. This created a political dimension to the use of the Intranet as a challenge to the traditional way of social organizational interaction. This was successful among some groups in the organization but the strategy also created even greater resistance among other groups.

A hospital works in two modes, an administration that manages the activities and an expert organization that performs the work with the patient care. Top management has a weak grip on the knowledge organization and the professional organization dominates activities (Ouchi, 1979). In our hospital top management used the Intranet system for intervention in the knowledge management processes and as a general tool to create better distribution of, and access to, knowledge documents. The aim was to make the production of standard treatments more efficient. However, this strategy assumed that these knowledge processes (typically the development of new treatments) was uniform, and this was not the case. There are great differences between specialties in terms of how knowledge is developed, codified and transferred. From a cognitive point of view some progress was made, but when it came to the social interactions around the local specialties there was resistance. The system provided a possibility to circumvent traditional structures of information communication providing the management with a tool that could facilitate organizational changes. However, the project has sown the seeds of change; projects to create more uniform ways of handling knowledge documents or developing organizational roles have emerged.

The hospital relies on knowledge for producing its results, but this incorporates both standard treatments in a mode of mass production and the treatment of special unique cases. In the latter, a full-scale knowledge project combining experts from several disciplines is needed. In the former, work processes are supported by codified knowledge documents as well as the social environments where knowledge is created, shared and used. Following the ideas of Hansen et al. (Hansen et al., 1999)

this would create expensive standard products (treatments). This study shows that the hospital did not rely on only one strategy for knowledge management as suggested by Hansen et al. (1999). This situation makes it possible to produce high quality products, but on the downside there have been mounting queues in the hospital waiting rooms.

The hospital is good at creating and applying knowledge in local communities. But it is in need of both better ways of spreading knowledge for wider use (just as in an industrial company) and better management and control over knowledge workers (just as in a professional company). The demands for having things both ways - high quality treatments and personal understanding of each individual person's needs on the one hand and shorter queues and lower costs of production on the other - are hard to reconcile. This demand a model that incorporates and balances both aspects and the knowledge management processes are vital for achieving it.

5.2 The Printing Company Case: Learning by Machine

> *In this section the paper "Learning by Machine: A Multiple Perspective Approach to Knowledge Work Analysis" (Aidemark and Persson, 2004).*

The paper investigates a study of operators at a printing company. The operators are characterized as knowledge workers and the possibilities to introduce information based knowledge support for these workers were investigated. To deal with the complexity, a five perspective interpretative framework is suggested. A complex picture emerged; different intertwined and interacting knowledge management themes were found. The outcome of the study is a discussion of the necessity to discuss different and very diverse aspects of knowledge management in an integrated way.

5.2.1 Introduction

Knowledge management is a set of procedures and techniques used to get the most from a firm's knowledge asset (Teece, 2000). In practice, it is a diverse, complex and often contradictory activity (Newell et al., 2001). Anything from database technologies and Intranet solutions to organizational learning and intellectual capital has been discussed in terms of knowledge management projects. Knowledge management has been described as a necessity for survival (Grant, 1996) and as the next management fad (Swan et al., 1999). This complexity, it has been suggested (Davenport and Prusak, 1998), could be tackled by selecting one aspect of knowledge management (e.g. organizational learning or intellectual capital etc.) that is known and working in the organization to build on this aspect. This would facilitate getting things going, setting good examples and educating the organization about the benefits of knowledge management. However, a knowledge management project that returns benefits for the whole organization consists of a number of activities that must be interrelated (Kreiner and Mouritsen, 2003 p. 237-8). Kreiner and Mouritsen argued that, even if a certain knowledge management effort could lead the project, it must be

preceded by planning on a strategic level. This process should produce a picture of the overall aims and an overview of the multitude of the necessary knowledge management sub-projects.
To investigate how such a picture could be formulated, an analysis of a case is presented and discussed. The aim of this study is to understand the operators of the printing machines as knowledge workers. We look at the overall possibilities of introducing knowledge management support, trying to pinpoint the difficulties and issues that must be dealt with before a projected is started. The aim of this research is to discuss the problems and possibilities of introducing a knowledge support system in a traditional blue-collar workplace. This is about giving a multi-perspective account of knowledge related aspects of the daily life of operators and to discuss knowledge management solutions and their possible impact on the situation. This has been a favoured theme of information systems research (c.f. Zuboff, 1988). The focus has been on moving people's knowledge to machines. In knowledge management the machine is supposed to aid the building of personal knowledge, either by focussing on personal creativity or by knowledge sharing.
A number of studies of the possibilities and problems of supporting operators have been reported, for example (Glassey et al., 2000; Ohashi and Yuki, 2002). Both of these studies suggest knowledge bases and focus upon the elicitation and encoding process. A series of special pre-conditions are expressed. For example, Glassey et al. (2000) report from studying bio-industrial processes that variances in processes are solved by the expertise of operators and how they interpret the problem. Further, Ohashi and Yuki (2002) in a study of manufacturing processes, point to problems of complexity and lack of completeness of standard operating procedures. Here the need for learning at work is discussed as necessary for handling the complexity and special conditions of working with the machines. The ability to learn at work affects the quality and productivity of the plant. Communications between operators, especially between shift hours, are crucial for learning. These studies focus upon technical solutions for codification and knowledge transfer. Hansen et al. (1999) argues that the company must make a choice between a codification and a personalization strategy. Complementing this dimension, Alvesson and Kärreman (2001) argue that a knowledge management project must have an approach to the management aspects of knowledge management. A strong approach that focuses on controlling activities or an approach that tries to facilitate co-operation among staff. In this research, we try to find a balance between these aspects of knowledge management.

5.2.2 Research Strategy

The strategy of the research is an interpretative case study (Walsham, 1995). First, an ethnographical (Fetterman, 1989) study was conducted at a printing company with the general intention of understanding the work situation of operators from a knowledge perspective. The full study is reported in Persson (2003), focusing on the learning processes associated with machine failures. The study was conducted by shadowing the operators as they performed their daily work in a participant observation approach (Atkinson and Hammersley, 1994). 90 hours was spent in the

company; asking questions, taking field notes and observing. Notes were reviewed and used for new questions. At the end of the study a summarizing interview with one of the operations was conducted at the operator's home. The role of the researcher is one of an outside observer with little knowledge of a printing company. This created a natural distance to the subject, avoiding the difficult trap of not seeing things that were a part of everyday life. A theoretical analysis using a broader interpretative (section 3) frame was used to get deeper into the problematic situation. Explanations and influences on the possibilities for knowledge support are sought in the broad context of the work situation. The contributions consist of discussions about the results of the case study in relation to existing knowledge management theory (c.f. Cavaye, 1996).

5.2.3 Theoretical Framework

As theory for the interpretation of the case, a broad set of aspects on knowledge work is used. The aspects represent some major directions in the knowledge management field that were selected using Nonaka and Takeuchi (1995) as a starting point. The work of Nonaka and Takeuchi (1995) is used in both (Glassey et al., 200) and (Ohashi and Yuki, 2002) as a theoretical background and guide for the development of support systems.

5.2.3.1 Philosophical Perspectives on Knowledge Work

Knowledge management is a complex and multi-faceted problem area (Blackler, 1995) and should be studied using several philosophical platforms (Schultze and Leidner, 2002). Nonaka and Takeuchi (1995) focus on the need to understand fundamentally different views of knowledge and how these views are interconnected. They focus on the ability to handle the tacit - explicit dimension of knowledge (Polanyi, 1958). Newell et al. (2002) propose two perspectives; cognitive and social. In this research, a broader approach is used (Aidemark, 2003b). Three perspectives are used to understand knowledge support, including:

- A cognitive perspective that treats knowledge as a thing that can be obtained by human senses (c.f. Piaget, 2001) and could be supported by database type technologies.
- A social perspective where knowledge is an agreement among people (Holzner and Marx, 1979). Knowledge becomes the constituting process for a society or an organization (Berger and Luckmann, 1966).
- A critical perspective where knowledge is seen as the pivotal issue of organizational power. Here, knowledge support has political dimensions (Hayes and Walsham, 2001) or in itself constitutes a management control technology (Alvesson and Kärreman, 2001).

5.2.3.2 Strategic Perspective on Knowledge Support

Strategy is the driving force in knowledge management, for example, Nonaka and Takeuchi (1995) argue that knowledge creation is the key to competitiveness. This

picture is differentiated by, for example, Hansen et al (1999) who argue for different kinds of knowledge strategies, including personalization and codification strategies. A problem is how to connect the current business strategy to the use of knowledge support systems (Truch and Bridger, 2002). Here we have chosen to use the balance score card model (Kaplan and Norton, 1992) as a framework for understanding knowledge support from different strategic aspects. The argument being that a knowledge management project must consider all the dimensions of a scorecard (Aidemark and Sterner, 2003). A balanced scorecard consists of a set of measures that gives managers a comprehensive view of the business (Kaplan and Norton, 1992). The measures are generated from four different perspectives, including:

- Financial; "to succeed financially, how should we appear to our shareholders?"
- Customer; "to achieve our vision, how should we appear to our customers?"
- Internal process; "to satisfy our shareholders and customers, what business processes must we excel at?"
- Learning and growth; "to achieve our vision, how will we sustain our ability to change and improve?"

5.2.3.3 Strategic Flexibility

Turbulence and continuous change is a central challenge for knowledge support. It is the urgency of new and unforeseen issues that drives the need for organizational learning and knowledge creation. To investigate this perspective the concept of "strategic flexibility" as discussed in Evans (1991) is used. The outline of the argument is that knowledge work should comprise actions both before and after the event and have both a protective and an opportunity dimension. By combining these two dimensions, four general types of flexible actions can be formulated.

- Corrective manoeuvres. Defensive action taken after the situation.
- Protective manoeuvres. Defensive action taken before a situation.
- Exploitative manoeuvres. Pro-active action taken after the situation.
- Pre-emptive manoeuvres. Pro-active action taken before the situation.

5.2.3.4 Problem Solving and Knowledge Work

The organizational situation is an important factor to be considered for making knowledge support systems work. One outcome of the Nonaka and Takeuchi (1995) study was the importance of how to ready the organization for the creation and distribution of knowledge. The design of the information systems should be adapted to the organizational environment, which in this case means the use of information systems as support for knowledge workers. The focus is on the circumstances or logic that knowledge work is performed under. These provide the meaning for the work. The four contexts are "garbage can", "political", "rational" and "programme", building on a framework used for analysis of decision-making environments in Huber (1981).

5.2.3.5 Knowledge Support in a Networked World

A transition towards a "network society" (Castells, 1996) includes a move from hierarchies as control technologies to a more dynamic and organic situation. It is assumed that there will be a change in the patterns of interactions both between people and organizations. Castells' broad analysis of the network society can be used to understand the conditions of knowledge work. Key aspects are the processes of integration and diversion that network logic bring. This is a process of identity building along new lines of network connections that are not visible or controllable by hierarchical structures. This points towards the creation of subgroups, both within and spanning over organizational borders. A new breeding ground for organizational culture might arise. New possibilities for novel viewpoints of making experience emerge and, in the best case, a base for broader and more flexible decision-making is created.

5.2.4 Results of the Case Study

The focus in the case study is descriptions of the work situations of operators managing a set of printing machines. The study included 8 sets of machines, where each set consists of a number of individual machines linked together that comprise the whole printing process. The interconnections between different parts of the printing process are a source of problems. The machines run in two shifts each day, each set of machines has team of four operators. In total the department had a staff of 128, including 64 operators. The rest were administration, management and other technical personnel. The operators handle the whole printing process, from lifting blank paper rolls to checking the final result.

The operators are partly knowledge workers but also partly traditional blue collar workers with heavy lifting and cleaning to do. The knowledge work includes planning the production process, dealing with complicated machinery, making quality checks on the final product and dealing with serious problem solving when the machines break down. In order to plan for possible support for knowledge work a thorough investigation of the preconditions must be performed. Here a five step framework is tested as the means for such an analysis.

5.2.4.1 Philosophical Perspectives on Knowledge Work

By looking at knowledge work from different philosophical standpoints a number of complementary pictures emerge.

From a cognitive point of view, knowledge is what a person senses and represents in mental models. The operators express this as while they work with the machine, pictures of the process grow in their minds. When something goes wrong, a computer screen alerts the operator. The message often informs the operator of the problem. But the screen gives too much information causing information overload problems. No support for how to solve the problem is given by the system. The operator must rely on personal knowledge gained by experience. No formal or systematic codification process is active. However some operators put up personal notes, placing them close to the problem situation. If personal knowledge is not enough, the

alternative is to turn to colleagues for advice. For simpler and commonly recurring problems, a stock of common knowledge has developed among the collective of operators. Problems that are more complex are harder to communicate. Not everyone has developed the right mental models. This deficit of common experience makes the solutions harder to transfer.

The social perspective looks beyond knowledge as a mental model in the brain and focuses on how people come to perceive and trust something as knowledge. It is in interaction with other people that a personal understanding of the world is constructed (Berger and Luckmann, 1966). The operators are involved in a number of more or less planned socialization processes. The basic process is the interaction within the team of operators working on the machines. There is also an important 10 minute meeting between teams when the shifts change. If problems arise, the operator might turn to senior operators on other teams for expertise advice. Around the coffee table discussions concerning work related problems form an important problem solving forum. A weekly meeting involving the whole workforce focuses on problems and issues around work. However, no written notes or decisions are taken at these meetings, thereby limiting their importance.
A number of issues affect the process of social construction of knowledge. From a critical perspective, knowledge creation and use become issues of power and control in the organization. Knowledge creation and sharing is not under clear supervision from the management. Much is left to individual initiative and dedication to the work. These differences in ambitions between individual operators become a source of disagreements and bad blood amongst the work force. Control is mainly exercised by the technical document that specifies the product and process. There is an operator in charge with limited responsibilities for keeping the work flowing. Very much is left to the professionalism of the individual operator. This has created a strong commitment to work among the senior operators. This group of operations has developed a wealth of personal knowledge. This in turn has created a resistance towards computers and a fear of change in work practices. The strong professional culture has also created an atmosphere of whom to share with, depending on the attitudes and efforts of different people.

An overall look at the three perspectives shows two important issues: strong professional attitude and personal knowledge on one hand and on the other a wish to retain this power position with effects on how knowledge is shared and how new support technology is perceived.

5.2.4.2 Strategic Perspective on Knowledge Support

The company is successful and makes a healthy profit year after year. It competes with specialized products and not with low prices. The management is firmly focused on the financial side of operations and do not meddle in the production process more than necessary as long as the profits are high.

From a financial point of view operators show a lot of awareness and responsibility. The overshadowing concern is to keep the machines running. The goal is to produce

as much as possible. From a knowledge point of view, this is shown in active decisions of when to stop the machines for maintenance. Operators have an eye for when a problem should be attended to or could be dealt with later. These decisions are made in consideration of the current production situation.

From an internal processes point of view, the operators are given responsibility for the whole process, from planning of the production process to checking the result. The ability to solve problems is crucial for the overall production result. The machines tend to fail. Personal knowledge about the machines and their peculiarities is central for keeping the production going. The ambitions of the operator when it comes to fixing problems and leaving the machine in good shape are essential. If either the attitude or knowledge is on the wrong level, problems are met with passivity and the problems are left for the next team of operators or to technical staff. After that it is about personal skills or asking around among seniors. An important part of the production process is how the operator teams leave the machines to the next team. The best case is when machines are prepared and tended to so that the next team can get started right away. The short meeting between the teams is important for sharing knowledge about the current production situation. There is also a limit to what kind of problems the operators should deal with; when it comes to electrical components, an engineer should be called. However, spotting this kind of problem is also important, in order to get the right man on the job.

The customer’s perspective is present in the everyday work of the operators. When the printing process is finished, the operator checks the quality of the results. Then a protocol is signed by the operator, assuring that the product is ready for the customer. No explicit support for these activities is provided. Again, it is up to the operator's personal knowledge and skills. However, at the same time a total quality management situation is created, as the operator controls the whole process to the finished product. Planning the production, control over the machine and responsibility for the final product create a learning environment with responsibility as the motivation.

Learning resides very much in an informal and social environment in direct contact with the problem solving activities. Operators learn by fixing problems. Two types of learning situation can be seen. First, there are simple repetitive problems that are routinely solved. Second, infrequent problems, these are more complex to solve. The first type creates a stock of common knowledge that is important for keeping production going. The second problem demands active problem solving and gaining new knowledge by trial and error. Here, an action learning style tradition (Revans, 1980) has been developed. Individual operators have taken initiatives and resolved problems with whatever means they had.

The operators seem to be active in all four of the aspects of a general scorecard. The theory of balanced scorecards (Kaplan and Norton, 1992) included relationships between the aspects. The theory assumes that learning drives internal excellence of production and thus better products that create happy customers, in turn leading to financial success. These connections seem to be the case at the printing company. Knowledge processes and personal knowledge are driving forces in all aspects.

However, there is the difference between the two sides of the scorecard. The cognitive perspective is more reflected in the financial and customer aspects of the balanced score card. In these aspects, written material and management prescribed actions are important. The internal and learning perspectives seem more informal and work is seen as traditional black box control by information.

5.2.4.3 Strategic Flexibility

Flexibility is the central ability needed for organizations to survive in changing environments. The ideas of strategic flexibility as described by Evans (1991) refer to the competitive strategies of a whole company. In this case, the scope is narrowed down to the situation of the operators. Following the idea of strategic flexibility operators should be able to perform a series of moves in order to handle their work. The actions discussed below refer to what is done before or after the printing process, in terms of knowledge creation, transfer or use.

- *Pre-emptive manoeuvres.* Actions focused on getting things right, performed before printing begins. Here we find planning activities for example data files for printing are loaded and manuscripts are reviewed. Feedback from the preceding team is taken into consideration.
- *Protective manoeuvres.* Actions focused on avoiding problems, performed before printing begins. This involves considering known problems and curiosities with the set of machines that is to be used. Based on personal experiences of weaknesses improvements, just-in-case checks are performed. During printing, the machines are checked for emerging problems. Decisions are made if the problems are serious and if a stop in production is necessary.
- *Exploitative manoeuvres.* Actions focused on benefiting from the situation, performed after the printing is done. Including activities such as; preparing material for the 10 minute briefing for the next team, handing down experiences and precautions, writing down notes on how to solve problems, checking the results and writing quality reports, getting the workplace in good working order for the next team and thereby ensuring continuous error free printing.
- *Protective manoeuvres.* Actions focused on correcting things gone wrong that are carried out after the printing is done or failed. First, the computer screen is checked for error messages. Simple problems are fixed at once, problems that are more serious require a trial and error problem solving process or asking a senior operator for advice. If the problem cannot be overcome with available resources technical expertise is called in.

The analysis shows a rather all-round set of activities that at least some of the operators do their best to perform. This is the best case scenario; some operators might have a more passive or less competent way of dealing with a printing session. The major problem is that this set of tasks is not formally described or given as work instructions. Parts of the workforce are able to live up to these standards, but some are basically not interested.

5.2.4.4 Problems Solving in Knowledge Work

The operators are problem solvers and sometimes they are faced with complex and unsolvable problems. Any organization or group is dominated by a logic or pattern of action concerning how problems usually are solved. This aspect of information support for decision makers was acknowledged by Huber (1981), who suggested different characteristics for the support system depending on the organizational situation. Four patterns were discussed by Huber and they are used here as starting points for discussions about different ways of solving problems among the operators.

A rational approach, viewed as an explicit and normative process, is often understood as the choice of any organization. The main steps include; gathering information, determining the problem, forming and selecting a solution, implementation and finally a follow up. No clear rational process is formulated in the organization. Problem solving does occur but is more of an ad hoc kind that is best discussed later. There seem to be some guidelines for how to behave when problems occur. This is a set of general guidelines that brings us to the next pattern.

In an organization governed by rules (a bureaucracy) one finds a number of programmes that determine the workers actions. These express the right way of doing the work and the workers are paid to follow them. The operators have some instructions about how to produce products using the machine. When it comes to problem-solving the procedures are not written down but some things are clearly expected. If a machine should malfunction, the operator should check the computer for error messages, fix the problem if known, call the technical personnel if unknown and report the problem to the next team if necessary. This is rather a framework for action than a programme for action.

Huber (1981) uses the theory of the “Garbage Can” (Cohen et al., 1972) to picture an organization where no clear rules for problem solving exist. The idea of this theory is that problems are solved by “accident”, and that an organization can get by in this way. Solutions and problems randomly meet, in practice these processes relies on informal contacts between people. At the printing company the situation is not this extreme but much of the more advanced problem solving is made in an ad hoc mode. Problems are solved depending on who is close by, trial and error methods, etc. Connections between people, ways of solving problems and sets of common solutions create an informal organization that keeps the machines running.

All organizations have a political dimension. Discussions among organizational groups or people about what is good or bad is a necessity needed to give the organization a sense of direction. Power play and trying to get things one’s own way are natural components. Focusing on a political dimension of the work of operators reveals an important picture. The situation is marked by rather little management involvement; seniority and the ability to solve problems have created a set of leading operators. The informal networks are formed around the people who decide much about how work is performed. This might have consequences for who shares knowledge with whom.

This analysis shows lack of explicit support and management involvement in operators' knowledge work. Ad hoc solutions and informal networks dominate the scene and make the production run smoothly.

5.2.4.5 Knowledge Support in a Networked World

Castells (1996) discusses how technologies affect the development of societies, and put information technology in a class of its own. IT is not only a means for changing the world, but it also changes the way people understand their world. This means that IT changes the way people create knowledge by providing new paths of interaction. A number of issues can be derived from Castells work; in Aidemark (2002b) six issues concerning the introduction of knowledge management support are discussed. These are taken here as a starting point for a discussion of the current situation of knowledge support and possibilities for introducing IT-base support systems.

There are difficulties about how to balance the focus in the *man vs. machine dimension* of knowledge support. The sense making process is based on person to person interaction. Even pen and paper are not used to any great degree. A genuine dislike of computers can be felt throughout the group of operators. The experiences of the computer support associated with the printing machines and the problems of information overload are not good.

There are different ways of dealing with an *increasingly turbulent world* where computers both cause the speed of change and at the same time are used to counter these problems. The flexibility aspects have been discussed in section 5.3. Knowledge creation and learning are shown to be a key to dealing with unpredictable printing problems. Again, it is not mainly a matter of IT based support. It is the personal engagement and ability to learn and share the knowledge that creates flexibility.

An uncertain work situation puts demands on the *learning situation* in the organization. Learning could be seen as a local or distributed phenomenon. In the case where the learning is local, personal, social and informal, the introduction of computer support for codifying, retrieving and distributing problem related knowledge would change this situation. However, this solution might clash with the current mode of learning and disrupt what works well today.

The *organization of the work* can be of several kinds: hierarchical, flat or networked. IT solutions might be used in order to create a flatter organization, by enabling bosses to handle more personnel at one time and also giving the personnel more responsibilities to work with. The printing company is relatively flat in its organization, when the team of operators receives the instructions for the job they are in control. But at the same time there is an invisible organization within the group of operators that controls much of the work. This could very well be characterized as an informal network with its own communication structure.

When it comes to the power over operators' work and the *control functions* that are used to manage it, a complex picture emerges. The management seems to control the practical work from above, using information rather than walking around and being

there. This leaves room for the development of power among skilled senior operators who create authority by their skills. The introduction of support systems into this situation is therefore not very welcome as it aims at codifying the knowledge. As cited in the case study, operators express a wish to stick to their personal knowledge rather than a new support system, even though they can see the possibilities of having a knowledge base.

A final aspect concerns issues of *development of identities* among operators and how new applications of information technology might interfere. Drawing on the story that is emerging through this analysis, two types of operator seem to be present. First, the senior operator dominates his work place by virtue of the time in the job and the depth of knowledge obtained over the years. He seems to feel like the central part of the company, without whom operations would grind to a halt. In the company there are operators less eager to solve problems and have their minds set simply on doing their time and getting paid. These two types are extremes and most operators are to be found somewhere in between.

5.2.4.6 Connections Between the Perspectives

There is a core of high level action learning among the operators. This is shown both when looking at the nature of knowledge work (4.1) and the flexibility analysis. From the strategic point of view (4.2) broad support for the overall goals (quality and production deadlines) exists in the learning processes. But on the downside, the analysis highlights three problems that run through all the perspectives. First, knowledge creation and sharing is limited to cliques of people. Second, there is a gap between general management and the staff of operators when it comes learning issues. Third, there is a primitive fear of information technology throughout the company. While knowledge issues are at the centre of organizational success the impact is limited, mainly due to management issues. There are obvious possibilities with a codifying and distribution project, but it must be preceded by a package of activities that pave the way for an IT solution.

5.2.5 Discussion

5.2.5.1 Implications for Research on Knowledge Management

Hansen et al. (1999) discusses two strategies for knowledge management: personalization or codification. The company competes with specialized products. This strategy demands a broad and diverse machine park and with that comes higher demands on the operators to deal with the machines. The problems of failing machines are related to complex lines of production. The learning of the operators is directly connected to the ability to deliver specialized products. The knowledge management processes are those of a community of practice (Wenger, 1998) or just community (Alvesson and Kärreman, 2001; Newell et al., 2002) nature. Top management do not concern itself with these processes, the contact with production is of monetary nature. A human resource management approach could have been possible, that is, the management hired people that had the potential to fit into the community. This is not directly the case, the policy of the management is to hire hard

workers, but people that are informally known are favoured. The situation can be understood using Ouchi (1979), who discusses three forms of organizational control; markets, bureaucracy and clans. The market uses money as a control instrument, the bureaucracy uses information and the clan uses tradition or culture. The company uses a combination of a market for controlling the production on a high level, i.e. "produce this much, using these resources" and a clan that controls the production process. The company seems to have skipped most management trends including bureaucracy. The explanation is a combination between the workers' pride and basic goal congruence between management and worker, i.e. to keep the machines running. In this manner, questions about the nature of knowledge processes are connected to flexibility of the work processes, problem solving, business strategies and organizational structures. The analysis framework used to connect these issues can be summarized in a table (table 14).

Table 14. Analysis of possible knowledge management systems and organizational consequences

Perspectives on KMS	**Knowledge management system (KMS)** *How will the cognitive support system…*
KM processes	change social and political dimensions of knowledge work?
Work processes	change the balance between learning and stability of work processes?
Decision making	change the mix of decision making processes active in the organization? For example developing more rational decision making and new standard procedures.
Strategies	change the way learning drives production of excellent products that make customers happy and the company more profitable?
Org. structures	change the organization towards a more adaptive networked structure or will it reinforce existing hierarchies?

The case seems to illustrate two approaches to knowledge management: workers' knowledge management vs. managers' knowledge management. In practice this means to look at management activities, (human resource management, incentives, control systems, organizational structures, competitive strategies) and practical knowledge support (knowledge management systems, communities of practice) (Alvesson and Kärreman, 2001). This research concludes that a set of knowledge management activities or systems must be balanced on several levels. The objective

is to check whether the suggested knowledge management system (a best practice system in the case) would be desirable and feasible in the organization. This system will not stand on its own. A number of other knowledge management initiatives are expected to be needed. The solution seems to be a knowledge management portfolio that can balance demands and opportunities that come from different directions.

When it comes to deciding about support systems, the central issue is how the knowledge strategy on one hand and the management strategy on the other are affected. The trouble is that both must work and the key lies in the balance between the two aspects. The case provides an example of the introduction of a best practice system that might interfere with the current knowledge management situation. This problem can be broken down into a number of contradictory sub-questions including:

- Codifying knowledge is the method for making people's knowledge accessible for management. This puts the employer/employee relationship in a new light; the people studied in the case are used to selling their time and their competence. But taking control over knowledge processes implies taking control of the development of identity (Castells, 1996). In the example of knowledge management at Matsushita (Nonaka and Takeuchi, 1995), power issues and incentive programmes seem unnecessary, as the complete devotion to the company is taken for granted.
- The need to measure the real impact of learning vs. people's feelings of being watched. This could include for example: time to fix problems and the number of problems of different kinds that can occur. Knowledge management is a way of stepping into the black box world of management control by information.
- Knowledge management systems, (e.g. best practice systems) also work both ways. They can work as support for better problem solving and learning, but the can also be viewed as a way of changing local practices, depriving people of their possibilities to control their own work situation (e.g. Kreiner and Mouritsen, 2003).

5.2.5.2 Towards a Knowledge Management System Portfolio

In the case, the informal learning culture is successful. The company is at least making money. There is a danger of messing with a learning culture that works. A knowledge management project might collide with this situation. The natural leaders among the operators drive development and personal engagement is more important than management directives. The downside of the creation of informal networks is the difficulties of spreading the use of knowledge outside the networks. There are divisions among the workforce that create tensions and limit learning processes. In spite of these cautions against knowledge management, the possibilities of knowledge support should be looked at. The aim should be to support the learning processes that are working. This should be done without alienating groups of people, for example the learning authorities or the groups of passive operators that do not take part in problem solving. A knowledge management portfolio structured using the

management and workers dimension of knowledge management, could include the following systems or initiatives.

From a managerial point of view, five issues should be addressed, including:

1. Should learning and problem solving processes be managed more closely? This could be in the form of programmes for learning and problem solving processes.
2. Should incentive structures for contributions to knowledge creation or sharing be introduced?
3. Should new management positions be introduced? For example, the introduction of floor managers with responsibilities for problem solving and learning.
4. How important are knowledge creation and learning in terms of productivity, customer satisfaction and bottom line figures?
5. What is the background to the informal learning culture?

From a work practice point of view four issues should be addressed, including:

1. Should a best practice system be introduced? Practically, this could be a computer system where facts about failures and actions to fix the problems are stored.
2. How can a template for capturing the knowledge be developed? A project could include but not limited to: interviews, participatory investigations, and workshops.
3. The constitution of work groups should be looked at; learning between people is and will be the most important factor. This is about both the constitution of operators' teams and mixing between different groups of personnel, for example between technical staff and operators, sales and design staff and operators.
4. Systematic reporting of group meetings should be developed.

6 THE PROBLEM EXPLORATION APPROACH

In this section, an overall picture is presented of the approach as it emerges from the applications/case studies. The development is based on insights from working with the different parts, together with reflections made in this section. There are three main parts of this section, which are: presentation of the approach, some aspects on a working method and some discussions of the characteristics of the approach.

The overall goal of this research is to investigate ways of knowledge management systems planning. The way to deal with this aim was to develop and test a planning approach, with the intention of gaining more insight into the problems and possibilities of this kind of planning. The material presented in Chapters four and five is put together in this chapter into a more coherent planning approach. The experiences of the development and use of the various planning frameworks are here presented as a whole.

6.1 Overview of the Approach: Frameworks in Interaction

The approach is intended to be part of a strategic phase of a systems development cycle. This is a process of defining organizational goals and then suggesting IS/IT as a means for reaching these goals. The framework is supposed to augment this process by providing a broad context of the business processes (the knowledge management processes and the work processes supported by the systems). The framework focuses on the generation of ideas rather than on making decisions on which ones to develop.

6.1.1 Structure of the Approach

First a look back is taken at the definitions of approaches, as a reminder of what was the aim of the study. The concept of a "system approach" developed for some specific purpose was discussed (in section 2.3.4) as a:

"… way of going about tackling a problem." (Checkland, 1981, p. 5)

while using a:

"… broad view, which tries to take all aspects into account, which concentrates on interactions between the different parts of the problem" (Checkland, 1981, p. 5).

The problem exploration approach follows the outlines of a system approach. The proposed approach aims at tackling the problem of suggesting a set of knowledge management systems for a particular organizational process or activity. The aim is to suggest knowledge management systems that reflect the complexity of the organizational situation, systems between which the internal relationship creates a balanced support in the particular organizational situation at hand.

Figure 13 provides an overview of the approach, displaying the five frameworks, their internal perspectives, and the central activity of balancing a KMS portfolio. The

approach is built on three levels of analysis. First, analyses on a perspectives level within each of the frameworks (for example, cognitive / social or critical in Framework 1, knowledge processes, Fig. 13). Analysis on this level is the core part of the approach, asking questions or raising issues from each perspective (or concept of the framework) that might provide ideas about the needs of support systems and how the use of that system might affect the organization. On the next level, the frameworks level, we consolidate the findings of KMS on the perspectives levels. In this process a better and deeper understanding of needs and consequences is developed.

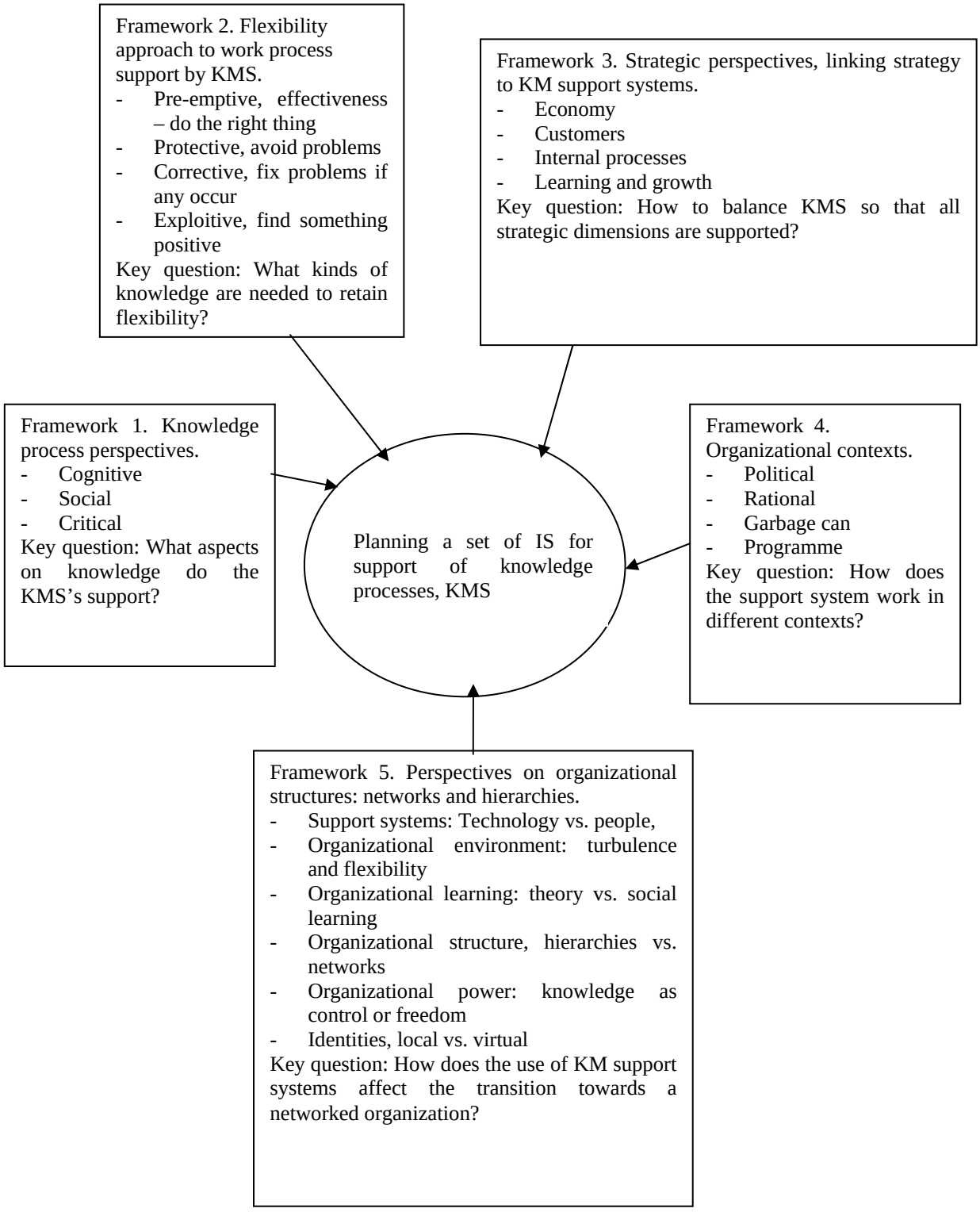


Figure 13. Overview of the KMS Planning Approach

On the approach level, this process is repeated, based on the findings in the different frameworks. Here the findings between the different frameworks are compared in an attempt to assess how these different types of KMS might interact and what the

outcomes might be when the systems are used in the context of each other. The outcome of these processes is a balanced set of KMS's (represented by the central circle in Fig. 13), balanced in the meaning that the interactions of the different types of KMS are investigated (which made sense in their respective perspectives) as well as what the joint outcome might be.

The approach is built up by five frameworks and contains a number of structural features.

1 Each framework is structured around one or more dimensions.

2 Each dimension has two aspects and each framework provides a number of perspectives for a broad analysis.

3 A number of balancing interconnections and contradictions are implied in each framework.

4 Within each framework, the findings in each perspective must be related and compared.

5 The result of the analysis of each perspective should be understood in the context of the framework as a whole.

6 Each framework should be related to the other outcomes of each of the other four frameworks.

7 A final balance must be negotiated on an approach level.

6.1.2 A Process View of the Approach

The approach can be illustrated with a process model (fig. 14). The process model of an organization is based on a simple and generic organization. In Figure 14 the different organizational levels of analysis are laid out, including 1) the work process, 2) the KM processes, 3) the work context, 4) the strategic perspectives, and 5) the wider context. These correspond to the five frameworks of Figures 13 and 14.

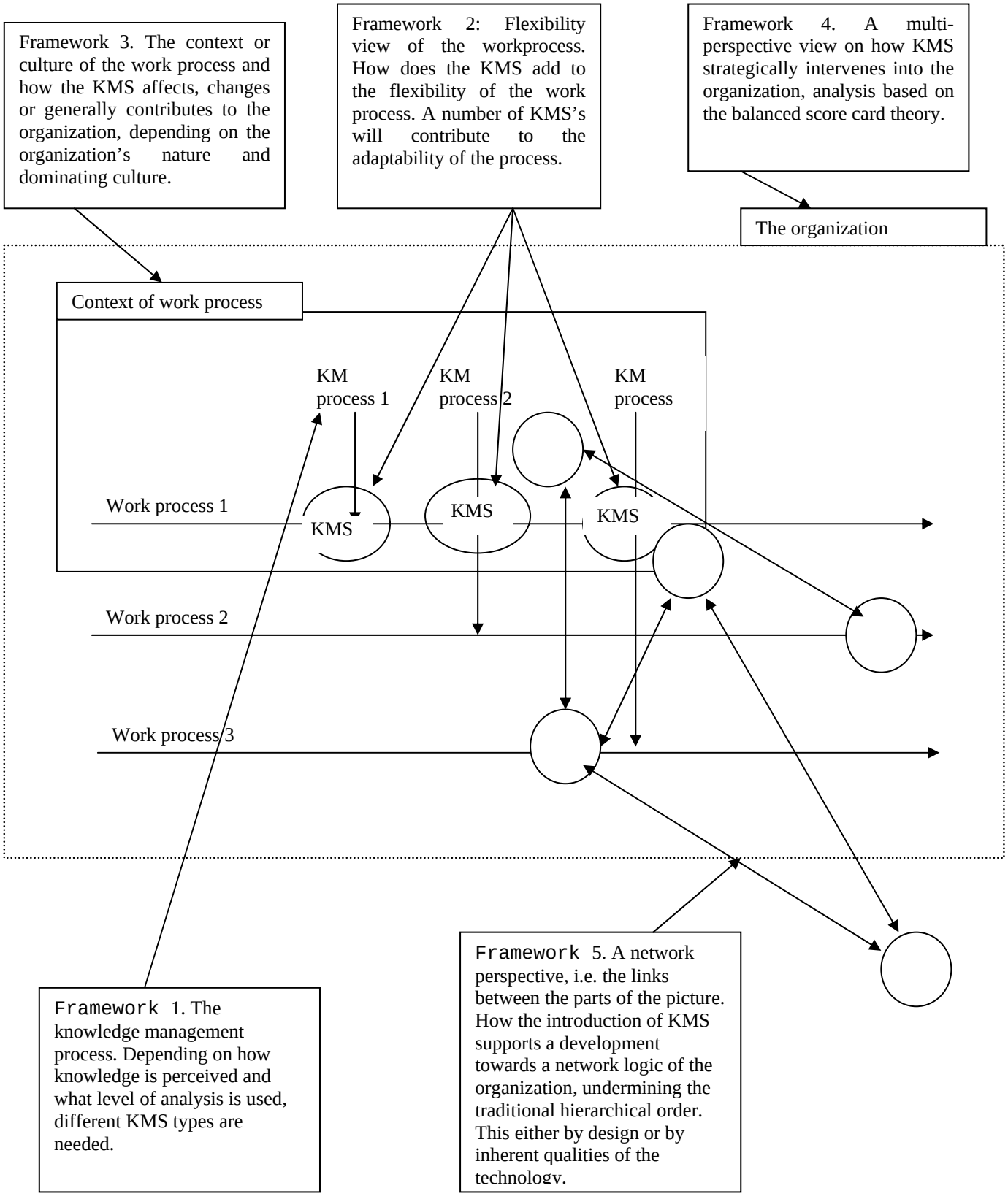


Figure 14. A process view of the problem exploration approach

Figure 14 can be seen as a process description for the work with the approach, at least

in a generic case, moving from the details and then towards the more general conditions of the situation. From the particular KM process, (Step 1) on to the work process (Step 2) that it supports, and then to the context (Step 3) in which the work group resides. Then moving on to the strategic step (Step 4) and then to considering the problem on a more general and organizational level, including the environment (Step 5). Other ways of configuring a working method are of course possible. A more top-down-inspired approach might begin with Step five, understanding the broader context using Frame 5, then a strategic analysis (Framework 4), then looking at the particular problems using Frames 1 and 2, and, finally, checking the feasibility of the suggested KMS, up to this point using the context/culture Frame 3.

6.2 Working with the Approach: Interviews and Portfolios

As with any planning approach there are some basic outlines, including creating ideas about the future, making decisions, and doing this in a structured way. An approach should support the process of gathering information about possible information systems and providing tools for handling and balancing these suggestions in an effort of suggesting a consistent set of information systems for further development.

6.2.1 Gathering Knowledge and Formulating Suggestions

One of the testing difficulties with such an approach is making large quantities of theories into some kind of planning support that actually makes things easier. The goal is to make complexity manageable. At the same time, there is a need for letting contradicting ideas contribute to a multi-faceted whole. For all practical reasons the work, with the approach and its frameworks, in essence consists of deducing questions to be asked or issues to be raised with people in the organization. The basic set of issues could be summarized as in Table 15 (based on the theoretical discussions of Chapters 4.2-4.6).

Table 15. Basic set of issues to be discussed, based on the perspectives of the frameworks

- Perspectives on knowledge processes
  - Describe knowledge processes from a cognitive perspective
  - Describe knowledge processes from a social perspective
  - Describe knowledge processes from a critical perspective
- Strategic importance of knowledge processes
  - Describe the connections to a economic perspective of the knowledge support systems
  - Describe the connections to a customer perspective of the knowledge support systems
  - Describe the connections to an internal process perspective of the knowledge support systems
  - Describe the connections to an organizational learning perspective of the knowledge support systems
- Information planning for support of knowledge processes
  - Investigate need /use of information for acting proactive and before a situation occurs
  - Investigate need /use of information for acting proactive and after a situation occurs
  - Investigate need /use of information for acting defensive and before a situation occurs
  - Investigate need /use of information for acting defensive and after a situation occurs
- The organizational context
  - Describe the context from a rational perspective
  - Describe the context from a programme perspective
  - Describe the context from a political perspective
  - Describe the context from a garbage can perspective
- Perspectives on knowledge support
  – Support systems: Human and technology
  – Organizational environment: Turbulence and flexibility
  – Organizational learning: Texts and talk
  – Organizational structures: Hierarchy and networks
  – Organizational power: Knowledge as control and freedom
  – Organizational identity: Local and virtual

Table 15 presents theoretical knowledge interests, and can be used as pathways into a situation in general. These questions/issues could, in interaction with an early insight into the situation, be "translated" to fit the problem situation at hand, making the investigation richer and more oriented towards organizational goals. The answers, in turn, should be understood in the context that they were asked, but should also be brought back to the theoretical field and understood there. An example of this is provided in Table 16 (based on material in Aidemark, 2005a).

Table 16. Example of a set of questions and issues adapted to a context

- **What knowledge processes are supposed to be supported**
  – Describe the main processes for knowledge creation, distribution and use (related to current problem situation).
  – Is this knowledge presentable using texts, documents for distributing and storing or to what extent is knowledge associated with personal knowledge of people?
  – Describe the need for group or interpersonal communication, for knowledge creation, distribution or use
  – Describe the main groups of people that influence and define organizational knowledge.
  – To what extent are the history and logic of these processes available?
  – Is there a way to question or change the current situation?
- **What strategic importance do the knowledge processes have?**
  – Which strategic goals do the knowledge processes affect or support?
  – Do the processes relate to any goals of the balance scored cared (if one is used)?
  – Need of support for valuing/measure organizational knowledge?
  – Need of support for any function for building environmental/competitive knowledge.
  – Need of support for knowledge distribution or creation in internal processes?
  – Need of support for organizational learning and growth?
- **What kinds of strategic change process could / should be supported?**
  – Focus on avoiding problems, and related knowledge processes.
  – Focus on instructions for taking advantage of situations, and related knowledge processes.
  – Focus on instructions for fixing problems if any occur, and which are the related knowledge processes
  – Abilities of turning a problem into something positive, and which are the related knowledge processes
- **Is the system used differently in different parts of the organization?**
  – Describe the different organizational cultures that exist within the organization.
  – Describe the nature or culture of knowledge creation/use and IS/IT use, Test the following themes:
  * Org. problems are solved in a defined, scientific-styled way
  * Discussion themes around goals and means: processes of political nature are common, goal conflicts leading to declining effectiveness
  * Work is performed according to rules and instructions, learning programs and written instructions are important
  * A turbulent situation makes it necessary to solve problems as they come along, ad-hoc decisions and short term solutions are important to keep up with changes.
- **Organizational hierarchies and networks**
  - Describe the structure of the organization: Hierarchies or flat/networked
  - Describe organizational context: turbulence, complexity, and how these threats are met
  - Describe learning and adaptation processes; apply network perspective.
  - Describe learning and knowledge creation in informal networks of the org.
  - Discuss identity building processes and influence of IS/IT
  - Discuss knowledge as an issue of power and control

Furthermore, during the first encounter with the organization, an even more simplified questionnaire could be used. A short list of introductory questions that lead the way, but avoiding that the theoretical background takes too much control, hiding what might turn out to be important factors.

A short example based on the case reported in Chapter 5.1 (Aidemark, 2005a) can be used to illustrate this. As a first step, an initiating interview with the project leader was done. The purpose here was to get a first impression on how the approach works in practice, and more concretely to form a useful interview guide. Building on the

lists presented above (table 16), a handful of open questions were put to the project leader (table 17).

The questions should work as doorways into the case. The more detailed questionnaires, as shown above, could in the best case be used as a checklist to see if all aspects are covered during the following conversation. The reflexive conversation around these general perspectives is hoped to lead to an insight into the central issues of the problem situation. For each conversation, with the same person or other people, the list should be reworked using the full list and the background articles. The difficulty here is the sensitive balance between direction from the frameworks and a necessary openness to the current situation. There is always a possibility that theory hides what is important rather than puts the focus on it. Therefore, it is the diversity of the framework rather then the details that is the important feature of the planning approach and its planning frameworks.

Table 17. List of initial issues and questions

- What is your function during the project?
- What is the background to the system?
- What are the intentions of the system?
- Who are the intended users?
- Does the system support any knowledge organization / workers?
- What work processes are supported?
- How are these processes supported today?
- What are the connections to organizational strategy?
- What information / knowledge content is central?
- Describe the development process.
- Describe the problems of the system.
- Describe ideas about the future development of the system.

6.2.2 Managing KMS with Portfolios

Each of the frameworks presented in the approach represents a portfolio of possible KMS's. Any portfolio is built on a combination of two underlying dimensions. The portfolio of the problem exploration approach is presented as four fielded grids or matrices (fig. 15). The vertical dimension focuses on the nature of the support system. Here the social and technical aspects are contrasted. The horizontal

dimension focuses on what should be supported. The two aspects here are the people or the knowledge workers involved and the business objectives supported by knowledge management.

This generalized portfolio could be seen as an underlying spirit in both the various frameworks of the approach and in the concluding portfolio in the final stage of the

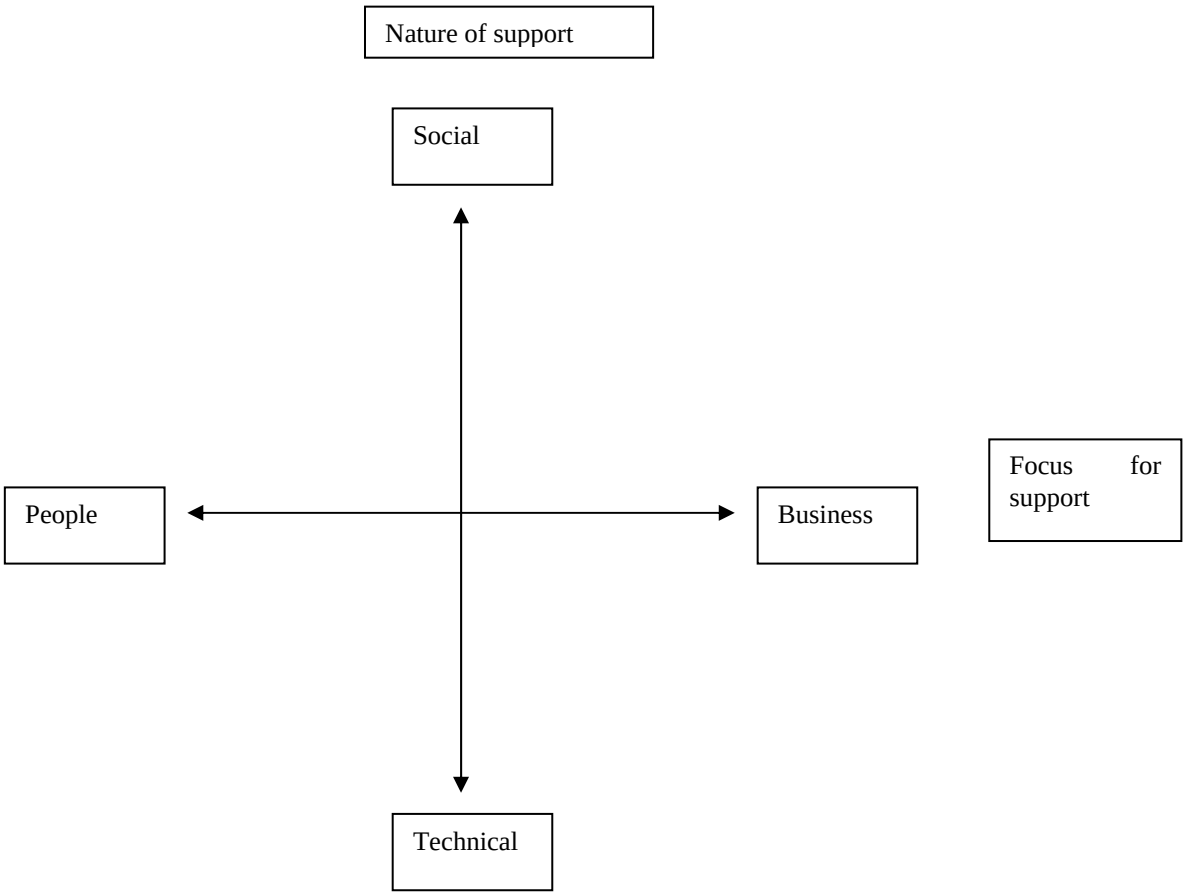


Figure 15. Generalized portfolio for KMS

approach. The different frameworks should, in interaction, produce this final outcome of the planning process. The main application of the matrix is to detect and prevent any biases toward any one direction. Practically, this means that one or two of the quadrants get all the KMS's. This should be a signal for moving back and reinvestigating the missing aspect, or for providing some good arguments of why the current profile is to be preferred.

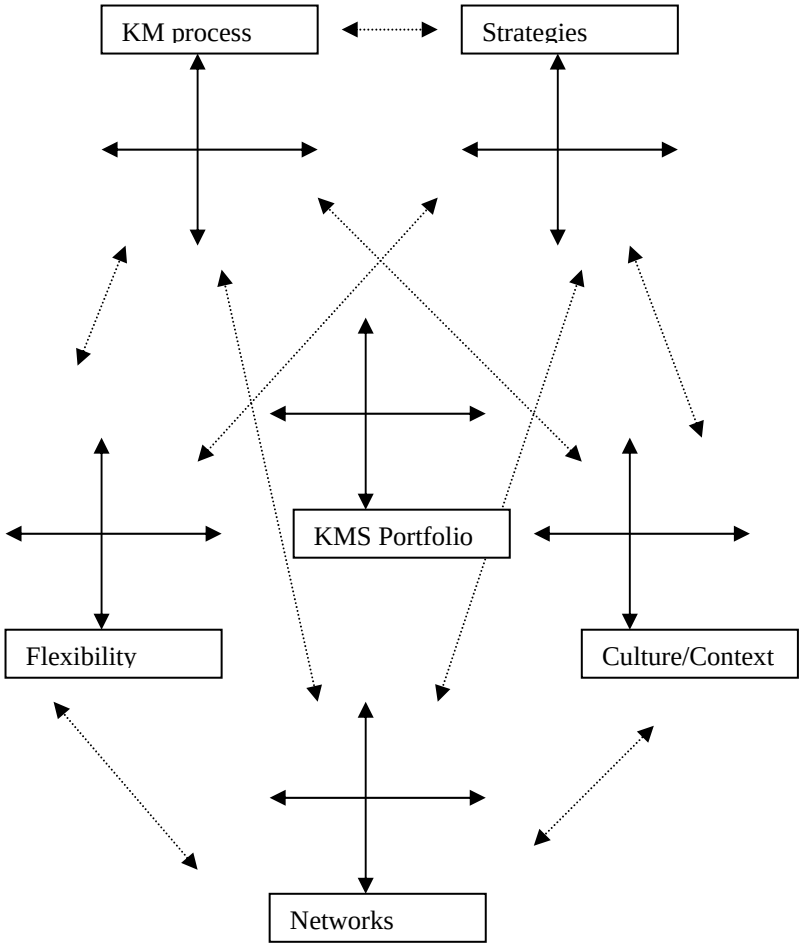


Figure 16. A system of systems portfolios

The suggested use of this model is rather uncomplicated in principle. However, the interactions between frameworks make the work with it complex. Figure 16 simply tries to illustrate this complex situation, each framework generating a number of suggestions for applications or other activities. These should be classified according to the matrix in Figure 15. Each of the results of each of the portfolios should then be compared to each other. This multi-directional relating of results will end in a balancing of the suggestion of KMS's. During the process of comparing the suggestions, new insight could be expected to be discovered. After this, the total number of suggestions could be summarized in a central portfolio. Insight into the nature and relevance of each suggested system could become clearer when compared to the others. The big picture of the interconnections that create the balance of the planning process is summarized in figure 16.

6.2.3 The KMS Portfolio

At the centre of the planning process lies the KMS. A KMS, like any information system, is defined in as an interaction between people, technology and organizational components; it is not, however, defined by any particular technology. So the main task of identifying a KMS is to understand the organizational needs and how people

and technology could interact to satisfy these needs. This in turn means that, if done in the “right” way, many kinds of information technology configurations could be useful as a component of a KMS. This is illustrated by Alavi and Leidner (2001) in their overview of possible information systems that support various types of knowledge management activities.

As a consequence, we have discussed KMS in terms of organizational activities, projects or initiatives, not just as software. It is of course assumed that IT will eventually play an important part, and a deep insight into the possibilities of using IT as a problem-solving tool or as a driving force for change is necessary for good KMS planning. The final degree of IT in any of these activities or initiatives is hard to know about at this early stage.

To illustrate the practical work with KMS portfolios we turn back to one of the cases. The “Printing company case” (chapter 5.2) includes the outlines of a KMS portfolio for that particular problem situation. We here illustrate the portfolio in two tables, (Tables 18 and 19) in order to make it easier to work with.

By placing the suggestion in the matrix, we are able to make some additions to the analysis made in Chapter 5.2.5.2. Using the portfolio approach, we are urged to focus on all the main perspectives (work-business and people-technology) and to make an explicit account of them.

Table 18. KMS portfolio: A managerial point of view

People	*Technology*
Could learning and problem solving processes be supported effectively?	This could be in the form of programmes that instruct the workers in practical problem solving.
Should incentive structures for contributions to knowledge creation or sharing be introduced?	A reporting system that keeps track of performance.
Should new management positions be introduced? For example, floor managers with responsibilities for problem-solving and learning.	Any manager will have need of some decision-making and upwards reporting support, and will probably manage the mentioned performance system
How important are knowledge creation and learning in terms of productivity, customer satisfaction and bottom line figures?	An economic model for assessing value creation, and an IT system for managing and presenting these figures.
What is the background and importance of the informal learning culture?	No apparent IT connection to this one. Social network analysis might be a tool.

Table 19. KMS portfolio: A work practice point of view

People	*Technology*
Should a best practice system be introduced?	Practically, this could be a computer system where facts about failures and actions to fix the problems are stored.
A project for knowledge elicitation, including interviews, participatory investigations, and workshops.	Develop a template for capturing the knowledge and systems for management and use.
The constitution of work groups should be looked at; learning between people is and will be the most important factor.	Group support systems for interaction in learning teams, consisting of different groups of personnel, for example between technical staff and operators, sales and design staff and operators.
Systematic reporting of group meetings should be developed.	An Intranet solution for archives and search of these meeting minutes.

There are connections that become visible when comparing the items in the two tables (18, 19). Issues that are raised by such an analysis include a number of problematic dimensions:

* *Control vs. creativity.* The portfolio has a leaning towards management activities like control and measuring. These efforts are probably necessary to obtain effectiveness from a KMS effort. However, this might hamper spontaneous problem-

solving by creative staff. The initiative with the incentives could counterbalance this. Creativity might also be encouraged by the use of the best practice system, i.e. that an insight into previous solutions inspires to new and deeper practical knowledge. For all of these possible systems there is one central precondition, the motivating forces of learning and problem-solving must be well understood and the systems that are implemented must not interfere with these forces.

* *Formal vs. informal.* Here we find the contradiction between formalization of knowledge and informal knowledge. The formalization of knowledge, by using templates for knowledge elicitation is one approach. However, the informal aspects of knowledge creation are personal and individual and are not easily supported by any kind of system. The approach to this balance is rather to limit the impact and intrusiveness of the systems that are built.

* *Strategic vs. operational*. The strategic dimension is taken care of in the suggestion of a value creation model. By this approach we gain a better understanding of the overall impact of knowledge on the organization, providing facts of decision for the founding of these projects. However, we should also see this from a work practice point of view. This could imply investigating the workers' view of these systems and knowledge management processes. This could include surveys, work-manager meetings or focus groups. The material from such KM-related activities could be supported by HRM-styled systems.

As soon as technical solutions (for example a best practice database) are provided, the systems become clearer and the IT aspect begins to dominate the field of vision for the planner. It is very crucial to keep the organization-people-technology triangle alive and working as long as possible, the KMS portfolio being one way of doing this.

These types of comparative analysis constitute the practical implementation of the balancing idea of the approach.

From this point onwards these suggested KMS's should be further explored and developed. This could be done using a number of methods. Two examples that we would recommend is an information analysis using the CSF approach and a conceptual model technique as suggested in the soft system methodology.

6.3 Comparing the Approach with other Planning Approaches

The planning approach has been developed within a rich tradition of theories and planning methods. Here some connections to this environment are discussed. The discussions take three directions, towards first a general IS strategy (CSF), then a learning aspect on strategic thinking (SSM), and thirdly towards a KM strategy (KM schools).

6.3.1 Connections to CSF

In its basic outlines the problem exploration approach conforms to most strategic planning approaches, as in the CSF method (Rockart, 1979). Structural elements from

the CSF approach were used as a starting point in the development of the problem exploration approach. The development is of course substantial, for example when it comes to how the steps were performed and how the order has undergone developments.

The rather straightforward working method of CSF (suggesting that information systems be developed) consists of a number of steps:

- Get to know the situation, choose people to interview.
- Interview people; generate questions using CSF "sources".
- Discern problems of phenomena that are to be controlled, and find a pattern in these needs among the people interviewed.
- Formulate data needs that can give information about the phenomena and suggest information systems that can handle and present the data.

On a very general level these working steps would be appropriate for the problem exploration framework. The last step in the CSF method is not extensive in the problem exploration approach, but limited here to a discussion of types of information systems or KM activities. There are some issues worth discussing, which could give some insights into the nature of the problem exploration framework and how to work with it. Some items for comparisons can be used:

* *Scope of the study*. CSF handles a process from problem discovery to the suggestion of a generalized information content for a system development project. The problem exploration approach is focused on the direction and types of IS support that are suitable in a certain situation, not the data content of the systems.

* *Direction of the intervention*. CSF has a traditional top-down approach, just like in many approaches in strategic business planning. In the problem exploration approach, any of the frameworks or the perspectives could work as an entrance. However, the different frameworks of problem exploration approach are somewhat different among themselves. For example, the context or network perspectives are more outside-in approaches, strategy perspective is a top-down approach, and the knowledge process and work process perspectives are bottom-up approaches.

* *The interview method.* As has been discussed, this is the central part of the CSF. This is based on the belief that getting close to the manager and understanding the practical work situation are central for creating valid information support for managers. The CSF method focuses on finding likenesses in types of data between different executives. In the problem exploration approach, the problems and possibilities discovered from different perspectives are hoped to support the discovery of a broad range of information systems. An interpretative method is used, allowing discovery and reinterpretations based on multiple understandings of a situation (compare with Fig. 16 on systems portfolios).

* *Selection of sources for the generation of questions*. The CSF approach argues for the elicitation of questions from a broad spectrum of general perspectives. The

problem exploration approaches work in a similar manner, although focused on KM-related issues, rather than just “what might be important for the manager”. Both focus on the concrete support situation (the decision-maker or actor) and the expanding of the view outward towards aspects that are more general.

CSF is, on the high level, typical of many strategic planning approaches. It contains the basic gap-analysis approach: describing the current situation, envisioning the desired future states and defining the gap. The problem exploration approach builds on these traditional activities often found in strategic planning, but extends them with a rich content from the KM area and a more flexible way of working with these models.

6.3.2 Connections to SSM

The soft system methodology, (SSM, Checkland, 1981) inspired into moving towards developing a more hermeneutic or interpretative planning approach.

We can identify a number of connecting points.

* SSM tries to achieve these aims by general method elements or tools. The problem exploration approach tries to do it with content frameworks that are more specific. SSM has no content side, of course, and it does not aspire to have one, as a general methodology school would do.

* The general instruments for analysis in the SSM problem situation, as mentioned above, have corresponding functions in the problem exploration approach. There are a number of examples of features in SSM that could be used:

  - *The rich picture*, forming the big picture of the problem in an explorative manner. The problem exploration approach provides us with a continuously evolving image of the problem situation, for example, by using the process model (see Fig. 14).

  - *Weltanschauung*, dealing with diverse ways of understanding the problem area and of those pointing towards different types of solutions. The basic discussion of the knowledge perspective, with its contrasting perspectives, provides an arena for basic assumptions about the problem situation.

  - *Feasibility studies*, consisting of investigations of how solutions might work in their environment. The context and the network perspectives in particular provide broader views of the possible implication of a KMS change program. However, a feasibility perspective is part of the entire framework, and in that sense, there is an ongoing discussion of the possibilities of getting any solution to work.

* SSM is an explicit learning framework. In repeated iterations of suggesting solutions, testing them and renewed inquiries, all people involved understand more and more of the inner workings of the situation.

* The working order of SSM is open and the different tools could be used in any order as the problem situation at hand seems to require.

The problem exploration approach aims at combining these features of methodological flexibility and learning environment with a rich and deep content knowledge of the problem area.

6.3.3 Connections to Earl's Schools of KM Strategies

The rationale behind KM strategy schools (Earl, 2001) was to provide a frame for taking action on knowledge management issues. It seems easy to gain an executive interest in KM, but converting this into fruitful investment decisions in new staff or computer systems is harder. The contribution that Earl wishes to make is:

"… to make sense of the many corporate initiatives undertaken in recent years and to provide a frame of reference … to highlight different options as a defence against those who dismiss the potential of knowledge management …" (Earl, 2001, p. 231)

The schools that are presented are not exclusive or, for that matter, final. The schools are complementary and might exist side by side. Further research is urged by Earl into the nature of the schools, to explore whether they are distinguishable as they are or if there are other ones. Earl continues suggesting:

"It seems likely that multiple initiatives or schools will emerge and be promoted over time in most firms." (Earl, 2001, p. 231)

The "KM Schools" framework is a meta frame or a meta approach for providing some kind of order in the initial stage of KM planning. The problem exploration approach operates according to the same lines of reasoning. There are some points of comparison between the two frameworks that could be discussed, see Table 20. There are differences but also agreeing aspects.

The problem exploration approach could be seen as an effort in the direction of integrating multiple initiatives as called for by Earl (2001, p. 231). There is a systemic nature in the planning approach, in the sense that it is the relationships between perspectives that provide us with meaning and understanding of the planning situation.

Table 20. Comparing frameworks: "KM schools" vs "Problem exploration"

Issue	KM Schools	Problem Exploration
1) Nature of framework	Distinct schools to clarify options	Integrated perspectives that stress interconnections
2) Nature of method	Traditional linear method sequence	Guided by principles: open starting point, learning process, iterative
3) Role in KM planning	Meta framework for deciding on direction for KM programs	Meta framework for situation exploration and suggestion of projects or programs
4) Path to results	Analytic approach, matching possibilities with organizational characteristics	Synthetic approach, results emerging from relations between perspectives
5) Relation to KM cycle	Not based on the cycle, focus on nature of KM activity	Not based on the KM cycle, focus on organizational level

6.4 Contribution of the Approach

The claim is that the "Problem exploration approach" contributes to the planning of knowledge management systems with respect to the problems connected to the complexity and ambiguity of the planning situation. The argument for this claim could be summarized as its ability to deal with three challenges of knowledge management systems planning: 1) content/method, 2) socio/technical, 3) depth of detail/economy of use.

1) The issue could be summarized as: "To find a balance and connection between the content side and the method side of an approach". The model or content aspect of the approach is fairly obvious (knowledge management concepts and models), but the method aspect is a more open question. The work with the approach conducted was directed by means of a hermeneutic science method theory, for example "the long interview" (McCracken, 1988). A proposition could be formed: "conducting the planning process could be informed by the ways suggested for a scientific investigation". The models suggested in the approach could be likened to the background theory in hermeneutic science. The outcome, the suggestion of applications, could be compared to a generalized

concept used to describe a phenomenon under investigation. The balance between model and method could be described as follows: “a model directs the attention of the investigator and the method ensures that the concepts developed are representative of the opinions of the interviewed people”. The case studies (in particular “Government agency” and “Public hospital”) consisted of a mix between the investigation of an application portfolio and a hermeneutic case study.

2) The issue could be summarized like this: “To find a balance between a social and a technical perspective on knowledge management systems”. The rather simple logic behind this effort was that most business-based models with an information/process focus suggest the use of an IT system. Planning solely with these models might yield a one-sided technical project and the people/work/situated aspects might be pushed aside. A simple dual track approach might not be enough, as seen in the lack of success of socio-technical approaches. The solution is the integrated models, generally a traditional business model extended with other perspectives. This process started with existing models/framework/theories more or less in use for IS planning today. These were investigated and adapted to the current problems situation. Three central qualities of the framework include: the selection of perspectives, the relevance to the KMS problems and the possibility of connecting the perspectives.

3) The issue could be summarized in the following sentence: “To find a balance between a comprehensive investigation and the resources, in time, money, etc, that are spent in the process”. The balance involves in short: the frameworks provide an expansion of details, enlarging the investigation, and the method provides a focus and limits the investigation. The hermeneutic method is used to aggregate important and general concepts from a large material; in this case the concepts are translated into suggestions for information systems.

This results section deals with the basic outlines of the characteristics of a suggested approach, and how it tries to deal with the challenges. In the following Chapter 7 these findings are related to the background theory for further investigations into the nature of the first two challenges.

6.5 Limitations of and Preconditions for the Approach

A number of limitation of or preconditions for the use of the approach should be noted. It is not a complete strategic planning approach; it should rather be understood as filling a step in an existing approach. This is a process that is often associated with brainstorming meetings, where the goal is to generate as many suggestions as possible. This process is often stimulated by various models used as tools for discovering possibilities. Ward and Peppard (2002) suggest a number of models, focusing on the strategic uses of IS/IT including: product portfolio analysis, competitive analysis (Porter and Miller, 1985, Cash, 1988), value chain analysis (Porter, 1984), strategic options generator (Rackoff et al., 1985), and critical success

factors (Rockart, 1979). After this generation step, a choice process begins. The assessment of value to the organization is a central theme, ending with the choice of a number of applications to be developed. The current approach assumes that an initial analysis of a work process and its main knowledge processes are identified. Using models or theories (one example being Alavi and Leidner, 2001) suggesting KMS depends on the nature of the knowledge management process. These results can be obtained fairly easily. The approach does not reach into the choice phase. The use of the concept of "problem" in the name is indicative of the nature of the approach. Given the initial results, problems and possible solutions are examined with a focus on the context of the situation and especially on the non-business-related aspects.

Performing full investigations of each perspective and all the possible iterations would be very time-consuming. The application of the approach should be performed in an inquisitive and problem-oriented spirit. The final balance between thoroughness and a fairly swift conclusion must be the user's responsibility. However, no good measurements, as to when enough is enough, can be provided.

6.6 Concluding Remarks on the Approach

As discussed in the introduction section and in several of the literature sections, many traditional planning models have problems in dealing with a complex and multi-faceted world. Information systems are motivated by the complexity of the world today. Planning these systems is the first line in this strife. Our planning approach will direct the possibilities to deal with information systems and subsequently our daily activities.

One must also bear in mind the limitations of the scientific approach employed; a case study research is suitable for suggesting a framework and connecting it to practical reality. It should not be seen as a final proof of its excellence.

Here we try to conclude a number of aspects on what seem to be the success factors that might characterize a viable planning approach.

1. *Individual and organizational knowledge*. The interconnection between the individual with a subjective and situated knowledge (e.g. personal knowledge, Polanyi, 1958) and the organizational use of knowledge as a key resource is a central theme in knowledge management. This raises the complexity of the planning situation (which is already considerable in the IS field) and makes it necessary to be even more sensitive to the situation and the implications for the usefulness of information systems for the achievement of organizational goals. These connections are made in several places in the approach. On the higher level, this is reflected in the general portfolio, where an individual and an organizational dimension are included. This can also be found in the frameworks, for example, the "Knowledge process framework". Suggestions about IS from a cognitive perspective are discussed in the context of IS that makes sense in the social constructivist view of knowledge.

2. *Interaction of perspectives*. The working mechanism of the approach is the interaction between perspectives. The idea is not to find the exactly right set of perspectives or frameworks. It is the connections between rather general and, for that matter, rather contrasting concepts that create the pluralism and breadth of the analysis.
3. *A Singerian learning style* (Churchman, 1971; Mason and Mitroff, 1973). This means a simplification of the perspectives rather than making them more complicated and specific. This is done in order to make the approach easier to work with and get the large lines of the picture to emerge more clearly. Critique against socio-technical approaches often points at the abundance of volumes of descriptive and ethnographic analysis. This problem is connected to research by Newkirk et al. (2003) stating that planning should be performed in the right amount; both too much and too little can lead to an unfavourable result.
4. *Easy of use vs. complexity of the problem*. Although the framework draws on a substantial body of theory, the "front end" material used by the analyst can be expressed in rather simple terms. In the two cases (Chapter 5) a rather small set of questions was used, rather as directions for conversations. After that, it is the outcome of the interviews which guides any further data collection. The translating process is a central step in the planning process. However, the guidelines for doing this are harder to discern, since the planning situation must be the most influential factor, and for all practical purposes it must be an interactive, trial-and-error-styled process. There is probably more insight to be gained from studies on scientific methods as presented in, for example, *The Long Interview* (McCracken, 1988).

7 RESULTS ANALYSIS OF SOCIO-TECHNICAL, STRATEGIC AND MULTIPLE-PARADIGM ASPECTS OF THE APPROACH

Here some problematic aspects and possibilities of the planning approach are discussed from three perspectives: socio-technical theory, strategic planning and multiple methodologies. The outcome of the discussion is a checklist of central dimensions or balancing points, aimed at supporting the analysis, choice or development of KM planning approaches.

The work up to this point has resulted in a suggested planning approach. The development process and testing of the approach provide a rich body of material for understanding the more general problems that inspired the research in the first place. This chapter aims at discussing questions central to this problem area, including the socio-technical duality of IS/IT planning, issues in strategic IS planning, and issues connected to multimethodologies.

The problem exploration approach could be described as a "socio-technical, strategic multimethodology" approach. The approach represents a series of choices in some central issues that have been found important in the knowledge management systems context. The approach should not be seen as the definite answer or optimum configuration, since its main contribution is to trigger questions. It should rather be seen as a call for tackling some problematic dimensions in some way within the knowledge management system development projects and making conscious decisions on these issues. The approach provides examples and illustrations of the problems and possible solutions. These results are now confronted with ideas from the literature. The discussion (sections 7.1-7.3) provides a more systematic discussion of some central issues. Based on the discussions, a summary of central dimensions, thought to be important to the design and choice of planning approaches is provided in section 7.4.

7.1 Socio-technical Frameworks

The planning approach was developed with the socio-technical perspective in mind, even though no formal integration of any particular theory was made. The experiences gathered during the work with the development of the approach provide a basis for discussing some of the theories presented in Chapter 2.1. Here we try to identify and discuss theoretical concepts that describe or explain the experiences and that can be suggested as having a role in a future development of the planning approach.

7.1.1 Connecting Social and Technical Aspects

A common argument in socio-technical theory is that an explanation of a situation should include descriptions of the technology. In a planning process, this is of course obvious, as the objective is to translate the organizations' needs into technical solutions. The corresponding problem exists in technology-focused development

methods, where issues of a social nature have no clear place. The problem is important and complex:

1. Different people involved will understand each solution differently.
2. Each situation could be resolved using different types of technology.
3. There is a dialectic relationship between these two aspects, technology and social, (Castells, 1996, p. 19).
4. Regardless of which technology is implemented, when in use, people's understanding of themselves and their world will be changed by the experience of using the technology. The probable effect is that a successful use will make the user more positive to the technology, and if unsuccessful, the outcome should be the other way around. The occurrence of a more complex relationship between technology, users, and third-hand factors could also be expected.
5. Knowledge management systems that are designed with a focus on people's knowledge of the world and how this knowledge is gained should have a more profound effect on the users. This type of technology not only changes the way the world is perceived by displaying a certain set of information (as any IS system would), but also changes the processes and principles for how knowledge is gained.

Two concepts from the socio-technical theory could be used to deal with this problem, neutral technology description and joint optimization. A neutral description could be used during the planning process. Such a neutral description could be achieved, for example, by building a prototype. Neutral, in this case, does not imply that technology is unimportant, just that the capabilities of the technology are fairly well known and possible to be understood by the people involved. This step is not explicated in the suggested planning approach. However, there is clear evidence from the case studies that such a common understanding of technology existed and was important for the planning process. Such a pre-planning activity could be suggested for future development. The aim should be to provide all participants with a similar understanding of the proposed technology. For example, in the "Public hospital" case all the members of the project group had some understanding of what an Intranet system was. However, in practice each person's understanding was predisposed by his or her background. The production of a document or artefact that provides a basis for a common understanding might have provided valuable contribution for a faster and more accurate Intranet system. This might even include basic training to raise all participants to a knowledge level needed to properly read and use the document. It might be argued that the construction of the description in itself is a steering tool for some groups, but the point is, if the document is established, the source of problems in the following process might be traced back to the description, and underlying causes could then be discussed more openly. Commonly recognized labels, like Intranet, ERP, KMS and so on, are a mixed blessing, which might serve as a basis for

a neutral description, but which might also lure people into thinking that they know more than they actually do.

The basic trait of a traditional socio-technical approach (c.f. Bostrom and Heinen, 1977a) is the parallel investigation and joint optimization of the social and technical aspects. The interaction point is the meeting of the two perspectives and the rules for optimization seem to shift from case to case. There seems to be a very basic problem with this approach, as the real development process must begin when the two sides meet. It is not until then that a realistic picture is created and the possibilities of success are within reach. This is illustrated by Taylor (1998), where cycles of test implementations, evaluations, re-design and re-implementation form the path to success. A framework like the one discussed in this thesis should provide an outline for an analysis of the situation in the early strategic planning stage. The problem is if the strategy/policy part of the planning and design process is not included into the socio-technical framework. This aspect is further discussed under the following subsection, for example interpretative flexibility, concerning both a technology during planning and in use.

A hypothesis concerning how to deal with the socio-technical connection can be made:

It is not viable to let both technical solutions and how people perceive them vary at the same time.

The methodology should advise the investigator to lock one aspect and investigate the other, and then the approach should be to switch the positions and do it the other way round. A second hypothesis suggests a general guideline for selecting planning models:

Models and frameworks used for the analysis must be able to direct the attention of the investigator towards both social and technical issues.

A third hypothesis suggests a technique for the planning process:

The creation of a neutral technology description should precede the strategic planning process.

To dig further into to these propositions we look closer at the two theories, that have been drawing a lot of attention in the IS field, SCOT and ANT.

7.1.2 The Social Construction of Technology (SCOT) Approach

SST focuses on the interactions between design of technology and how users and other stakeholders perceive it, and how these reactions influence the further design processes. This process is studied until a stable state is reached and the design process is closed. A number of concepts from SCOT could be used to discuss the problems and insights uncovered in the work with the planning approach.

SCOT discusses technology design in terms of an innovation process (c.f. Newell et al. 2002). The planning and development of a major support system (for example an

Intranet system as in the Public hospital case), used for supporting a number of processes and activities, involve large parts of the organization. The outcome of such interference should not be understood as the same organization with some new capabilities, but rather as an organization that has undergone a transformation and emerged as a different one. It is not only an innovation of a support system but also a process where the organization reinvents itself. We could therefore suggest that the systems planning process should be understood as an innovation process (c.f. Newell et al., 2002). The use of the innovation concept might help the people involved to understand that the introduction of a KMS is not just an extension of the organization but a change process that will result in a new situation that is not possible to clearly understand in advance or plan for in detail.

SCOT suggests the investigation of relevant social groups, stakeholders and competing interests. The problem is that even an apparent information problem, with a straightforward technical solution, might turn out to be more complicated than thought at first, if a broader range of groups of people involved are examined.

The broad set of perspectives, as the central feature of the planning framework, is thought be a support for the investigator to catch a wide view of the situation. This process is hoped to yield a broader range of relevant groups. The planning approach both directs the questions put by the investigator and provides a context for the analysis of interpreting the answers.

The relevant social groups are sought after with the artefact as the starting point. The SCOT approach is mainly for the analysis of past events, but it would be possible to translate it into a planning situation. This would mean to put the focus on the initial definition of the project and on using the neutral technology description.

In this way, the initial understanding of the situation could be challenged. This could be compared with the root definition stage (Weltanschauung) of SSM (Checkland, 1981). The combination of the perspective analysis of the KMS planning approach and the root definition using the CATWOE instrument (Checkland, 1981) might prove fruitful.

Here we can detect a number of steps that can form part of the working method:

1. Make an initial problem statement and suggestion of a neutral technology statement.
2. Find the relevant social group, search for people with relationships to the suggested problem and technology.
3. Perform the analysis using planning approach, suggest system portfolio.
4. Re-investigate relevant groups, with new systems in mind and then reiterate the approach analysis with the new groups in mind.
5. Challenge technology description using root definition.
6. Reiterate the process, with a new technology description.

In connection with the multiple views on technology, SCOT discusses the relation between people and technology in terms of interpretative flexibility. The construction of people's beliefs in technology both in planning and in use is a social process. Pinch and Bijker (1984) suggest a form a diagram for illustrating the innovation process over time. The graphs could contain technology innovation (solutions), groups and problems. It could also be useful to include group experiences of solutions of problems, which in turn might cause new problems or engage new groups. This kind of graph could be integrated into a planning approach, as a way of exploring the possible developments that a KMS project might start, possibly causing a chain reaction in several steps. The flexibility aspect should be possible to illustrate, and to track in several steps, with reaction and counter reactions from different involved groups. The suggested graph could be compared with for example the "Rich picture" drawing technique (Checkland, 1981). Even though there are clear differences, SCOT has been developed over time on one side and "Rich picture" coming from another direction, with its base in systems analysis. This could be a promising development: a specialized type of graph or drawing techniques for the KMS areas.

From this discussion two hypotheses could be formed:

The broader range of relevant social actors the planning approach is able to engage in the process, the more successful the project is likely to be.

Problem/solution/group graphs or similar illustration techniques would structure and deepen the analysis performed using the planning approach.

7.1.3 The Actor Network Theory (ANT) Approach

The ANT approach works with a suspension of the division between the social and the technical aspects. This, it is argued, allows for a better discussion on the problem and ultimately a better understanding of the situation. The trouble with this approach is whether "the actant" exists as a study object for science or if it should be seen as metaphor for something we just do not know about yet. In planning, this aspect is not so problematic, but the consequences of this way of thinking must be investigated in order to see if there are any advantages.

The obvious effects are that one does not recognize humans as a particular group of "actants", and that pieces of technologies are given a more active status, able to react and resist when they are interacted with. An attempt to use an information system might fail because of the nature of the system. However, it is hard to understand what the contribution of seeing this as a reaction from the systems side, really is. It would be more natural to see it as effects of design decisions and of the people changing views (c.f. interpretative flexibility) of the information system, when they try to use it.

On the other hand, if we see it as a way of postponing the decision of what is a built-in characteristic of the technology or an opinion of a human actor that tries to convince other people of something, then some possibilities arise. We just do not

know the exact configuration of the system in terms of physical pieces and people's views on these objects. The final system will consist of a mix of both, and the design process must deal with this configuration. An analysis made in this spirit might create a more plastic development process, making participants more open to the nature of the system under development. An information systems development process revolves around an idea (phantasm, vision, dream, etc.) about the problems it should resolve, and what this idea is depends on who asks and when. To make the transformation of this idea into a new and better working organizational situation as open as possible would be a good thing. In addition, there are some practical ways of using ANT.

There are some possibilities, following Walsham's (1997) recommendation of understanding ANT as a toolbox. This would mean avoiding digging too deep into the nature of the "actant" or other questions about philosophy of science. A working method with a drawing technique is suggested (Latour, 1992), which seems possible to use as a component or an idea generator for further development of the planning approach. There are a number of features of this method that fit the problem situations of KMS, as explored in the case studies:

- The focus on the interaction between technology and people; and how this interaction develops over time. The time dimension is important and connects to the project planning aspect, generally filling a void of systems models that are often "time-less".
- The innovation and problem-solving focus. This reconnects to the ideals of more traditional systems development approaches and their rational and goal-oriented nature. The driving force is a goal owner, the importance of which seems to be sometimes overlooked in socio-technical approaches. However, in the ANT perspective it is a network of "actants" that solves the problem. The meaning of the problem owner is translated into "actants", making them part of the solution.
- The power struggle dimension. The instigator of the system tries to change the behaviour of people under resistance from them. If there were no conflicts or resistance in the everyday IS project, a traditional approach would be more successful. To incorporate this insight into the basic description tool seems a guarantee that this will not be forgotten. The process of enrolling members into one's agenda is a central sign of progress in the project.
- The complex nature of technology, a "monster" made of metal, plastic and people, as discussed above. Interestingly, this combined human/technical nature is professed in most basic IS textbooks, but the consequences and problems of this rather shallow insight is seldom taken seriously. The firm focus of ANT on this relationship should make it a good starting-point for approaching these sensitive issues of the IS field.

- The use of visualizing drawing techniques. Drawing techniques are central in IS planning, because as soon as a white sheet is filled with lines connecting boxes, people tend to feel they have a grip on the situation. A human-centred graph depicting how technology and humans interact over time seems as a good project planning support. It might also be possible to be adapted for other purposes, for example how people interact around an enterprise resource planning system.
- The idea of packages of initiatives, where technology is one component. The connection to the portfolio concept is obvious, and fruitful finds from combinations are to be expected.

The method could be used to enhance Step Four in the method mentioned in the subsection above, to investigate the development over time, where systems introduced into the situation change opinions and behaviour and trigger the need of further development. In an ISD process, this could be seen as a scenario-building tool, where actions and reactions are anticipated and explored over time. The more obvious method dimension of ANT should be accompanied with the idea of being open to the nature of technology and its emergent properties. In this way ANT is both a toolbox and a value or spirit that guides the analysis.

It should also be noted that the use of parts of ANT takes place on a toolbox basis. ANT is a firmly micro-oriented theory, meaning any effort of imposing theories outside or from above the problem situation is strictly forbidden. The use of theoretical frameworks is not in the basic line of ANT thinking, but this should not be an obstacle to making use of parts of ANT in a toolbox manner (Walsham, 1997).

7.2 Strategic Planning of Information Systems

The work with the planning approach provides us with a number of interesting issues to be discussed further concerning the strategic perspective.

7.2.1 Strategic Planning vs. Implementation of Strategies

There is an obvious gap between the planning and the implementation phases of an ISD process. The experiences of this research are that the planning models must be possible to be carried between these two phases. This has not been explicitly tested in this research. However, there has been a dual use of the frameworks, both as a planning process support (Printing company case, Aidemark and Persson, 2004) and as the evaluation of an implementation process (Public hospital case, Aidemark, 2005a). A basic insight here is that the frameworks of the planning approach must be relevant in both situations. This seems to be true for the planning approach.

Looking in more detail at the “Public hospital case”, evidence showed the importance and the problems of maintaining connections between the phases. Two insights can be mentioned: firstly, the diversity of the planning situation, with manifold demands on the systems that are in the making. Secondly, the danger that one perspective takes over in the more practical implementation process. Part of the problem in the case

was that the insight into the multiplicity of the problems (reflected in a broad project group) in the practical implementation was turned into a single agenda project. Clearly stated and consequently used planning frameworks might have been useful to carry these insights throughout the project.

In the “Printing company case”, too, there were clear signs of this problem. An initial study quickly revealed potentials for a KMS as support for learning. However, when the discussion went on to implementation questions, more problems and objections were discovered. The application of the planning approach gave insights into the complexities that must be countered for a successful project. A package of systems, changes in work and structures and other initiatives seemed necessary for a successful project, in the light of the picture painted using the frameworks of the approach. This also indicated the extent of the engagement and the possible cost of such a project.

These difficulties can be compared to the split in the socio-technical area, where the focus on the planning side has given rise to an unbalanced situation, in which implementation and use have become invisible.

A hypothesis can be suggested on this basis: The use of a planning approach, which can work as a connector between the planning and the implementation phases, will lead to a more successful ISD project.

7.2.2 The Strategic Process as Plans or Patterns: Toward a Network World

A basic problem of strategic planning is how this process is understood. First there is the more traditional style (Ansoff, 1965), with work steps including producing business concepts, laying plans, and then executing them. The alternative is a more reflexive process, where patterns emerge over time in interaction with the development in the situation (Mintzberg, 1978). In this second direction, the focus is on the strategic actions that are made rather on the plan itself. The closer the strategic decision/action is made to the problem situation both in time and space the better the outcome seems to be.

The movement towards a network society seems to be under way (Castells, 1996). At the same time, most organizations use some kind of hierarchical structure in order to keep control. There seems to be a connection between the ability of dealing with a dynamic situation and strategic actions.

In the “Public hospital case” this problem became very visible. The plans of an Intranet system for a number of purposes (internal communication, planning, coordination, archives, knowledge management etc.) were laid out (some aspects being more explicit then others). However, what proved more challenging were the more or less visible networks of the organization. These networks had both internal and external nodes, and they often proved to be important power centres of the organization. The suggested system interfered with the domains of activities and decisions made in such network. When these patterns were discovered, the needs for strategic activities became urgent, and to some extent such actions were devised and

performed. On a more general organizational scale, the Intranet system as such could be viewed as a strategic action in a more global organizational change process. The problem was how to co-ordinate these actions. The situation is made more complex as the communication technology introduced might change the way to communicate and in turn change the condition for how networks emerge. This makes strategic action close to the situation more important than strategic plans. The analysis guided by the planning approach suggested that the broader scope of the frameworks of the approach might support the integration of these actions.

A hypothesis can be suggested on the basis of these arguments:

The ability of a planning approach of keeping a connection between a hierarchical view and a network view of the organization will support a successful project.

A secondary hypothesis could also be formulated:

A planning approach should support the co-ordination of strategic planning and strategic action.

7.2.3 KMS Portfolios

The outcome of the planning process is a set of suggestions of information systems – KMS. After this phase follows a selection process and the development of a strategic plan for systems implementation. Portfolios can be used on several levels: individual information systems (Weill and Vitale, 1999), the information systems of a business unit or the whole organization or on the industry level (McFarlan, 1984). This basic idea is to put information systems into the same frame of reference, relating them to important aspects of the organization and the information system. In this manner, information systems can be judged in comparison with other systems for their relative contribution to the organization. The goal is to create a balanced set of systems, each contributing to a certain task or process in the organization. In this research, we suggest several such portfolios or, more generally put: “balanced sets of systems/activities”. This overlaying of several portfolios seems an important feature (c.f. Peppard, 2003).

This reflects the practical situation, as found in for example the “Public hospital case”, where the members of the planning committee contributed with widely separate viewpoints. Even though it was a broad group, not all aspects were represented. Most notable was that the strategic planning was not very well thought of, despite insights into the system’s importance. This study was conducted a year after the introduction of the system, and still there seemed to be clear differences about how the system and its future were understood. Not only did people disagree, but there even seemed to be a lacking insight into how the other parts of the group understood the system. Integrating frameworks that are able to bring together these perspectives seems very necessary.

A hypothesis can be suggested on this basis:

A number of portfolios could be used to relate KMS's to each other, as a tool for better understanding of the nature of the individual systems and finding gaps in the total portfolio.

7.2.4 The Resource-based View in KMS Planning

There is a duality in the KM field, some theories or models relying on a traditional environmental/competitive view (Porter, 1984), and others being based on a resource view of the firm.

In the neo-classic view of a successful company, the relationship to the external environment is central, information systems are often seen as important in general, and KMS is no exception. For example, creating a better understanding of customers using customers' relation systems (CRM) (Bose and Sugumaran, 2003) are areas targeted in KMS projects. The ideas about knowledge management, resource-based economy and a knowledge-based view of the firm are closely linked (Grant, 1997). A flexible adaptation of production by updating works instruction faster (Sieloff, 1999) is a typical KMS project.

The transaction cost theory cannot always explain why an organization is a better solution than a market. The transfer of knowledge on a market in an effective way is possible, for example, through products. If the consumption of a product demands the same knowledge as what is needed for the construction of the product, the company will not exist for long. A firm can survive only if the production process is transferable within the firm and the replication of the knowledge outside the firm is hard or uneconomical (Grant, 1997).

The problems of knowledge as a source of competitiveness are found both in the control of knowledge and in the organization of work. Here we also find a connection between the hierarchy/network perspectives of the problem. The more personal and special knowledge becomes, the harder it is to control it effectively in traditional hierarchies. Team-based organizations for internal coordination and strategic alliances or networks for external coordination are examples of approaches to the management of knowledge intensive business processes (Grant, 1997). At the same time, there will be a need of hierarchical control at some level, pointing at the demand for combining network control and hierarchical control. In the "Printing company case" this trade-off became very visible. The trouble with production technology created a need for a group-based knowledge culture. Altogether, including high demands on flexibility in production (based on customer demand) and short delivery times, this created a very special work situation. A culture of self-containing work groups, informal networks of specialists and a leadership of non-interference was developed in response to this situation. The general unspoken agreement between general management and the work force became: "deliver the profit and you won't be bothered". These people in turn were basically very sceptical of any IS/IT/KMS solution whatsoever, as it was seen as a potential threat to the current situation and the power base of a group of very specialized workers.

This problem can also be extended to the split between the need for KMS and other uses of information systems to meet a common goal success of a KM initiative. This became a very clear in the “Public hospital case”. Here the Intranet project contained a large number of applications, some more directed towards goals associated to the hospital as a knowledge organization, and more general information systems implemented in indirect support of these goals.

First, a hypothesis on the need of incorporating a resource-based view of the firm in KMS planning:

A planning approach must be able to deal with logics and arguments from both a traditional view and a resource-based view on how information systems support organizational success.

A second hypothesis concerning the interplay between information systems of different kinds reads as follows:

A planning approach must handle both KMS systems and information systems for other purposes necessary for the success of a KM initiative or program.

7.3 Multiple Paradigm Analysis

> *Here the discussion involves a number of the key issues as presented in the theory section on multimethodologies. We investigate how the experiences in the work with the planning approach can contribute to the understanding of the application of the theories.*

The basic theme of this research is to use multiple approaches to broaden the participation in the planning process. However, to use multiple approaches often includes ideas stemming from different traditions, creating questions of how to deal with the meetings between ideas from different paradigms. In this section we will try to tackle some of these concerns.

7.3.1 Multiple Perspectives: Threat or Blessing?

The use of multiple perspectives seems easy to argue for, when used for generating ideas. There always seems to be something that is left behind, overlooked, not recognized as important, etc. If the approach, as being a host of related concepts, is of any help, it is about directing attention and connecting ideas. The connection might be discovered just because two aspects are discussed on the same day. The connections could be expected to emerge when used in a particular situation and are of course not limited in any way to the examples in this thesis.

However, this is not an uncontroversial practice. The central debate of this area concerns the question whether the use of multiple perspectives really contributes or just adds conceptual confusion. Here we present a number of aspects on this problem:

- *Use critical theory*. Critical theory is here used as a general label for theories that help us to understand the origins and processes of the current order, who it servers,

who it excludes, and how this situation could be changed. Investigation in this direction reveals a predicament: it is not possible to get people with very basic interests and goals into the same picture, just because they are not related to each other in any other way than that they are affected by the same system or set of systems. The initial understanding of the problem and the more or less automatic concepts of a support system that will appear "natural" to the analyst will be a selective and narrow understanding of the situation. Questions based on critical traditions are hoped to help the planner to find people and problems not "naturally" associated with the problem (regardless what that position is).

- *Provide a broad picture.* Such a picture could fill more than one aim, for example to give an impression of a whole, or to create a diverse and contradictory image. The approach puts some trust in confusion and that it allows the generation of diverse ideas which take the analyst outside his or her more or less unconscious paths of thinking. It should be noted that the approach also includes an integrating and relating movement. The creation of (or suggestion of) a KMS portfolio, provides an integrated view of the situation. Here different views and, in extension, different people's interests, are related and their connections are made visible and discussable. The movements between wholes and parts are a central and important aspect of the planning approach.
- *Keep the intentions of the original theory*. This is not the case, since it has been thought more important to make the loans from various areas useful in the current situation.
- *Meta method vs. problem-specific method*. There are two possible approaches, either to use a meta method for constructing ad hoc solutions or to use a problem-specific multi-model approach. Most of the multimethodology approaches, as presented in Mingers and Gill (1997), build on a traditional "systems approach" idea. The approaches consist of set of general concepts that are to be employed to understand more or less any situation. The suggested approach of this thesis is a little of the opposite, providing concepts pertaining directly to the type of problem at hand, and using a more general and simplified method for working with them. This of course has a reverse side, since a general "systems approach" (of some kind) provides a more neutral position and might be less likely to bring about "tunnel vision", which prevents the right understanding from emerging during the analysis. Here we have a contradiction between views on the role of pre-understanding. The interpretative approach suggested for using in the current research focuses on a broad pre-understanding and the methodological steps that prevent it from dominating the continued investigation.

Common to all these four aspects of the problem is a back-and-forth movement, which could be part both of the method and the content aspect of a planning process.

7.3.2 Ethics or Relativism?

There seems to be a contradiction between a relativistic and a moral or ethical view of the problem. The basic problem could be captured in the words “if anything goes it is hard to uphold any general values”. A general approach of having open and closed phases is suggested as a way forward. Following the path discussed in the previous section a way forward could be to first generate ideas, then in the next phase check back against values, and then again iterate this process. However, in the end this discussion seems to boil down to a “money talks” argument. This is sometimes met with a counter argument: “… systems that take human values and moral treatment of personnel into consideration are more successful”. In the KMS area there seems to be somewhat more need of ethical and moral arguments, given the personal and social nature of knowledge. The use of the ethical or moral aspect can be a way of acknowledging that there are limits to what power methods the owner/builder of the system can enforce, and in the best case a way of dealing with associated problems.

7.3.3 Flexibility and Reflexivity

The problems of reconciling the problems of multimethodologies could be approached using a long line of concepts: creativity, flexibility, reflection, reflexivity and dialectics; more could be added to the list. A central aspect of this problem is that these concepts/solutions are not so much properties of the methodology, but rather of the analyst. There are parts of the methodologies that might support the analyst in acting or enable him or her to act in a flexible or reflexive manner, but in the end it is a question about how the methodology is applied.

A possible characteristic of an analyst which should be investigated further is reflexivity. This could be a guiding star for how a planning approach should function. The concept is defined by, for example, Schutz (1970), building on a discussion of “streams of consciousness” and “meaning”. Schutz argues that “consciousness” is a stream of lived experiences, that in itself has no meaning. Meaning depends on reflexivity, which is the process of turning back on oneself and looking at what has been going on. In this way, meaning is attached retrospectively to actions. The reflexivity concept has appeared in some research traditions, for example ethnomethodology (Garfinkle, 1984), where reflexivity is a way of making “taken for granted” knowledge explicit.

The concept has been used in the context of research methods. It has also emerged in IS research; Weber (2004), for one, proposes the use of reflexivity in an editorial comment in MIS Quarterly. Weber suggests that the concept is a more important aspect on methodologies than the old positivist/interpretative debate that is branded as “vacuous”. First Weber makes a distinction between reflections and reflexivity, defining reflection as: “when we try to look on ourselves as another person might”. Reflexivity also involves seeing the interrelationships between assumptions, biases and perspectives (meta-theoretical assumptions) that underpin our research (Weber, 2004, p. iv). The focus on a deep understanding of the parts of the research must be balanced against a view of the research as a whole. Weber sees this as a hermeneutic

view of research, where a movement between the whole and its parts are central to being reflexive. Theories might both constrain and support the reflexive researcher. The use of theories must be non-dogmatic, creative and adaptive. Different positions must be juxtaposed, compared and contrasted. Reflexive researchers should be able to use portfolios of both theories for their research methods.

Weber writes about a researcher, proposing the argument of skipping the interpretative/positivism debate and focusing on reflexivity. The current research deals with a system analyst, but the argument is still relevant. However, as seen in the previous section, there is a need of a value dimension of analysis. A reflexive analyst with a moral compass could be envisioned.

7.4 Summary: Central Dimensions for Understanding a KMS Planning Approach

A KMS planning approach could be set up in many ways depending on the particular situation that it focuses on. The best case would be an approach that handles all cases down to the last detail. The risk of creating a mega approach, which in the end would not serve any purpose sufficiently, is clear if one embarks on this road. The other option to make approaches more specific might bring forth approaches that work just in specific situations. The middle way consists of a rather broad approach that contains the possibilities for controlled choices depending on the situation, allowing users to modify it, bringing their own favourite model.

The development of the "Multiview" approach (Avison and Wood-Harper, 1990), which could be described as a meta-approach, is a good example of the difficulties of making these deliberations. The user of the approach must bear the responsibility for success or failure, so blaming the approach is not much of a comfort in the end. The project leader is left with some hard decisions when it comes to the choices of methods and models.

The path chosen in this research could be summarized as:

A planning approach built on existing frameworks from knowledge management and business planning, frameworks that are reworked and extended towards softer human-oriented issues and socio-technical theory; directed by the use of a hermeneutic-based investigation method and interpretive case study research.

The application of the planning approach must surely be adapted to the situation where it is to be used. Modification implements should be balanced both on a model and a method level. As a support for such a task, a list of deliberations is presented, which are probably necessary in the process of choosing and/or designing an approach. The first item in the list below (content vs. method) sets two directions for this analysis. The method/content division is very visible in the list, the first five points after the first one being content-oriented (2-6) and the following ones more oriented towards the method aspect (7-13).

1. Content – Method Dimension. This is a discussion including a number of aspects: 1) general – special focus of approach, i.e. KMS approach vs. IS approach and 2) a

discussion about the differences between the strategic planning approach vs. the ISD approach. These two issues are discussed further in the content/method discussion in section 8.2.2.

2. Control – Support Dimension. This is a discussion of the underlying raison d'être of a KMS (this issue being discussed later on in this text, 8.2.1).

3. People/work – Business/strategy Dimension. The planning approach should include a balanced set of perspectives, covering both aspects of the dimension. Behind this dimension, there is the tacit assumption that the reason for the system to be developed is the business need and that the user aspect complements this main aspect so that the goals are met. This is hard to argue with; however, the insights from the people/work aspect reveal the "real" situation that is to be supported, something that might be very distant from corporate hopes and plans. Without these insights, the plans might be too distant to be relevant at all. So, instead of "one leading to the other situation", it seems to be more relevant to see it as a situation where the two aspects must be equally investigated.

4. Change – Stability Dimension. This dimension deals with the assumptions about the nature and goal of the planning situation. It could be understood both as the precondition of the planning situation, whether it is stable or not, and of the goal of the planning, whether it is to keep the status quo or to bring about a change in the organization. In the planning approach, this dimension is thought of in terms of flexibility, the need of striking a balance between change and stability. The goal is to be able to choose a mix of activities that provide options for both change and stability, depending on the situation.

5. Conflict – Consensus Dimension. A planning approach should be able to handle all situations, whether there is a state of conflict or consensus. It is even more likely that there is a mix of the two, some areas containing conflicts between some of the participants involved. As a whole, the situation is heterogeneous. Conflicts should not be downplayed or be allowed to dominate the situation completely.

6. Individual – Group/organization Dimension. KMS aims at helping individual people in developing new knowledge or using existing knowledge. KMS is also about how to integrate organizational work, making knowledge transferable and getting people to work closer together. The integrative movement of these two aspects is necessary for stimulating the excellence of the organization.

7. Interpretative – Positivistic Dimension. This deals with the nature of the planning process. The norm is still the scientific management tradition, where both theory describing the world and the scientific method itself are transferred into management practices. The planning approach advocates an interpretative approach to planning, brought over from the hermeneutic approach to science studies. In the planning approach, this would call some attention to the need of some harder models and planning activities.

8. Scientific planning – Practical planning Dimension. There is a sentiment in practice that science is distant from any "reality" whatsoever. If it is true to some extent for the harder sciences, then it is even more so for the softer approaches often found in the socio-technical area. The planning approach of this thesis is assumed to be adapted to the practical situation. This transfer process might be hard for the investigator, but it is also hard for the scientist to predict and support the process in any greater detail. Just as hard as it is to apply a method fresh from an article in a scientific journal, just as careful the investigator should be when using a how-to-do description generated by consultants.

9. Descriptive – Normative Dimension. Can or should a planning approach be normative or should it just reflect known applications and how past problems have been tackled? This latter assumption would provide an approach that is expected to be adapted and further developed by subsequent users.

10. Detailed models – Interaction models Dimension. This dimension has grown as a central theme throughout this research. The outcome of the planning processes seems more to be one where decisions are made on the insight into relations between perspectives or systems. This should be preferred rather than detailed descriptions of systems which are used to understand a certain system on its own.

11. Problem exploration – Problem solving Dimension. Defining problems and generating alternatives, on the one hand, and choosing and implementing the solution, on the other, are two very different activities. Moreover, they should above all not be confused or mixed. To plan for one without preparing for the other is not good either. The presented planning approach deals with the first phase, the exploration part. This should later be complemented with the second phase. Inserting it into a larger framework, where the other necessary steps are included, would be one possibility.

12. Planning – Use Dimension. The planning process has a limited influence on the final outcome of a KMS project or, for that matter, on any change project of any kind. Much will be decided during the practical use of whatever system or technology the project manages to produce. This insight should be of some consequence for the planning approach. One could be to make the planning approach useful throughout the life span of the project and the technologies that are developed and applied. Another could be to install a retrospective view in the planning process, where past introductions are studied to gain an insight into how a future implementation might be received. A third possibility is to put more focus on scenario planning, trying to foretell how the interaction between people and technology might play out.

13. Strategic action – Strategic planning Dimension. A planning process contains both a paper production and an action aspect. The planning approach is probably geared towards one or the other, and this might be a source of problems. The traditional approach produces a paper with guides to actions, and the approach presented in this thesis is no exception. Even if some efforts of focusing on the coming interaction between technology and people in an actual situation have been

made, the outcome is a list of systems to be developed. A full cycle where systems are suggested, developed, used, and the experiences are fed back into a further interaction (for example SSM, Checkland, 1981) is one possibility. However, to get closer to a planning situation writing plans and doing practical things in the organization, more must be done. Approaches like prototyping and participative design are examples of how to involve the organizations in practice. Nevertheless, these efforts seem rather to be leaving the planning phase in a general “plan-do-plan-do” interaction. To be able to find room for action during the planning phase in an organized and structured approach where thinking and doing are integrated seems harder to conceptualize.

8 CONCLUDING DISCUSSIONS

This chapter starts with a section on the validation of the research results, where the status of the results is discussed. Then follows a section where the further implications of the findings in the study (presented in Chapter 7) are discussed. The chapter is concluded with some outlooks towards possible roads ahead for future research.

The intention of this thesis was to further the understanding of planning approaches for KMS. Two instalments have been made, first a planning approach, directed towards the problem exploration phase of KMS development. This approach, as presented in Chapter 6, is grounded in a broad selection of theories relevant to the KMS area and developed/tested on practical cases. Then this was reconnected with what was learnt by developing the approach to three central background theory areas, (socio-technical, strategy and multiple-paradigm methodologies). The outcome of this theoretical analysis was presented as a list of dimensions for the analysis of a planning methodology (presented in 7.4). This chapter tries to discuss these results, first by a look at the research method used (8.1), followed by focusing on one of the dimensions from section 7.4 (KMS as control/support) and a reconnection of some of the practical cases from Chapters 4 and 5 (8.2), and finally in section 8.3 looking forward to a future of KMS planning, focusing on the concept of reciprocity.

8.1 Discussions on Trustworthiness – Evaluation of Research Approach

Two approaches to validation were suggested in section 3.6. First, a look at the principles given by Klein and Meyer (1999), followed by the concepts provided by Lincoln and Gupta (1985). One central point on this list is that the knowledge is situational and subjective, while generalization is more illusive. These questions put the focus on the interpretative research process.

8.1.1 Evaluating the Result- Hermeneutic Perspectives

The suggested directives (Klein and Meyer, 1999) (see section 3.6.1) for hermeneutic research can be traced throughout this thesis. Here follows a discussion of how these principles are used throughout the work process.

1 *Principle of the hermeneutic circle.* The iteration between the meaning of parts and the whole that they form has taken many forms. These interactions can be found on a number of levels, including both the theory and the empirical material. First, theories and concepts from various areas have been put into the context of the general problem of planning KMS. The outcome of these processes is the theoretical constructs of the planning frameworks. Secondly, the frameworks have been put in the context of empirical cases in an effort to understand them from a practical perspective. These two processes apply in all

of the papers in Chapter 4. The outcome of these processes was refined frameworks, which then were brought together into a tentative planning approach. On the third level, two cases were put in the context of the planning approach. This is done in Chapter 5.

2 *Principle of contextualization.* The research should reflect on the social and historical background of the research setting. This was achieved both in the theoretical studies, by the extensive interest in the broad range of concepts making the research susceptible to these issues, and in the empirical studies, with a focus on the situation of the interviewed as the primary goal of interviews.

3 *Principle of interaction between the researchers and the subjects*. The "empirical material" of the research is constructed in social interaction between the researcher and the actors of the research situation. This issue reflects the nature of data collection, which was set up as a discussion around issues important from both the researcher's and the interviewees' perspective. What was important in the cases influencing the decision and outcomes in the planning process was reached in a conversation of equal participants. This ambiance of discussions was also found in the academic meeting around both the background theory and the outcomes of the studies. This community around the researcher constantly interpreted and communicated their understanding of theories and cases, these processes adding to the picture of the results as socially negotiated.

4 *Principle of abstraction and generalization*. The material collected is generalized by means of theoretical concepts. This is done using the principles of the hermeneutic circle and of contextualization. The outcome, expressed in a set of frameworks, constitutes a theoretical generalization of the experiences from the research and is presented in section 7.4. In Chapter 7.4, the experiences of contradictions that mar the planning and use of KMS in the cases are generalized into a number of dimensions.

5 *Principle of dialogical reasoning*. The findings of the research are developed in a dialogue between the preconception of the research and the findings of the study. Each step in the research process has in turn been fed into the next step. This is especially clear in the interaction between different stages of the frameworks. The first outcomes of one stage influenced the start-up of the next one. This interactive process was important for the final outcome. An example of such a process is the development of each framework. The frameworks are developed in a series of papers, where each paper provides a pre-context for the next one. There are also interconnections between the work with the different frameworks, i.e. the outcome in one paper written about one of the frameworks has influenced the work with the other frameworks. The dialogical principles create a twisting and turning of the material, rather than providing clear and easy answers and definitions.

6 *Principle of multiple interpretations*. Interpretative research requires an ability to understand a situation from multiple perspectives. Broad theoretical frames of understanding have been used to approach the empirical material. The use of a number of different cases to further the development of frameworks has also contributed to a multi-faceted understanding of these central outcomes of the research. This has, among other things, resulted in the extensive literature chapter of the thesis.

7 *Principle of suspicion.* The researcher must be sensitive to the possibilities of biases in a situation. The collection and analysis of data were performed using informants with very varying backgrounds and persuasions, and the material was understood within a very broad theoretical frame. Hard questions were asked, and frank answers were given. The many layers and arguments, for and against the information system planned and utilized, came forward in open dialogues. In the theoretical studies, too, the face value of proposed theories and frameworks was not readily accepted. Deep-reaching studies into the background of frameworks and concepts and the frequent reconfiguration of the basic ideas into new forms suitable for the current situation vouch for the critical stance of the research.

It must be noted that interpretative research does not produce a final and conclusive outcome, being part of an ongoing process or dialogue where different ways of understanding a phenomenon are discussed. Because of the difficulty of KMS, the current research aims at fuelling the debate rather than providing definitive answers. It is important to maintain the interpretative process throughout the whole of the work. In the end, one should be given the opportunity to continue the processes rather than being served the finished processes.

8.1.2 Trustworthiness: Evaluating the Empirical Studies

The validity concept – the connection between the truth statement and the situation is here discussed in terms of ideas around trustworthiness (Lincoln and Gupta, 1985, and section 3.6.2). Four main concepts and related techniques are used to establish the trustworthiness of the work.

Here we detail how these principles have been applied throughout the work.

1 *Credibility*. The number of techniques are available for establishing the credibility of the research, which are discussed in the following points, a-f.

a. *Prolonged engagement and persistent observation*. The investigator should be involved with a site for a lengthy period of time. In all the primary cases, the interaction period was between 1-2 years.

b. *Triangulation*. Multiple sets of sources and methods were generally used.

c. *Peer debriefing*. Debriefing has taken place in a large number of seminars, on the department level, at research network meetings and research conferences. A large number of intermediate reports have been presented and discussed. These have had a great influence on the final results.

d. *Negative case analysis*. This technique has not been employed.

e. *Referential adequacy*. Much of the data capture has been recorded, using tape recorders, and saved for the future.

f. *Member checks*. The early interpretations have been fed back to the respondents for discussion. Results or insight from interviews have been brought up in subsequent interviews.

2 *Transferability*. The applicability of the suggested planning approach is limited to the times and places of testing. The testing of the framework on two types of cases can be seen as a limited test of transferability. However, the actual transfer is a responsibility of other researches that pick up the hypothesis and try it again.

3 *Dependability***.** Dependability builds on the possibility of repeating the research. There are some possibilities of doing this. One is the use of overlapping methods as when we have chosen a number of case studies from different sources. Another way is using dual analysis teams. A variation of this has been applied, whereby cooperation with other researchers in the collection of data and analysis processes gave some dependability to the result. A third suggestion is an audit of the material performed by an expert in the field, which to some extent has taken place through the reviewing of the published research reports. Not, however, to the full extent as envisioned by Lincoln and Gupta, including a review of the empirical material.

4 *Confirmability*. The process of confirming the research is an audit process, where an external expert checks the material from the raw data to the result. The check includes many of the concepts and activities suggested above, and the total remake of the investigation as indicated in the previous section. A total remake has not been performed. However, it is rather easy to follow the trail from the evolution of frameworks and their application in a string of papers. These ranges from basic literature reviews and project plans presented/published at local seminars to the final application presented and published at international conferences.

8.1.3 Usefulness in Practice

Much has been written about the nature and meaning of knowledge, knowledge processes, knowledge support, knowledge systems etc. in organizations. Practical

success stories have informed the KM field and they have been generalized and proposed as models. Models have been sold as recipes for success.

This thesis has provided further insights into the two broad schools of the KM field. This has been done in two ways. The first is concerned with perspectives on humans as knowledge workers and the consequences that these perspectives bring for the use of IT. The second is focused on the economic benefits of replacing humans as knowledge worker with computers. Both sides have their points, but the overall success comes when these traditions are integrated. Between these two trends there is a deep gap. One ambition has been to try to relate these two traditions, by presenting some models that contain ideas from both perspectives. The success potential for an approach that provides a practical way of creating these connections is great.

8.2 Reflections on Results

This section takes a closer look at some aspects of the results as presented in Chapters 6 and 7. The discussion revolves around three problematic areas. First, we look at the control/support dimension of KMS (8.2.1) and then at a model for balancing the model/method dimensions (8.2.2) followed by a concluding discussion on the topic of understanding competing worldviews and the socio-technical dimension of planning (8.2.3).

In section 7.4 two central dimensions of KMS planning were identified, including a model and a method dimension. This is one central result of this thesis, in short, that to be successful in KMS planning, the approach employed must have a balance in these dimensions. In this section, we take a closer look at one of these dimensions, the model dimension and the control/support contradiction. In the next section, we look at the problems of balancing the two dimensions, i.e. a model/method balance. In the last subsection we take a broader look at the problem of dealing with different types of worldviews.

8.2.1 Model Dimension: Information Systems for Control of Knowledge Work or Support for Knowledge Development and Use

The model dimension deals with the content of KM models. There are two directions within this dimension: the control and the support of knowledge work. Depending on what kinds of problems are encountered in a situation, different approaches and models are needed in the planning process. The control “paradigm” and the support “paradigm” are interdependent of each other; one cannot think any of them away when investigating a KMS. An idea of this research is that an information systems project, especially KMS, which does not handle this dimension, will be likely to fail. However, it is not enough to incorporate both in the project; they must also be integrated in some systematic way.

Throughout all the frameworks of the planning approach there is a clear pattern of repeated clashes between perspectives that highlight support, alternatively control. Some perspectives contain clear mixes, where the problems or the possibilities are clear; others have this dimension as a more underlying factor. A discussion of the frameworks and their interacting perspectives includes a number of points:

1. *Cognitive, social and critical perspectives on knowledge processes.* Here the connection between the knowledge or learning support on an individual level and the resource management motives on the organizational level is fairly clear. Many of the interactions are played out on a group level, i.e. how people are motivated to share their knowledge or, for that matter, to learn and put it to use in a way that is beneficial for the organization. However, forcing people into either of these activities has proved to be hard. Examples, like the hoarding of knowledge as a key to personal success on the one hand and the excessive posting on knowledge forums to gain bonuses on the other, show the difficulties of creating a balance. The special nature of personal and tacit knowledge puts it out of reach of traditional control thinking. This makes knowledge different from other resources and KMS different from other information systems. An example from the literature (Zuboff, 1988) can be used to illustrate this. A communication system, e-mail for example, could be a good way to promote sharing ideas in the work place. Zuboff tells a short story of an organization were the boss introduced an e-mail system, with hopes of creating a better communication channel in the organization. Soon this proved to be the case, many messages were sent, and the personnel were happy with the system. The boss saw the activity and got curious, and began reading messages. A lot of them proved to be non-work-related and the boss began to regulate the e-mail usage. The news of the boss's action spread fast and the interest in the e-mail system dwindled equally fast. This example shows a number of key points. Sometimes technology will not be used regardless of how simple it is from a cognitive point of view. The social dimension plays an important role, because it is the small talk and non-work-related topic that create a social closeness among communicators. The power dimension, often discussed in the critical perspective, is an important factor in system use or non-use.
2. *Balance scorecard (BSC) perspectives on KMS.* The BSC model is in essence a control instrument. It is a model for constructing systems of measures and an information system to gather and summarize the control data for these measures. The purpose is to tell general managers that the organization is moving in the right direction. The use of the BSC in this research is slightly different, because here the perspectives of identifying activities central for success are used, followed by an attempt to see if a KMS can be of help to support these activities. In this way, BSC functions as model for the generation of ideas. The original thought of BSC as a means of getting the whole picture of the organization is retained and reused. The goal is to provide a KMS that

supports all aspects of the organization, and to make sure that the organization gets a balanced mix of KMS's. Here the "Are we making money?" question is contrasted with the "Are we building a learning organization?" question. So far so good, when it comes to balancing the support and control dimensions. Then one can ponder whether the KMS's that are suggested in this analysis tend to be more of a controlling or of a supporting kind. There seemed to be somewhat more of KMS generated in the control mode, with some exceptions in the learning perspective and some in the internal operations perspective. This is not necessarily an automatic outcome, since if one pays more attention to the control/support dimension, this potential downside to the BSC model can be avoided.

3. *Flexibility: change and stability perspectives on KMS as support for work processes.* This model comes from the area of planning strategic actions (Evans, 1991). Just as it is possible to find strategic action, it should be possible to find systems that enable the organization both to find these actions and to create the ability to perform the acts. As a strategic planning model, it has a management perspective and a bias towards controlling the organization. However, a central theme in flexibility is adaptation to changing situations. The control of the unknown is of course impossible, and the standard answer is to hand down the responsibility to the personnel closest to the situation both in time and in place. Systems that support the person dealing with the situation in a flexible manner are necessary. In this sense the flexibility concept has a balancing function between control and support built into it. The use of the planning concept has been examined in Aidemark (2000a, 2002c) and the application of the concept for planning a KMS portfolio in Aidemark (2004c).
4. *Organizational context or cultures: garbage can, politics, rational and program perspectives.* The basic idea here depends on the nature or culture of the context; different sets of KMS are suitable. This is complicated by differences between different parts of the organizations, changes over time or emerging situations. Generally, rational and program contexts seem to be more inclined to develop KMS in control functions. The garbage can type of context relies rather on the lack of structure and favours chances, taking advantage of emerging possibilities. In a political environment there is a mixed situation. Individual groups might resist KMS, if the systems are seen as a threat to their position. On the other hand, the system might be welcomed if it has a power potential for the group. The "Public hospital case" contained a good example of this complexity. A central knowledge management process was the development of new treatment guidelines. This situation contained aspects of all four contexts, but mainly the rational and the program context. The rational context was central, one task being taken on by a senior M.D., a traditional research activity, supported by literature studies, case studies of experiences, and so on. The Intranet system could have been a good way of providing easy access to research tools, but this was not seen as a central part of the project.

This support situation could contain a mix of control- and support-styled support systems. The work method could very well be programmed into a system in order to ensure the high quality of the result. Other aspects of this research work might be freer, for example where or when the work is performed. Here the Intranet system provided some communication functions enabling the M.D. to do research work from home at all times. The result was written down in a certain format and distributed to the potential users in an effort of programming the behaviour of the organization. The Intranet was hoped to become a good way for distribution, but short of publishing the documents, these ambitions proved hard to realize. The reason for this has a clear political flavour to it. The way a certain prescription was constructed depended on the area. The effort of creating a unified format was not well received, as the format differed too much, and behind this there were different views on treatments and how patients where viewed in general. Emergent situations were not considered in the project, even though ideas on how to use the technology prevailed in the organization. Situations that had no clear prescription to them must be handled in some way, and according to the garbage can idea, the chance of finding a solution increases the more often problems and solutions are allowed to meet. In practice, looking from an Intranet system point of view this might mean that extensive, more or less formal, networks would provide the hospital with more opportunities to deal with the unforeseen. One suggestion on this note was to prepare for video-guided support from experts around the world. On the downside of the Intranet system, we find issues concerning how people connected to each other, including issues like: system automating communication processes and replacing people as connection points. These persons were often situated on the ward, knowing who had the knowledge in areas were no programmed treatment existed. This short example demonstrates the need of mixing systems that act in a control manner with support systems that help people to deal with situations in a more ad hoc manner. When it comes to the politically influenced situation, we have problems of finding the right balance between letting subgroups control their own domains and trying to impose order upon them. Information systems can provide ways of increasing control but this option should be used wisely.

5. *Hierarchies and network perspectives on KMS*. This perspective has been identified as the central trend in the changes of today and must be planned in accordance with this development. KMS can even be seen as a driver of this trend. It offers new possibilities of arranging organizational cooperation and of handling knowledge as a resource. These processes might occur in turbulence situations, where people enter and exit the organization at a high pace. The resource-based view of the firm is connected to this problem complex. The core of the enterprise becomes the knowledge creation and the control and use of knowledge. Production and consumer contacts become peripheral and

basically support activities in a network of agents more or less controlled by a central node, which holds the knowledge resource. There is a natural connection to the control/support dimension here. Hierarchies are built for control, just as networks are developed in a less orderly manner. The “Public hospital case” provides good examples of these issues. Informal networks are present in any organization and are often a natural and important part of a well functioning organization. Natural meeting places such as organizational position, joint work tasks, lunch rooms, off-work interests and so on form a breeding ground for these networks. Information technology innovations, for example e-mail systems, make such networks even easier to maintain and expand, even outside the organization. These kinds of network were common at the hospital, e-mail being a preferred communication medium, in addition to face-to-face meetings. Within these networks news was spread and opinions were formed. The context of these networks was the strong traditional hierarchical structure of the hospital. These structures are also communication lines for information, which in practice create a string of very powerful information nodes in the form of what might be described as middle management positions. The development of the Intranet challenged both these structures, making information available for broader groups of personnel. Many, indeed, welcomed this development. Other groups were more sceptical. Clear examples of people actively not distributing documents that were definitely suitable for the Intranet were found. There seem to be active choices of copying machines or e-mail instead, apparently to retain information control. Another telling tale of this was discussion forums that were started on organization-wide issues and on more specialized topics. These forums were more or less unused during the first years after the introduction of the Intranet.

One outcome of this overview is the call for a more intense investigation of the nature of existing and accepted planning models and methods with respect to their capacity of dealing with this duality. Looking at the general body of socio-technical theory, the power dimension is often central, and this control/support dimension of KMS might be a viable way of dealing with this issue. From a strategic planning point of view, in which power issues are more or less absent, this dimension should be even more needed. More work is necessary to enhance the body of frameworks in use today in IS planning, leading to more versatile planning approaches.

8.2.2 The Model/Method Matrix

Previously, we have discussed models dealing with the content of the situation (see section 7.4). The discussion can be broadened to a combined model/method matrix (Figure 17). When choosing (or designing, adapting, etc.) a planning approach, this would be a central problem to be considered. The matrix indicates whether a planning approach is more based on models or methods. This implies that if it is more oriented towards the content of the planning process, then we should turn our attention towards the other side, and the other way around. The model dimension contains the

sometimes opposing aspects of KMS as a source of control or support, as discussed in the previous section. Following that discussion, we would like to associate support with work process and a general focus on people. The control aspect seems more

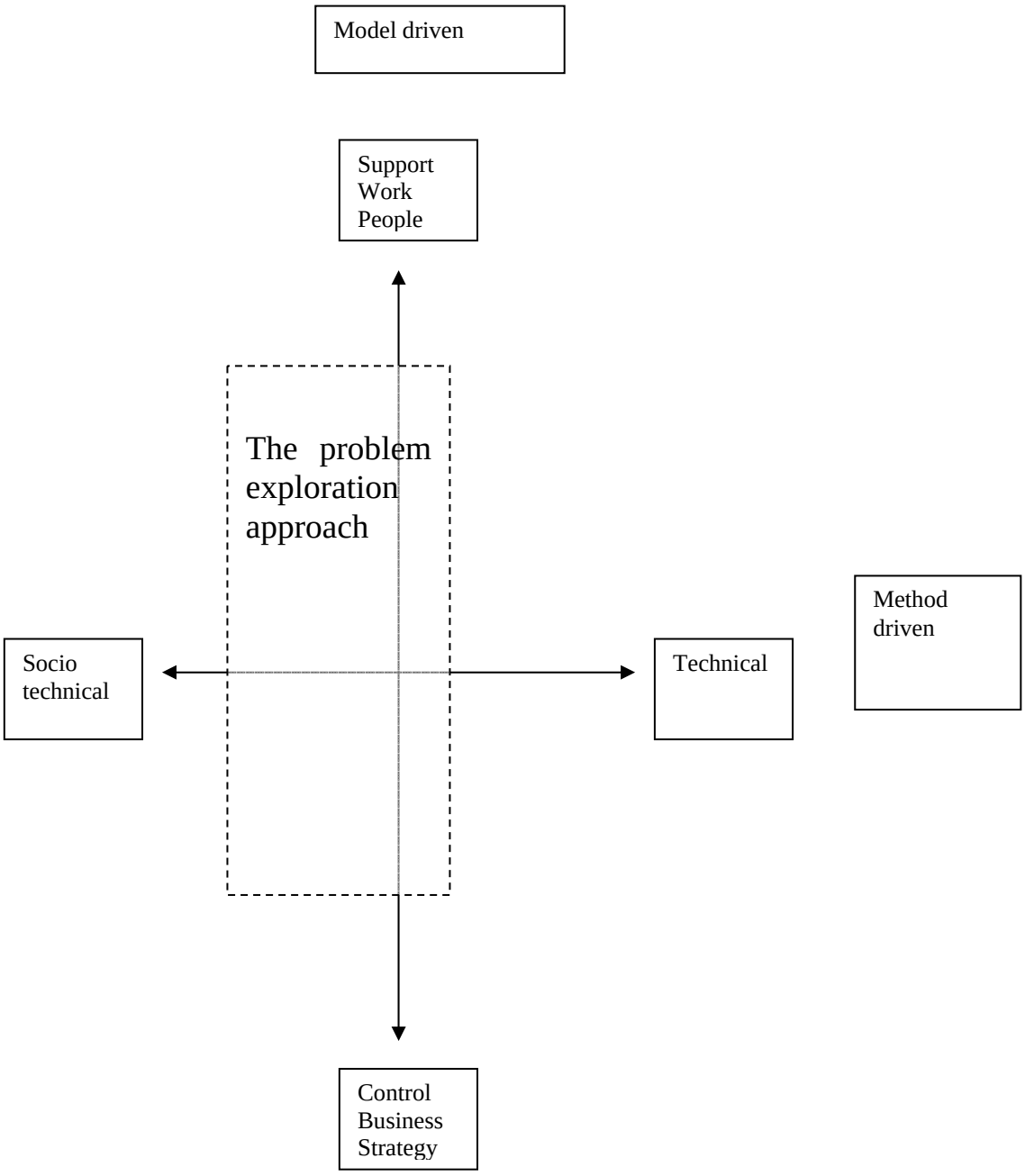


Figure 17. The model/method matrix

connected to business and strategy issues. The method dimension we divide into socio-technical and technical aspects. That is, a method might be focused on the

development of people and technology in concert or it could be focused more on the development of IT or software products.

The mapping of a proposed approach in this matrix could support a good choice and/or a subsequent adaptation of a chosen approach. The nature of an analyzed approach should be indicated with a square that covers the area of the approach. That is if the approach is mainly method-focused but includes both traditional technical and socio-technical issues, it should be a long and rather thin square, centrally located in the middle.

The approach suggested in this research would occupy a section as indicated in Figure 17, the dotted square. The analysis might provide some insight into the need of development or adaptation of the chosen approach. The approach developed in this research is located nearer to the middle of the scale, more about models than about methods, and it is also oriented towards the work aspect rather than towards business aspects. This might indicate that some complements to the approach might be needed, all depending on the situation. This would also indicate that it is not a complete approach for all purposes and would require to be used in combination with other planning models. A more traditional approach, data-driven and based on some drawing technique (ER-models etc.), would be on the method side, providing many steps to be followed but few directions of how to understand the organization. In comparison, a strategic planning approach based on Porter's competitive forces should clearly be in the model/business area (not indicated in the figure, but would be situated centrally and low in the matrix); consequently, it should be complemented by some method steps and models that belong in other parts of the matrix.

This simple analysis sends an initial signal of the potential problems of the chosen approach. Whether it is too much or too little of one or the other must be judged with respect to the problem situation. It is the situation that dictates what the right balance is, what is provided here is just an instrument for the support of this checkout. Some approaches can of course cover the whole matrix, but these are easily counted.

8.2.3 Consistency of Worldviews

This research started out in the discussion by Lee (2004) about problems of social vs. technological focus in the study of information systems. This was then extended into the area of methodologies for the planning of information systems, where the same problem can be seen. Here we find a general problem, the connections between scientific methods for studying the use of information systems or the use of methods for planning or implementing information systems in organizations. One fairly successful example of this is the SSM approach, which works both as a systems development instrument and as a scientific instrument (Checkland, 1981).

These methods can rest on more technological or more socially oriented worldviews. The method rests on (more or less explicit) views of the organization and processes that are to be supported, altered or generally enhanced by the technology. Again,

these perspectives could be more or less technically/structurally focused or more socially/people focused.

The traditional influence that science has on practical organizational work has been a trend of making ordinary life more scientific. The scientific management ideas have brought more structures, measurements, rules, categorizations and so on, and all this has made a clear impact on human behaviour in organizations. A decision-making process in the organization has been considered good if it reminds one of how hard science is conducted. The use of computers and the development of information systems have fitted well into these structures. In turn, further research on organization has been made according to the same principles, which has rooted this perspective even harder into organizational life.

The emerging interest in socially focused and hermeneutically based research approaches, which today have gained broad acceptance, provides alternatives. This includes a number of changes, including:

- *Worldview*. This includes views on organizational life, with people in focus, where the social world is important, and change and development depend on interaction between people. Ontological and epistemological questions are answered along new lines of reasoning. In the vocabulary of Burrell and Morgan (1979), these perspectives are found in the interpretative sociology or radical humanism paradigms.
- *Research*. Research is conducted using interpretative and qualitative methods. Hermeneutics is the guiding principle for the development of knowledge. The insights produced in such research are fed back into organizations, forming their future developments.
- *Development*. Information systems should be developed using methods that are based on these philosophical standpoints.
- *Use*. The introduction and use of the information system and its consequences should be understood and evaluated.

In the best of worlds there should be a connection between these four activities, the *philosophy* the worldview rests on should direct *science* and research methods, which in turn guide the *technical* development, which will impact the *practical* experience of those who take part in organizational life. The experiences made in this process should work as a learning spiral. There must be some possibilities of a continuous change in the underpinning philosophy or world-view, which direct and control the knowledge development and use process.

The situation becomes more complex when dealing with multi-perspective approaches, in any of these efforts. The development of a multi-perspective planning and implementation method is based on mixes of traditions.

A hypothesis can be formed: a planning approach that succeeds in combining elements from different scientific traditions will be more successful. This combining

effort should end in a situation where the elements support rather then undermine the subsequent steps in the work in the planning process.

Some possible directions can be detected for further work with this problem. The "Critical realism" school (Bhaskar, 1998) has been suggested as one possibility (Dobson, 2001; Mingers, 2001). This is a relatively new direction, but a clear possibility. A more deeply explored theory is Giddens' structuration theory (Giddens, 1984), which has been discussed by many IS researchers, including Walsham (1993); Poole and DeSanctis (2004); Jones et al. (2004); Jones (1999) and Orlikowski (1991). A third way is the rather loose idea of "Design theory" (Markus et al., 2002; Hevner et al., 2004), but this is more directed to a practical/theory interaction in the process of constructing planning approaches or methodologies in general. None of these may tackle this particular problem, but are clearly viable paths to be used as support for tackling the presented problem.

8.3 Critiques of the Thesis

This is a discussion of a number of issues which might have been dealt with in a different manner and, if that had been the case, how these issues might have been approached.

A question of importance has not been discussed in this thesis so far. It is about the usefulness or actual use of methods in the practice of systems planning and system development in general. For example, Nandhakumar and Avison (1999) discuss the "fiction of methodological development", where the importance of method is debated.

In this thesis, the implicit answer is of course that the planning approach is important, and that different approaches are more or less suitable, depending on the situation. The research outcome largely concerns report-based special situations; and the usefulness of planning models is connected to these situations.

Information technology is omnipresent in the case studies, but in a rather passive mode. To gain better results a closer investigation into the nature and function of technology would have been necessary. In turn, this would have meant a smaller and more focused investigation, concentrating on a single system and its context. It would have been a different kind of study of, for example, Intranet systems in a knowledge organization and, more generally, understanding both a methodology and a technology might be hard to fit into one research effort.

The traditional planning models are not extensively investigated, save the use of the balanced score card model for understanding the business aspects. It would very well have been possible to bring in further models into the analysis, but this would risk making the investigation too heavy and prolonged. However, each of the perspectives of a balanced score card could be investigated further, using a number of existing instruments. Just one example of the customer satisfaction perspective, e.g. value chain models, completive forces or customer relationship models could be used here.

Similarly, not much has been presented in the form of process models, the main traditional instrument for bottom-up planning. The knowledge management process is in focus, but without any detailed model presented. To the extent that the details of processes have been interesting, these have been presented in the text. However, the focus has not been on elaborating on different types of knowledge management processes, but working with a basic and common knowledge management process. This underlines the assumption that the approach under investigation in this research should be embedded in some kind of traditional, more general approach. This has not been tackled in this research.

8.4 Further Work

Three movements, back-and-forth movements to be more precise, have been seen in this work.

1. From theories and models of the business world (Porters, 1984 competitive forces) moving into IS planning and then to information systems planning concepts (e.g. BPR), which are moved into more general business planning.
2. From general systems and system analysis and planning concepts into the study of IS and from the IS area back to the general systems theory field (SSM, Checkland, 1981; Checkland and Howell, 1998; information systems generally being an important application field of systems concepts).
3. From a social science point of view, for example socio-technical theories (Ethics, Mumford, 1983), into practical planning processes and back again (SST, Russell and Williams, 2002, information systems also in this respect being an important application area).

There is of course a close interconnection between these three dimensions, which, as is argued here, is a key to the understanding of nature of the IS planning theory and method.

Then, how should these interconnections be approached? A constant stream of frameworks, models and concepts are produced in economics, organizational theory, business administration and social sciences in general, which describe and sometimes explain the nature of organizational life. Many of these have implications for how information is used and handled, and some of them might be used for the planning of information systems and their technical components.

The core problem of an approach is not its ability to depict or describe the world it deals with; it should rather be the ability to relate phenomena in a constantly changing and interacting process. In the end, it is about relating people to each other.

To plan a KMS project is rather like judging a boxing contest; one must keep one’s eyes on the space in-between the boxers, in order to be able to catch the punches. One must also have an insight into the rigging game behind the scene. The analogy might not always concern the fight and victory aspects of boxing, but rather the fast pace in the contacts between the social and technical activities/artefacts. However, if a KMS

planning process is not properly managed, it might turn out as a contest between the two perspectives.

The challenge for planning approaches is to catch on to this relational or interactive nature of the connections between the perspectives of a socio-technical problem. A simple generic example: The knowledge management project might start off as a wish to cure knowledge distribution problems, leading to some database solution. The technology for saving a short description of how a problem was solved is easily constructed. However, there are a number of issues to consider: How should that piece of data be designed so that it works for people to learn from; How to motivate skilled people to write it?; How to motivate anyone to use it?, and so on? The solution presented in this thesis argues for an approach with a number of multi-perspective frameworks, which are interconnected internally and externally.

To approach these problems one concept focusing on interactivity can be suggested for further studies.

Reciprocity, as a concept for explaining the maintenance of stable social systems (Gouldner, 1960), could be used to analyze the interaction between perspectives and the people that represent them in the systems planning process. Gouldner discusses the concept in the context of a functionalistic explanation of why a social pattern exists and persists over time. The central idea here is that a certain pattern is needed for the social system to survive over time, i.e. serving a function. This takes place during a feedback connection or reciprocity between “A” and “B”, including:

- that “B” reciprocates “A” services, and
- that “B” services to “A” are contingent on the contribution of “A”

Reciprocity is a transaction between “A” and “B”. This transaction explains the stability of the pattern between “A” and “B”. In essence, it is the mutually contingent benefits rendered that constitute the stable relationship.

Many of the unequal, asymmetrical associations between actors and structures involved in the planning and use of information systems seem to form a suitable area for an analysis by the reciprocity concept. Many ideas within the multimethodology (Mingers, 1997) area seem stuck in either the rather optimistic views based on openness in communication or in a general trust in the power of revealing multi-perspectives. This does not approach the ultimate problem of the social and technical dimensions, just problems occurring between people in the process. The reciprocity concept focuses on power differences and the nature of mutual dependencies.

9 REFERENCES

Ackoff, R.L. (1967) “Management Misinformation Systems”, *Management Science*, Vol. 14, No. 4, December, pp. B147-B156.

Ackoff, R.L. (1979) “The Future of Operational Research is Past”, *Journal of the Operational Research Society*, Vol. 30, No. 2, pp. 93-104.

Ackoff, R.L. (1989) “From Data to Wisdom”, *Journal of Applied Systems Analysis*, Vol. 16, pp. 3-9.

Adman, P. and Warren, L. (2000) “Participatory Sociotechnical Design of Organizations and Information Systems – an Adaptation of ETHICS Methodology”, *Journal of Information Technology*, Vol. 15, No. 1, pp. 39-51.

Agarwal, R. and Lucas, H.C. Jr. (2005) “The Information Systems Identity Crisis: Focusing on High-Visiblity and High-Impact Research”, *MIS Quarterly*, Vol. 29, No. 3, pp. 381-398.

Aidemark, J. (1998) *Planning Information Systems for Organisational Flexibility*, Stockholm University, Dept. of Computer and Systems Sciences, Report No. 98-011.

Aidemark, J. (2000a) “A Framework for Information Planning for Flexibility”, *Conference Proceedings of Systems Integration 2000 - 8the International Conference*, Prague, Czech Republic, June 12-13, Edited by Pour, J. and Vorisek, J., Prague University of Economics.

Aidemark, J. (2000b) “Support for Decision Making Through the Management of Knowledge”, *Proceedings of the 1st European Conference on Knowledge Management*, Bled School of Management, Slovenia.

Aidemark, J. (2001) “Analysis of Knowledge Work – a Case and Some Planning Perspectives”, *The Proceedings of 2nd International Workshop on Knowledge Management in E-Government*, (organised by IFIP WG 8.3 and 8.5), Ed. by Wimmer, M., Universitätsverlag Rudolf Trauner.

Aidemark, J. (2002a) ”The Management of Knowledge in Complex Decision Making Environments”, *Proceedings of the First International Conference on Information and Management Science*, Edited by Song, K., Zhao, X and Liu, B., Volume 1 in The Series of Information & Management Science.

Aidemark, J. (2002b) ”Perspectives on the Support of Knowledge Work”, *Proceedings of the 10th European Conference on Information Systems: Information Systems and the Future of the Digital Economy*, Editor: Wrycza, S.

Aidemark, J. (2002c) “Information Planning for Knowledge Work – the Flexibility Approach”, *Proceedings of the Third European Conference on Knowledge*

Management, Trinity College Dublin, Ireland 24-25 September, Edited by Carlsson, S.

Aidemark, J. (2003a) "A Knowledge Perspective on e-Democracy", *Electronic Government*, Ed. by Traunmüller, R., LNCS 2739, Springer.

Aidemark, J. (2003b) "Cognitive, Social and Critical Perspectives on Planning a Knowledge Support Portfolio", *Database and Expert Systems Applications, 2003, Proceedings of the 14th International Workshop, DEXA 2003,* IEEE Computer Society.

Aidemark, J. (2004a) "Implementing Intranet for Social and Cognitive Knowledge Processes", *Proceedings of the 2004 Americas Conference of Information Systems (AMCIS),* New York, US.

Aidemark, J. (2004b) "A Flexibility Approach to Planning an Intranet in Support of Knowledge Work", *Database and Expert Systems Applications, DEXA 2004. Proceedings of the 15th International Workshop,* IEEE Computer Society, pp. 466-470.

Aidemark, J. (2004c) "A Planning Approach for Knowledge Support Systems", *Perspectives in Business Informatics Research, Proceedings of the BIR-2004 Conference,* Rostock, Germany, Edited by Röck, H. Shaker Verlag, Aashen, pp. 1-14.

Aidemark, J. (2005a) "Implementing Intranet for Social and Cognitive Knowledge Processes", *Int. J. Healthcare Technology Management,* Vol. 6, Nos. 4/5/6, pp. 357–367.

Aidemark, J. (2005b) "A Multiple Perspectives View on Knowledge Support Systems and Their Organizational Contexts", In: *Promote IT 2005,* Edited by: Bubenko, J. Jr., Eriksson, O., Fernlund, H. and Lind, M., Studentlitteratur.

Aidemark, J. and Persson J. (2004) "Learning by Machine: A Multiple Perspective Approach to Knowledge Work Analysis", *Decision Support in an Uncertain World, Proceedings of The 2004 IFIP WG 8.3 International Conference on Decision Support Systems,* Edited by, Meredith, R., Shanks, G., Arnott, D. and Carlsson, S. Monash University, Prato.

Aidemark, J. and Sterner H. (2003) "A Framework for Strategic Balancing of Knowledge Management Initiatives", *Systems Science, Proceedings of the 36th Hawaii International Conference on,* Ed. by Sprague, R.H., IEEE Computer Society.

Alavi, M. and Leidner, D.E. (2001) "Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues", *MIS Quarterly,* Vol. 25, No. 1, March, pp. 107-136.

Alter, S. (2004) “Possibilities for Cross-fertilization Between Interpretative Approaches and other Methods for Analyzing Information Systems”, *European Journal of Information Systems*, Vol. 13, No. 3, pp. 173-186.

Alvesson, M. and Kärreman, D. (2001) “Odd Couple: Making Sense of the Curious Concept of Knowledge Management”, *Journal of Management Studies*, Vol. 38, No. 7, pp. 995-1018.

Alvesson, M. and Sköldberg, K. (2000) *Reflexive Methodology, New Vistas for Qualitative Research*, Sage.

Ansoff, H.I. (1965) *Corporate Structure*, McGraw-Hill, New York.

Argyris, C. and Schön, D. (1978) *Organizational Learning*, Addison-Wesley.

Arlow, J. and Neustadt, I. (2005) *UML2 and the Unified Pro*cess, Second ed. Addison-Wesley.

Atkinson, C.J. (2000) “Socio-Technical and Soft Approaches to Information Requirements Elicitation in the Post-Methodology Era”, *Requirements Engineering*, Vol. 5, No. 2, pp. 67-73.

Atkinson, P. and Hammersley, M. (1994) “Ethnography and Participant Observation”, *Handbook of Quality Research*, Sage Publication, London.

Avison, D.E. and Wood-Harper, A.T. (1990) *Multiview: an Exploration of Information Systems Development*, Oxford : Blackwell Scientific.

Avison, D. E. and Fitzgerald, G. (1995) *Information Systems Development: Methodologies, Techniques and Tools*, 2:nd Edition, McGraw-Hill.

Bansler, J. (1987) *Systemutveckling: Teori och Historia i Skandinaviskt Perspektiv*, Lund: Studentlitteratur.

Baskerville, R. and Wood-Harper, A.T. (1998) “Diversity in Information Systems Action Research Methods” *European Journal of Information Systems*, Vol. 7, No. 2, pp. 90-107.

Bates, S.P. and Robert, G. (2002) “Knowledge Management and Communities of Practice in the Private Sector: Lessons for Modernizing the National Health Service in England and Wales”, *Public Administration*, Vol. 80, No. 4, pp. 643-663.

Belkin, N. J. (1990) “The Cognitive Viewpoint in Information Science”, *Journal of Information Science*, Vol. 16, No. 1, pp. 11-15.

Bell, D. (1976) *The Coming of the Post-Industrial Society, A Venture in Social Forecasting*, New York: Basic Books.

Benbasat, I. and Zmud, R.W. (2003) “The Identity Crisis Within the IS Discipline: Defining and Communicating the Discipline’s Core Properties” *MIS Quarterly*, Vol. 27, No. 2, June, pp. 183-194.

Bennett, P., Ackermann, F., Eden, C. and Williams, T. (1997) "Analysing Litigation and Negotiation: Using a Combined Methodology", In: *Multimethodology – The Theory and Practice of Combining Management Science Methodologies*, editors Mingers, J. and Gill, G., John Wiley and Sons Ltd, pp. 59-88.

Bennetts, P., Wood-Harper, A.T. and Mills, S. (1999) "The Soft System Methodology as a Framework for Software Process Improvement", *Journal of End User Computing Year*, Vol. 10, No. 1, pp. 12-20.

Berger, P.L. and Luckmann, T. (1966) *The Social Construction of Reality*, Garden City, N.Y: Doubleday.

Bhaskar, R. (1998) *The Possibility of Naturalism: A Philosophical Critique of the Contemporary Human Sciences*, Routledge.

Bijker, W.E. and Pinch, T.J. (2002) "SCOT Answers, Other Questions – A Reply to Nick Clayton", *Technology & Culture*, Vol. 43, No. 2, pp. 361-271.

Binney, D. (2001) "The Knowledge Management Spectrum – Understanding the KM Landscape", *Journal of Knowledge Management*, Vol. 5, No. 1, pp. 33-42.

Blackler, F. (1995) "Knowledge, Knowledge Work and Organizations: An Overview and Interpretations", *Organization Studies*, Vol.16, No. 6, pp. 1021-1046.

Bloor, D. (1976) *Knowledge and Social Imagery*, Routledge and Kegan Paul Ltd, London.

Bloor, D. (1999) "Anti-Latour", *Studies in History, and Philosophy of Science*, Part A, Vol. 30, No. 1, pp. 81-112.

Boland, R.J. and Schultze, U. (1996) "Narrating Accountability", In: *Accountability : Power, Ethos and the Technologies of Managing*, Edited R. Munro, J. Mouritsen. London : International Thomson Business Press, pp. 62-81.

Bose, R. and Sugumaran, V. (2003) "Application of Knowledge Management Technology in Customer Relationship Management", *Knowledge and Process Management*, Vol. 10, No. 1, pp. 3-17.

Bostrom, R.P. and Heinen, J.S. (1977a) "MIS Problems and Failures: A Socio-Technical Perspective, PART 1: The Causes", *MIS Quarterly*, Vol. 1, No. 3, September, pp. 17-33.

Bostrom, R.P. and Heinen, J.S. (1977b) "MIS Problems and Failures: A Socio-Technical Perspective, Part 2: The Application of Socio-Technical Theory", *MIS Quarterly*, Vol. 1, No. 4, December, pp. 11-28.

Bracker, J. (1980) "The Historical Development of the Strategic Management Concept", *Academy of Management Review*, Vol. 5, No. 2, pp. 219-224.

Brown, J.S. and Duguid, P. (1991) "Organizational Learning and Communities of Practice: Towards an Unified View of Working, Learning and Innovation", *Organizational Science*, Vol. 2, No. 1, pp. 40-57.

Bruner, J. (1986) *Actual Minds, Possible Worlds*, Cambridge, MA: Harvard University Press.

Bruner, J. (1990) *Acts of Meaning*, Cambridge, MA: Harvard University Press.

Bullen, C.V. and Rockart, J.F. (1981) "A Primer on Critical Success Factors", *Center for Information Systems Research Working Paper No. 69, Sloan School of Management*, MIT, Cambridge, Mass, June.

Burrell, G. (1998) "Modernism, Postmodernism and Organizational Analysis: The Contribution of Michel Foucault" In: *Foucault, Management and Organization Theory: from Panopticon to Technologies of Self*, Edited by McKinlay A.and Starkey K., London: Sage, pp. 14-28.

Burrell, G. and Morgan, G. (1979) *Sociological Paradigms and Organisational Analysis*, Heinemann: London.

Bustard, D.W, (1998) "BPR through SSM: an Incremental Approach", *Managing Requirements Change: A Business Process Re-Engineering Perspective* (Digest No. 1998/312), IEEE Colloquium on, pp. 6/1-6/4.

Carlsson, S. (2001) "Knowledge Management in Network Contexts", *Proceedings of the 9th European Conference on Information Systems*, June, Bled, Slovenia, pp. 27-29.

Carlsson, S. (2003) "Strategic Knowledge Managing in the Context of Networks", *Handbook on Knowledge Management 1 – Knowledge Matters*, Editor: Holsapple, C.W., Springer-Verlag, Berlin, Heidelberg.

Carter, C. and Scarbrough, H. (2001) "Towards a Second Generation of KM? The people Management Challenge", *Education + Training*, Vol. 43, No. 4/5, pp. 215-224.

Cash, J.I. (1985) "Interorganisational Systems: an Information Society Opportunity or Threat?", *The Information Society*, Vol. 3, No. 3, pp. 199-228.

Castells, M. (1996) *The Rise of the Network Society*, Malden, Mass.: Blackwell Publishing Ltd.

Cavaye, A.L.M. (1996) "Case Study Research: A Multi-faceted Research Approach for IS", *Information Systems Journal*, Vol. 6, No. 3, pp. 227-242.

Checkland, P. (1981) *Systems Thinking, Systems Practice*, John Wiley & Sons.

Checkland, P. (1985) "From Optimising to Learning, a Development of Systems Thinking for the 1990s", *Journal of the Operational Research Society*, Vol. 36, No. 9, pp. 757-767.

Checkland, P. and Howell, S. (1998) *Information, Systems and Information Systems*, Chichester: Wiley.

Chomsky, N. (1975) *Syntactic Structures*, Peter Lang Publishing.

Churchman, C.W. (1971) *The Design of Inquiring Systems*, Basic Books Inc., New York.

Cohen, M.D., March, J.G. and Olsen, J.P. (1972) "A Garbage Can Model of Organizational Choice", *Administrative Science Quarterly*, Vol. 17, No. 1, March, pp. 1-25.

Cunningham, J.B. (1997) "Case Study Principles for Different Types of Cases", *Quality and Quantity*, Vol. 31, No. 4, pp. 401-423.

Davenport, T.H. and Prusak, L. (1997) *Information Ecology*, New York.

Davenport, T.H. and Prusak, L. (1998) *Working Knowledge: How Organizations Manage What They Know*, Harvard Business School Press, Boston, MA.

Davenport, T.H., De Long, D.W. and Beers, M.C. (1998) "Successful Knowledge Management Projects", *Sloan Management Review*, Vol. 39, No. 2, Winter, pp. 43-58.

Davis, F. (1989) "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology", *MIS Quarterly*, Vol. 13, No. 3, September, pp. 319-340.

Davis, G.B. and Naumann, J.D. (1997) *Personal Productivity with Information Technology*, McGraw Hill.

Dekker, R. and de Hoog, R. (2000) "The Monetary Value of Knowledge Assets: a Micro Approach", *Expert Systems with Applications*, Vol. 18, No. 2, pp. 111-124.

De Long, D. and Seemann, P. (2000) "Confronting Conceptual Confusion and Conflict in Knowledge Management", *Organizational Dynamics*, Vol. 29, No. 1, pp. 33-44.

Dobson, P.J. (2001) "The Philosophy of Critical Realism – an Opportunity for Information Systems Research", *Information Systems Frontier*, Vol. 3, No. 2, pp. 199-210.

Drucker, P. (1988) "The Coming of the New Organization", *Harvard Business Review*, Vol. 66, No. 1, January/February, pp 45 –53.

Drucker, P. (1993) *The Post-Capitalist Society*, New York: Harper Collins.

Eardley, A., Avison, D. and Powell, P. (1997) "Developing Information Systems to Support Flexible Strategy", *Journal of Organizational Computing and Electronic Commerce*, Vol. 7, No. 1, pp. 55-77.

Earl, M.J. (1989) *Management Strategies for Information Technology*, Prentice Hall, International (UK) Ltd.

Earl, M.J. (1993) "Experiences in Strategic Information Systems Planning", *MIS Quarterly*, Vol. 17, No. 1, March, pp. 1-25.

Earl, M.J. (2001) “Knowledge Management Strategies: Toward a Taxonomy”, *Journal of Management Information Systems*, Vol. 18, No. 1, Summer, pp. 215-233.

Earl, M.J. and Scott, I.A. (1998) *What on Earth is a CKO*, London: London Business School/IBM Inc.

Eisenhardt, K. (1989) “Building Theories from Case Study Research”, *Academy of Management Review*, Vol. 14, No. 4, pp. 532-550.

Evans, J.S. (1991) “Strategic Flexibility for High Technology Maneuvers: A Conceptual Framework”, *Journal of Management Studies*, Vol. 28, No. 1, January, pp. 69-89.

Fennessy, G. (2002) “Understanding and Selecting Knowledge Management Systems for a Health Information Provider”, *System Sciences, 2002 “HICSS”, Proceedings of the 35th Annual Hawaii International Conference on*, IEEE, pp. 638-645.

Fetterman, D.M. (1989) *Ethnography Step by Step*, London: Sage Publications.

Flood, R.L. (1995) *Solving Problems Solving*, Chichester: Wiley.

Flood, R.L. and Jackson, M.C. (1991a) *Creative Problem Solving: Total Systems Intervention*, Chichester: Wiley.

Flood, R.L. and Jackson, M.C. (1991b) *Critical Systems Thinking: Directed Readings*, Chichester: Wiley.

Foucault, M. (1979) *Discipline and Punish: The Birth of the Prison*, New York: Vintage Books, Random House.

Gadamer, H-G. (1994) *Truth and Method*, New York: Continuum.

Galbraith, J.R. (1967) *The New Industrial State*, Boston: Houghton Miftlin.

Galbraith, J.R. (1997) “The Reconfigurable Organization”, In: *The Organization of the Future*, Ed. by Hesselbein, F., Goldsmith, M. & Beckhard, R., Jossey-Bass Publisher, San Francisco, pp. 87-98.

Galliers, R.D. (1994) “Information Systems, Operational Research and Business Reengineering”, *International Transactions in Operational Research*, Vol. 1, No. 2, pp. 159-168.

Galliers, R.D. (2002) “Choosing Appropriate Information Systems Research Approaches”, In: *Information Systems Research – Issues, Methods and Practice Guidelines*, Galliers, R. (ed.), Blackwell Scientific Publications, Oxford, pp. 114-162.

Galliers, R.D. and Swan, J.A. (1997) “Against Structured Approaches: Information Requirements Analysis as a Socially Mediated Process”, *The Proceedings of the Thirtieth Hawaii International Conference on Systems Sciences*,

IEEE Computer Society Press, Los Alamitos California, USA, Vol. 3, pp. 179-187.

Galliers, R.D. and Swan, J.A. (2000) "There's more to Information Systems Development than Structured Approaches: Information Requirements Analysis as a Socially Mediated Process", *Requirements Engineering*, Vol. 5, No. 2, pp. 74-82.

Garfinkel, H. (1984) *Studies in Ethnomethodology*, Cambridge: Polity Oxford, Blackwell.

Giddens, A. (1984) *The Constitution of Society*, Cambridge: Polity Press.

Giddens, A. (1990) *The Consequences of Modernity*, Cambridge, England: Polity Press.

Gidlund, G. and T. Möller (1999), *IT i Demokratins Tjänst*, SOU Forskarvolym VII, SOU 1999:117, http://www.demokratitorget.gov.se/upload_filer/forskarvolymer/117text01.pdf.

Glassey, J., Montague, G. and Mohan, P. (2000) "Issues in the Development of an Industrial Bioprocess Advisory System", *Trends in Biotechnology*, Vol. 18, No. 4, pp. 136-141.

Goffman, E. (1986) *Frame Analysis: an Essay on the Organization of Experience*, Boston: Northeastern University Press.

Goodland, M. and Slater, C. (1995) *SSADM Version 4: a Practical Approach*, London : McGraw-Hill.

Gouldner, A.W. (1960) "The Norm of Reciprocity: a Preliminary Statement", *American Sociological Review*, Vol. 25, No. 2, pp. 161-178.

Grant, R.M. (1996) "Toward a Knowledge-based Theory of the Firm", *Strategic Management Journal*, Vol. 17, pp. 109-122.

Grant, R.M. (1997) "The Knowledge-based View of the Firm: Implications for Management Practice", *Long Range Planning*, Vol. 30, No. 3. pp. 450-454.

Grayling, A.C. (1995) *Philosophy 1 – a Guide Through the Subject*, Oxford University press.

Grover, V. and Davenport, T.H. (2001) "General Perspectives on Knowledge Management: Fostering a Research Agenda", *Journal of Management Information Systems*, Vol. 18, No. 1, Summer, pp. 5-12.

Habermas, J. (1978) *Knowledge and Human Interests*, London: Heinemann.

Hamel, G. and Prahalad, C.K. (1994) "Competing for the Future", *Harvard Business Review*, Vol. 72, No. 4, July-August, pp. 122-129.

Hammer, M. (1990) "Reengineering Work, Don't Automate, Obliterate", *Harvard Business Review*, Vol. 68, No. 4, July, pp. 104-113.

Hammer, M. (1997) “Reengineering for Results”, *Association Management*, Vol. 49, No. 8, August, pp. 133-139.

Hansen, M.T., Nohria, N. and Tierney, T. (1999) “What’s Your Strategy for Managing Knowledge”, *Harvard Business Review*, Vol. 77, No. 2, March - April, pp. 109-122.

Hayes, F. (2004) “Chaos is Back”, *Computer World*, Nov. 8, p. 70.

Hayes, N. and Walsham, G. (2001) “Participation in Groupware-Mediated Communities of Practice: a Socio-political Analysis of Knowledge Working”, *Information and Organization*, Vol. 11, No. 4, pp. 263-288.

Hedberg, B. (1975) “Computer Systems to Support Industrial Democracy”, in *Human Choice and Computers*, Mumford, E. and Sackman, H. (eds.), American Elsevier Publishing Co., New York.

Henderson, J.C., Rockart, J.F. and Sifonis, J.G. (1984) “A Planning Methodology for Integrating Management Support Systems”, Centre *for Information Systems Research Working Paper No. 116, Sloan School of Management*, MIT, Cambridge, Mass., September.

Hevner, A.R., March, S.T. and Park, J. (2004) “Design Science in Information Systems Research”, *MIS Quarterly*, Vol. 28, No. 1, March, pp. 75-105.

Hirschheim, R.A. (1985) “User Experience with and Assessment of Participative Systems Design”, *MIS Quarterly*, Vol. 9, No. 4, December, pp. 295-304.

Hirschheim, R.A. and Klein, H.K. (1989) “Four Paradigms of Information Systems Development”, *Communications of the ACM*, Vol. 32, No. 10, pp. 1199-1217.

Hirschheim, R.A. and Klein, H.K. (1994) “Realizing Emancipatory Principles in Information Systems Development: The Case for ETHICS”, *MIS Quarterly*, Vol. 18, No. 1, March, pp. 83-109.

Holsapple, C.W. (2005) “The Inseparability of Modern Knowledge Management and Computer-based Technology”, *Journal of Knowledge Management*, Vol. 9, No. 1, pp. 42-52.

Holsapple, C.W. and Joshi, K.D. (2003) “A Knowledge Management Ontology”, In: *Handbook on Knowledge Management 1: Knowledge Matter*, Editor: C.W. Holsapple, Springer-Verlag.

Holzner, B. and Marx, J. (1979) *Knowledge Application: The Knowledge System in Society*, Allyn-Bacon, Boston.

Howcroft, D., Mitev, N. and Wilson, M. (2004) “What We May Learn from the Social Shaping of Technology Approach”, in Mingers, J. and Willcocks, L. (Eds.), *Social Theory and Philosophy for Information Systems*, Wiley.

Huber, G.P. (1981) “The Nature of Organisational Decision Making and the Design of Decision Support Systems”, *MIS Quarterly*, Vol. 5, No. 2, June, pp. 1-10.

Huber, G.P. (1984) “The Nature and Design of Post-industrial Organizations” *Management Science*, Vol. 30, No. 8, August, pp. 928-951.

Huber, G.P. and McDaniel, R.R. (1986) “The Decision-making Paradigm of Organizational Design”, *Management Science*, Vol. 32, No. 5, May, pp. 572-589.

Huber, G.P. (1991) “Organizational Learning: the Contributing Processes and the Literatures”, *Organizational Science*, Vol. 2, No. 1, February, pp. 88-115.

Iivari, J., Hirshcheim, R. and Klein, H.K. (2001) “A Dynamic Framework for Classifying Information Systems Development Methodologies and Approaches” *Journal of Management Information Systems*, Vol. 17, No. 3, Winter, pp. 179-218.

Ives, B., Parks, M.S., Porra, J. and Silva, L. (2004) “Phylogeny and Power in the IS Domain: A Respons to Benbasat and Zmud’s Call for Returning to the IT Artifact”, *Journal of the Association for Information Systems, Vol.* 5, No. 3, March, pp. 108-124.

Jackson, M.C. (1997) “Pluralism in Systems Thinking and Practice”, In: *Multimethodology – The Theory and Practice of Combining Management Science Methodologies*, editors Mingers, J. and Gill, G., John Wiley and Sons Ltd, pp. 345-378.

Jacobs, B. (2004) “Using Soft Systems Methodology for Performance Improvement and Organisational Change in the English National Health Service”, *Journal of Contingencies and Crisis Management*, Vol. 12, No. 4, pp. 138-149.

Jacques, R. (1989) “Post-industrialism, Postmodernity and OR: Towards ‘Custom and Practice’ of Responsibility and Possibility”, in Jackson, M.C., Keys, P. and Cropper, S.A. (eds) *Operational Research and the Social Sciences*, Plenum, New York, pp. 703-708.

Jayaratna, N. (1994) *Understanding and Evaluating Methodologies: NIMSAD, a Systematic Framework*, London: McGraw-Hill.

Jones, M. (1999) “Structuration Theory”, in: *Rethinking Management Information Systems – An Interdisciplinary Perspective*, editors: Currie, W. and Galliers, B., Oxford University Press: Oxford, New York.

Jones, M., Orlikowski, W. and Munir, K. (2004) “Structuration Theory and Information Systems: A Critical Reappraisal”, in Mingers J. and Willcocks L. (Eds.), *Social Theory and Philosophy for Information Systems*, Wiley.

Järvinen, P.H. (2000) “Research Questions Guiding Selection of an Appropriate Research Method”, In T*he Proceedings of the 87th European Conference on Information Systems*, pp. 124-131.

Kalling, T. (2000) *Gaining Competitive Advantage through Information Technology*, Doctoral dissertation, Lund University, Lund Studies in Economics and Management, 55.

Kaplan, R.S. and Norton, D.P. (1992) “The Balanced Scorecard – Measures That Drive Performance”, *Harvard Business Review*, Vol. 70, No. 1, Jan-Feb, pp. 71-80.

Kaplan, R.S. and Norton, D.P. (1996) “Using the Balanced Scorecard as a Strategic Management System”, *Harvard Business Review*, Jan-Feb.

Karim, J. (1988) “Strategic Planning for Information Systems: Requirements and Information Engineering Methods”, *Journal of Management Information Systems*, Spring, Vol. 4, No. 4, pp. 5-25.

Kivi, J., Haydon, D., Hayes, J., Schneider, R. and Succi, G. (2000) “Extreme Programming: A University Team Design Experience”, *Electrical and Computer Engineering, Canadian Conference on*, Vol. 2, pp. 816-820.

Klein, H.K. and Myers, M.D. (1999) “A set of Principles for Conducting and Evaluating Interpretative Field studies in Information Systems”, *MIS Quarterly*, Vol. 23, No. 1, March, pp. 67-94.

KPMG, (2000), *Knowledge Management Research Report 2000*, KPMG Management Consulting.

Kreiner, K. and Mouritsen, J. (2003) “Knowledge Management as Technology: Making Knowledge Manageable”, In: Czarniawska, B. and Sevon, G. (Editors), *The Northern Lights – Organization theory in Scandinavia*, Liber – Abstrakt forlag, Copenhagen Business School Press.

Kuhn, T.S. (1970) *The Structure of Scientific Revolutions*, University of Chicago.

Latour, B. (1992) “Technology is Society Made Durable”, In Law, J. (ed.) *A sociology of Monsters: Essays on Power, Technology and Domination*, London: Routledge, pp. 103-130.

Latour, B. (2005) *Reassembling the Social*, Oxford University Press.

Lave, J. and Wenger, E. (1991) *Situated Learning: Legitimate, Peripheral Participation*, Cambridge: Cambridge University Press.

Law, J. (1988) “The Anatomy of a Socio-technical Struggle: The Design of the TSR2” In: B. Elliott (editor) *Technology and Social Process*, Edinburgh University Press, Edinburgh, pp. 44-69.

Leavitt, H.J. (1964) “Applied Organization Change in Industry: Structural, Technical and Human Approaches”, In: Cooper, W.W., Leavitt, H.J. and Shelley II,

M.W. (eds.), *New Perspectives in Organization Research*, New York: Wiley.

Lederer, A.L. and Sethi, V. (1988) "The Implementation of Strategic Information Systems Planning Methodologies", *MIS Quarterly*, Vol. 12, No.3, September, pp. 445-461.

Lee, A.S. (2004) "Thinking About Social Theory and Philosophy for IS", In: *Social Theory and Philosophy for Information Systems*, Edited by Mingers, J. and Willcocks, L., Chichester, West Sussex : Wiley, pp. 1-26.

Levy, M. and Powell, P. (1998) "SME Flexibility and the Role of Information Systems", *Small Business Economics*, Vol. 11, No. 2, pp. 183-196.

Linberg, K.R. (1999) "Software Developer Perceptions about Software Project Failure: a Case Study", *The Journal of Systems and Software*, Vol. 49, No. 2-3, pp. 177-192.

Lincoln, Y.S. and Guba, E.G. (1985) *Naturalistic Inquiry*, Sage Publications, Inc.

Loytard, J-F. (1984) *The Postmodern Condition: A Report on Knowledge*, Manchester University Press, Manchester.

Machlup, F. (1962), *The Production and Distribution of Knowledge in the United States*, Princeton, NJ: Princeton University Press.

Mackenzie, D. and Wajcman, J. (1999) *The Social Shaping of Technology*, Milton Keynes: Open University Press.

Malhotra, Y. (1998) "Toward a Knowledge Ecology for Organizational White-waters", http://www.brint.com/papers/ecology.htm, (2004-12-16).

Manz, C.C. and Stewart, G.L. (1997) "Attaining Flexible Stability by Integrating Total Quality Management and Socio-technical Systems Theory", *Organization Science*, Vol. 8, No. 1, pp. 59-70.

March, J.G. and Olsen, J.P. (1976) *Ambiguity and Choice in Organizations*, Bergen, Norway, Universitetsforlaget.

March, S.T. and Smith, G.F. (1995) "Design and Natural Science Research on Information Technology", *Decision Support Systems*, Vol. 15, No. 4, pp. 251-266.

Markus, M.L., Majchrzak, A. and Gasser, L. (2002) "A Design Theory for Systems that Support Emergent Knowledge Processes", *MIS Quarterly*, Vol 26, No. 3, September, pp. 179-212.

Mason, J. (1996) *Qualitative Researching*, Sage.

Mason, R.O. and Mitroff, I.I. (1973) "A Program for Research on Management Information Systems", *Management Science*, Vol. 19, No. 5, pp. 475-487.

McCracken, G. (1988) *The Long Interview*, Sage Publications Inc.

McDermott, R. (1999) “Why Information Technology Inspired but Cannot Deliver Knowledge Management”, *California Management Review*, Vol. 41, No. 4., Summer, pp. 103-117.

McFarlan, F.W. (1984) “Information Technology Changes the Way that you Compete”, *Harvard Business Review*, Vol. 62, No. 3, May/June, pp. 98-104.

McKay, J. and Marshall, P. (2005) “A review of Design Science in Information Systems”, *The 16Th Australasian Conference on Information Systems*, Nov-Dec, 2005, Sydney.

Midgley, G. (1997) “Mixing Methods: Developing Systemic Intervention”, In: *Multimethodology – The Theory and Practice of Combining Management Science Methodologies*, editors Mingers, J. and Gill, G., John Wiley and Sons Ltd, pp. 249-290.

Mingers, J. (1997) “Multi-paradigm Multimethodology”, In: *Multimethodology – The Theory and Practice of Combining Management Science Methodologies*, editors Mingers, J. and Gill, G., John Wiley and Sons Ltd, pp. 1-22.

Mingers, J. (2001) “Combining IS Research Methods: Towards a Pluralist Methodology”, *Information Systems Research*, Vol. 12, No. 3, pp. 240-259.

Mingers, J. and Gill, G. (1997) *Multimethodology – The Theory and Practice of Combining Management Science Methodologies*, John Wiley and Sons. Ltd.

Mintzberg, H. (1973) *The Nature of Managerial Work*, New York: Harper and Row.

Mintzberg, H., Raisinghani, D. and Théorêt, A. (1976) “The Structure of ‘Unstructured’ Decision Processes”, *Administrative Science Quarterly*, Vol. 21, No. 2, June, pp. 246-275.

Mintzberg, H. (1978) “Patterns in Strategy Formation”, *Management Science*, Vol. 24, No. 9, pp. 934-948.

Mintzberg, H. (1981) “What is Planning Anyway?”, *Strategic Management Journal*, Vol. 2, pp. 319-324.

Mintzberg, H. (1991) “Learning 1, Planning 0 Repy to Igor Ansoff”, *Strategic Management Journal*, Vol. 12, No. 6, pp. 463-466.

Mintzberg, H. (1994) *The Rise and Fall of Strategic Planning*, New York: The Free Press.

Molokken, K. and Jorgensen, M. (2003) ”A Review of Surveys on Software Effort Estimation”, Proceedings of *The 2003 International Symposium on Empirical Software Engineering*, IEEE Computer Society.

Morgan, G. (1986) *Images of Organization*, Sage Publication Inc.

Morrow, R.A. (1994) *Critical Theory and Methodology*, Sage Publication Inc.

Mouritsen, J., Larsen, H.T. and Bukh, P.N.D. (2001) "Intellectual Capital and the 'Capable Firm': Narrating, Visualising and Numbering for Managing Knowledge", *Accounting, Organizations and Society*, Vol. 26, No. 7-8, Oct-Nov, pp. 735-762.

Mumford, E. (1971) *Economic Evaluation of Computer Based Systems: Systems Design for People*, Book 3, England: National Computer Centre.

Mumford, E. (1983) *Designing Human Systems for New Technology: the ETHICS Method*, Manchester: Manchester Business School.

Mumford, E. (2000a) "Socio-Technical Design: An Unfulfilled Promise or a Future Opportunity?", in R. Baskerville, J. Stage and J. DeGross, (Eds.), *The Social and Organizational Perspective on Research and Practice in Information Technology*, London: Chapman-Hall, p. 33-46.

Mumford, E. (2000b) "A Socio-Technical Approach to Systems Design", *Requirements Engineering*, Vol. 5, No. 2, p. 125-133.

Mumford, E. (2003) *Redesigning Human Systems*, Idea Group Inc.

Myers, M.D. and Avison, D. (2002) *Qualitative Research in Information Systems : a Reader*, London: Sage.

Nandhakumar, J. and Avison D.E. (1999) "The Fiction of Methodological Development: A Field Study of Information Systems Development", *Information Technology and People*, Vol. 12, No. 2, pp. 176-191.

Newell, S., Scarbrough, H. and Swan, J. (2001) "From Global Knowledge Management to Internal Electronic Fences: Contradictory Outcomes of Intranet Development", *British Journal of Management*, Vol. 12, No. 2, pp. 97-111.

Newell, S., Robertson, M., Scarbrough, H. and Swan, J. (2002) *Managing Knowledge Work*, New York: Palgrave.

Newkirk, H.E., Lederer, A.L. and Srinivasan, C. (2003) "Strategic Information Systems Planning: Too Little or Too Much?", *Journal of Strategic Information Systems*, Vol. 12, No. 3, pp. 201-228.

Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-creating Company*, Oxford University press.

Nonaka, I., Toyama R. and Konno N. (2000) "SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation", *Long Range Planning*, Vol. 33, No. 1, pp. 5-34.

Nunamaker, J.F., Chen, M. and Purdin, T.D.M. (1991) "Systems Development in Information Systems Research", *Journal of Management Information Systems*, Vol. 7, No. 3, Winter 90/91, pp. 89-106.

Ohashi, M. and Yoki, Y. (2002) “Productivity Improvement by Automating Operators´ Knowledge and Experience”, *Proceeding of SICE 2002*, Aug. 5-7, Osaka.

Ouchi, W.G. (1979) “A Conceptual Framework for the Design of Organizational Control Mechanisms”, *Management Science*, Vol. 25, No. 9, September, pp. 833-848.

Orlikowski, W. (1991) “The Duality of Technology: Rethinking the Concept of Technology in Organizations”, *Organization Science*, Vol. 3, No. 3, August, pp. 398-427.

Orlikowski, W. and Iacono, C. (2001) "Desperately Seeking the ‘IT’ in IT Research - A Call to Theorizing the IT Artifact", *Information Systems Research*, Vol. 12, No. 2, pp. 121-134.

Ormerod, R. (1996) “Combining Management Consultancy and Research”, *Omega*, Vol. 24, No. 1, pp. 1-12.

Ormerod, R. (1997) “Mixing Methods in Practice: a Transformation-Competence Perspective”, In: *Multimethodology – The Theory and Practice of Combining Management Science Methodologies*, editors Mingers, J. and Gill, G., John Wiley and Sons. Ltd, pp. 29-58.

Parker, M.M. and Benson, R.J. with Trainor, H.E. (1988) *Information Economics: Linking Business Performance to Information Technology*, Prentice Hall, Englewood Cliffs, New Jersey.

Peffers, K., Gengler, C.E. and Tuunanen, T. (2003) “Extending Critical Success Factors Methodology to Facilitate Broadly Participative Information Systems Planning”, *Journal of Management Information Systems*, Vol. 20, No. 1, Summer, pp. 51-85.

Pentland, B. (1995) “Information Systems and Organizational Learning: The Social Epistemology of Organizational Knowledge Systems”, *Accounting, Management and Information Technology*, Vol. 5, No. 1, pp. 1-21.

Peppard, J. (2003) “Managing IT as a Portfolio of Services”, *European Management Journal*, Vol. 21, No. 4, pp. 467-483.

Persson, J. (2003) “Kunskapsöverföring vid Produktionsstörningar - Hur Informationsteknologin kan bli ett Stöd”, *Report in Information Science, School of Management and Economics*, Växjö University.

Piaget, J. (2001) *The Psychology of Intelligence*, Ruthledge, London.

Pinch, T.J. and Bijker, W.E. (1984) “The Social Construction of Facts and Artefacts or How the Sociology of Science and the sociology of Technology Might Benefit Each Other”, *Social Studies of Science*, Vol. 14, No. 3, pp. 399-441.

Plato (1892) *The Dialogues of Plato*, Vol. 1, Third Edition, Impression 1924, (translated by Jowett B.), Oxford University Press.

Polanyi, M. (1958) *Personal Knowledge*, Chicago : Routledge & K. Paul.

Polanyi, M. (1966) *The Tacit Dimension*, Gloucester, Mass.: Peter Smith.

Poole, M.S. and DeSanctis, G. (2004) "Structuration Theory in Information Systems Research: Methods and Controversies", In: Whitman M.E. and Woszczynski, A.B. (Editors), *The Handbook of Information Systems Research*, IDEA Group Publishing: Hershey, London, pp. 206-247.

Porter, M. (1984) *Competitive Strategies*, Free Press, New York.

Porter, M. and Miller, V.E. (1985) "How Information Gives You Competitive Advantage", *Harvard Business Review*, Vol. 63, No. 4, July/August, pp. 149-161.

Presley, A., Sarkis, J. and Liles, D.H. (2000) "A Soft Systems Methodology Approach for Product and Process Innovation", *Engineering Management, IEEE Transactions on*, Vol. 47, No. 3, pp. 379-392.

Prusak, L. (1997) *Knowledge in Organization*, Oxford: Butterworth-Heinemann.

Rackoff, N., Wiseman, C. and Ullrich, W.A. (1985) "Information Systems for Competitive Advantage: Implementation of a Planning Process", *MIS Quarterly*, Vol. 9, No. 4, December, pp. 285-294.

Ray, T. and Clegg, S. (2005) "Tacit Knowing, Communication and Power: Lessons from Japan?", *Managing Knowledge: An Essential Reader, Second Edition*, Edited by S. Little and T. Ray, The Open University, Sage Publications Ltd, pp. 319-347.

Reich, R. (1991) *The Work of Nations: Preparing Ourselves for 21st-century Capitalism*, London: Simon and Schuster.

Revans, R.W. (1980) *Action Learning – New Techniques for Management*, London: Blond & Briggs.

Ricoeur, P. (1981) *Hermeneutics and the Human Sciences*, Cambridge, MA: Cambridge University Press.

Rigby, D.K. (2001) "Putting Tools to the Test: Senior Executives Rate 25 Top Management Tools", *Strategy and Leadership*, Vol. 29, No. 3, pp. 4-12.

Rigby, D.K. and Bilodeau, B. (2005) "The Bain 2005 Management Tool Survey", *Strategy and Leadership*, Vol. 33, No. 4, pp. 4-12.

Robson, W. (1997) *Strategic Management and Information Systems*, Second Ed., Pitman Publishing.

Rockart, J. F. (1979) "Chief Executives Define Their Own Data Needs", *Harvard Business Review*, Vol. 57, No. 2, March-April, pp. 81-93.

Rubenstein-Montano, B., Liebowitz, J., Buchwalter, J., McCaw, D., Newman, B., Rebeck, K. and The Knowledge Management Team (2001) "A Systems Thinking Framework for Knowledge Management", *Decision Support Systems*, Vol. 31, No. 1, pp. 5-16.

Ruggles III, R.L. (1997) *Knowledge Management Tools*, Butterworth-Heinemann.

Russell, S. and Williams, R. (2002) "Concepts, Spaces and Tools for Action: Exploring the Policy Potential of the Social Shaping Perspective", In: Williams, R. (ed.), *Shaping Technology, Guiding Policy: Concepts, Space and Tools*, Cheltenham: Edward Elgar, pp. 133-154.

Sandström, J. (1995) *How Do We Justify Knowledge Produced by Interpretative Approaches?*, EFI Research Report, Publication No. 400, Stockholm, August.

Scarbrough, H. (1998) "BPR and the Knowledge-based View of the Firm", *Knowledge and Process Management*, Vol. 5, No. 3, pp. 192-200.

Scarbrough, H. and Swan, J. (1999) *Knowledge Management Cases*, Institute of Personnel and Development, London.

Schecter, D. (1991) "Critical Systems Thinking in the 1980s: a Connective Summary", in Flood, R. L. and Jackson, M. C., *Creative Problem Solving – Total Systems Intervention*, Wiley, New York.

Scheer, A-W. (2000) *ARIS - Business Process Modeling*, Springer, Third ed.

Schein, E.H. (1996) "Three Cultures of Management: The Key to Organizational Learning", *Sloan Management Review*, Vol. 38, No. 1, Fall, pp. 9-21.

Schultze, U.A. (2000) "Confessional Account of an Ethnography about Knowledge Work", *MIS Quarterly*, Vol. 24, No. 1, pp. 3-41.

Schultze, U.A. and Cox, E.L. (1998) "Investigating the Contradictions in Knowledge Management", *Proceedings of IFIP Working groups 8.2 and 8.6 joint Working Conference on Information Systems: Current Issues and Future Changes*, Helsinki, Finland, December 10-13.

Schultze, U.A. and Leidner, D.E. (2002) "Studying Knowledge Management in Information Systems Research Discourses and Theoretical Assumptions", *MIS Quarterly*, Vol. 26, No. 3, September, pp. 213-242.

Schutz, A. (1970) *On Phenomenology and Social Relations: Selected Writings*, ed. and with an intro. by Wagner, H.R., Chicago: Univ. of Chicago Press.

Segars, A.H. and Grover, V. (1999) "Profiles of Strategic Information Systems Planning", *Information Systems Research*, Vol. 10, No. 3, September, pp. 199-232.

Shank, M.E., Boynton, A.C. and Zmud, R.W. (1985) "Critical Success Factor Analysis as a Methodology for MIS Planning", *MIS Quarterly*, Vol. 9, No. 2, June, pp. 121-129.

Sieloff, C.G. (1999) “If Only HP Knew What HP Knows: the Roots of Knowledge Management at Hewlett-Packard”, *Journal of Knowledge Management*, Vol. 3, No. 1, pp. 47-53.

Simon, H.A. (1982) *Models of Bounded Rationality*, Cambridge, Mass.: MIT press.

Sorensen, K. (2002) “Social Shaping on the Move? On the Policy Relevance of Social Shaping of Technology Perspective”, In: Williams, R. (ed.), *Shaping Technology, Guiding Policy: Concepts, Space and Tools*, Cheltenham: Edward Elgar, pp. 19-35.

Spaul, M. (1997) “Multimethoddology and Critical Theory; an Intersection of Interests”, In: *Multimethodology – The Theory and Practice of Combining Management Science Methodologies*, editors Mingers, J. and Gill, G., John Wiley and Sons Ltd, pp. 323-346.

Spender, J.-C. and Scherer A.G. (2007) “The Philosophical Foundations of Knowledge Management”, *Organization*, Vol. 14, No. 1, pp. 5-28.

Standish Group (1994) “The Chaos Report, 1994”, http://www.standishgroup.com/sample_research/index.php, (2004-10-14.)

Standish Group (2003) “Press Release, March 2003”, http://www.standishgroup.com/press/article.php?id=2 (2004-10-14).

Stehr, N. (1994) *The Knowledge Society*, Sage, Cambridge, UK.

Stein, J. (1996) *Lärande Inom och Mellan Organisationer*, Studentlitteratur, Lund, Sweden.

Styhre, A. (2003) *Understanding Knowledge Management – Critical and Postmodern Perspectives*, Copenhagen: Copenhagen Business School Press.

Suchman, L. (1994) “Do Categories have Politics? The Language/action Perspective Reconsidered”, *Computer Supported Co-operative Work*, Vol. 2, No. 3, pp. 177-190.

Sullivan, C.H. (1985) “Systems Planning in the Information Age”, *Sloan Management Review*, Vol. 26, No. 2, Winter, pp. 3-13.

Sveiby, K.-E (1996) “What is Knowledge Management?”, http://www.sveiby.com/articles/KnowledgeManagement.html, 2004-11-26.

Sveiby, K.-E. (1997) *The New Organizational Wealth: Managing and Measuring Knowledge-based Assets*, San Francisco: Berrett-Koehler.

Swan, J., Scarbrough, H. and Preston, J. (1999) “Knowledge Management - The Next Fad to Forget People?” in *Proceedings of the Seventh Annual European Conference on Information Systems*, (ECIS'99), Copenhagen, Denmark: Copenhagen Business School, pp. 668-678.

Taylor, J.C. (1998) “Participative Design, Linking BPR and SAP with and STS Approach”, *Journal of Organizational Change Management*, Vol. 11, No. 3, 233-245.

Teece, D.J. (1977) “Technology Transfer by Multinational Firms: The Resource Cost of Transferring Technological Know-How”, *The Economic Journal*, Vol. 87, No. 346, pp. 242-261.

Teece, D.J. (2000) “Strategies for Managing Knowledge Assets: the Role of Firm Structure and Industrial Context”, *Long Range Planning*, Vol. 33, pp. 35-54.

Trist, E.L. (1981) “The Sociotechnical Perspective, The Evolution of Sociotechnical Systems as a Conceptual Framework and as an Action Research Program”, in *Perspectives on Organization Design and Behaviour*, ed. by Van De Ven, A.H. and Joyce, W.F., Wiley and Sons Inc, pp. 19-75.

Truch, E. and Bridger, D. (2002) “The Importance of Strategic Fit in Knowledge Management2, in Wrycza, S, (Editor), *The Proceedings of the 10th European Conference on Information Systems: Information Systems and the Future of the Digital Economy*, Gdansk, Poland, June.

Tsoukas, H. (1996) “The Firm as a Distributed Knowledge System: A Constructionist Approach”, *Strategic Management Journal*, Vol. 17, Winter, pp.11-25.

Urquhart, C. (2001) "Bridging Information Requirements and Information Needs Assessment: Do Scenarios and Vignettes Provide a Link?", *Information Research*, Vol. 6, No. 2.

Vaishnavi, V. and Kuechler, W. (2006) “Design Research in Information Systems” AIS Homepage, updated January 18, 2006. URL: http://www.isworld.org/Researchdesign/drisISworld.htm

Van de Ven, A.H. and Joyce, W.F. (1981) “Overview of Perspectives on Organization Design and Behaviour”, In: *Perspectives on Organization Design and Behaviour*, ed. by Van de Ven, A.H. and Joyce, W.F., Wiley and Sons Inc.

Vickery, B. and Vickery, A. (1987*) Information Science in Theory and Practice*, Bowker-Saur.

Von Krogh, G., Ichijo, K. and Nonaka, I. (2000) *Enabling Knowledge Creation*, Oxford University Press, Oxford.

Walls, J., Widmeyer, G. and El Sawy, O. (1992) "Building an Information System Design Theory for Vigilant EIS", *Information Systems Research*, Vol. 3, No. 1, pp. 36 - 59.

Walsham, J. (1993) *Interpreting Information Systems in Organizations*, Chichester: Wiley.

Walsham, G. (1995) “Interpretive Case Studies in IS Research: Nature and Method”, *European Journal of Information Systems*, Vol. 4, No. 1, pp. 74-81.

Walsham, G. (1997) “Actor-Network Theory and IS research: Current Status and Future Prospects”, In: *Information Systems and Qualitative Research*, Proceedings of the IFIP TC8, WG 8.2 International Conference on Information Systems and Qualitative Research, Ed. By Lee, A.S, Liebenau, J. and DeGross, J.I., Capman and Hall, pp. 466-480.

Ward, J., Griffith, P. and Withmore, P. (1990) *Strategic Planning for Information Systems*, Chichester: John Wiley & Sons.

Ward, J. and Peppard, J. (2002) *Strategic Planning for Information Systems*, 3 ed., New York: John Wiley & Sons.

Weick, K.E. (1984) “Theoretical Assumptions and Research Methodology Selection, In: *The Information Systems Research Challenge*, McFarlan, F.W. (ed.), Harvard Business School, Boston, pp. 111-132.

Weber, R. (2004) “The Rhetoric of Positivism Versus Interpretivism. A Personal View”, *MIS Quarterly*, Vol. 28, No. 1, pp.iii-xii.

Weill, P. and Vitale, M. (1999) “Assessing the Health of an Information Systems Applications Portfolio: An Example from Process Manufacturing”, *MIS Quarterly*, Vol. 23, No. 4, December, pp. 601-624.

Wenger, E. (1998), *Communities of Practice: Learning, Meaning and Identity*, Cambridge, Cambridge: University press.

Wenger, E. (2000) “Communities of Practice and Social Learning Systems”, *Organization*, Vol. 7, No. 2, pp. 225-246.

White, L. and Taket, A. (1997) “Critiquing Multimethodology as Metamethodology: Working towards Pragmatic Pluralism”, In: *Multimethodology – The Theory and Practice of Combining Management Science Methodologies*, editors Mingers, J. and Gill, G., John Wiley and Sons Ltd, pp. 379-405.

Williams, R. and Edge, D. (1996) “The Social Shaping of Technology”, *Research Policy*, Vol. 25, No. 6, pp. 865-899.

Wiig, K.M. (1999) “Comprehensive Knowledge Management”, Working Paper KRI #1999-4, Rev. 2, *Knowledge Research Institute*, Inc., www.krii.com.

Wijnhoven, F. (1998) “Designing Organizational Memories: Concept and Method”, *Journal of Organizational Computing and Electronic Commerce*, Vol. 8, No. 1, pp. 29-55.

Winner, L. (1993) “Upon Opening the Black Box and Finding it Empty: Social Constructivism and the Philosophy of Technology”, *Science, Technology, and Human Values*, Vol. 18, No. 3, Summer, pp. 362-378.

Wood-Harper, A.T., Corder, S., Wood, J.R.G. and Watson H. (1996) "How We Profess: The Ethical Systems Analyst", *Communications of the ACM*, Vol. 39, No. 3, March, pp. 69-78.

Yin, R.K. (1994) *Case Study Research – Design and Methods*, Second Edition, Sage Publications Inc., Thousand Oaks, California.

Zuboff, S. (1988) *In the Age of the Smart Machine: the Future of Work and Power*, New York: Basic Books.

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