If you are involved in outsourcing – this is the book!

SourceIT

What is needed to ensure both successful sourcing and innovation? To answer this question, we have conducted the SourceIT project from 2008 to 2011. This book contains the essence of our results, including new knowledge, new tools, and new methods.

You can use this book as a source of inspiration and knowledge that strengthens your efforts and improves your sourcing activities – in other words – to get a higher success rate.

The purpose of the SourceIT project has been to answer three important questions:

- Which are the optimal ways for an organization to combine sourcing and innovation?
- Which are the prerequisites for optimal sourcing and innovation practices?
- Can effects-driven IT development contribute to a greater degree of success with sourcing?

You can also read about the project partners' experience using the methods and tools.

The project was sponsored by the Danish Agency for Science, Technology, and Innovation. The Consortium consisted of five partners: Danske Bank A/S, Nets A/S, CSC Scandihealth A/S, Roskilde University, and DELTA.

It is our hope that this book can aid decision makers in achieving better sourcing decisions, irrespective of their prior experience. We also hope that this book will inspire companies to retain their ability and capacity for innovation while engaging in sourcing activities.

Edited by

Morten Hertzum, Associate Professor in Computer Science at Roskilde University

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Balancing Sourcing and Innovation in Information Systems Development

Foreword by **Jan Pries-Heje and Jørn Johansen**

Morten Hertzum & Carsten Jørgensen

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Preface

Nowadays, many new countries have come forward on the global stage. There is much talk about outsourcing to India, China, Eastern Europe and other countries. And often the consideration of outsourcing is about the development of IT and software solutions. Today, the argument is that a company is forced to think and act globally, both in relation to its markets and in relation to development and production.

In this competition, companies can gain an advantage if they are able to create and implement ideas for new products and services, helped by the options of sourcing – to nearby companies, to offshore, to partners, or by having people coming onsite. Companies that make sound sourcing decisions, which help them to be innovative, and can commit themselves locally and globally have a competitive advantage.

Today there are many – both positive and negative – experiences of companies that have outsourced. The typical approach is to start small and gain some experience, eventually in collaboration with other companies (on the basis of the company and personal networks and relations). The typical small and medium sized companies will not have enough resources to allocate to sourcing on a large scale and in a very structured way. Therefore, they rely on a more *ad-hoc* approach.

What is needed to ensure both successful outsourcing and innovation? To answer this, we have conducted the SourceIT project from 2008 to 2011. The project was the so-called "Innovation Consortium", sponsored by the Danish Agency for Science, Technology and Innovation. The Consortium consisted of three companies: Danske Bank, Nets and CSC Scandihealth as well as Roskilde University and DELTA. The budget was about 2½ million Euro.

The primary purpose of the SourceIT project is to answer the following two important questions:

- How best can an organization be innovative, combined with an optimal degree of sourcing?
- What are the prerequisites for optimum sourcing in relation to innovation?

Looking at sourcing decisions, we find that 'plan-driven' approaches put much emphasis on describing the functionality of requirements specifications or on contracts that are more or less frozen at an early stage, but still often ends up with unsatisfactory results. However, sourcing is often associated with knowledge-intensive,

complex, development-oriented tasks where it is impossible for the outcome to be a priori specified in detail. An idea from this observation is to shift focus from the detailed specifications of functionality towards a focus on the effect and value requested. This leads to a question on the third focus that we wanted to address:

- Can effect-driven IT development contribute to a greater degree of success with outsourcing?

Besides answers to these three questions, the results from the SourceIt project – in the form of this book – provide access to a set of tools and methods that are rooted in both the Danish culture and research at an international level. The tools and methods have been developed and tested by the participants of SourceIT.

The SourceIT project is now being completed and we believe that the project results give a good and comprehensive answer to the three questions originally raised. This book presents, through its chapters, a large selection of the results that the project has achieved.

It is our hope that this book can help companies make better sourcing decisions, no matter whether you are just at the beginning of a sourcing experience or you have done it for years. It is also our hope that it will inspire companies to ensure that they retain their ability and capacity for innovation.

Jan Pries-Heje and Jørn Johansen

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Jan Pries-Heje and Jørn Johansen
Research Manager and Project Manager for SourceIT

Introduction

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1 Introduction

Many organizations, not least the ones in the software industry, face the challenge of staffing their projects with people who have the right competences, come at the right price, and can be made to work efficiently together. Outsourcing has been one attempt to meet this challenge and insourcing has been another; and some organizations have devised still other sourcing arrangements to become or remain competitive. A sourcing arrangement involves a contractual relation between a client and a vendor, for example in terms of an offshore development centre, and a practical relation about the concrete work to be performed by client and vendor in implementing the contract. A crucial issue in every sourcing arrangement is to recognize whether important aspects of work suffer from the arrangement, for example because it primarily focuses on other aspects. One important aspect of work is innovation capability, which is central to the strategic competitiveness of systems-development projects. Although strategic competitiveness is central, many sourcing arrangements focus on making systems development more economically competitive. Sourcing may, however, also be a way of freeing innovative people from other project tasks, of getting access to innovative people, or of acquiring the mix of competences required to foster innovation. The interrelation between sourcing arrangement and the innovation capability required in a project is complex and, at present, poorly understood.

This book seeks to enhance our understanding of the interrelation between sourcing and innovation in information systems development. We define information systems development as "the application of information technologies (computers and telecommunications) to solve and address problems in managing and coordinating modern organizations" (Hirschheim, Klein, & Lyytinen, 1995, p. xi).

Notably, this definition goes beyond mere technical development by also including organizational implementation and system management. An understanding of the interrelation between sourcing and innovation is important in its own right, but we also aim to use this understanding to provide instruments for balancing sourcing and innovation in ways that match the needs of development projects. Therefore, the book addresses two questions:

- What are the preconditions for optimal sourcing in relation to innovation capability?
- How can an organization be most innovative, while making optimal use of sourcing?

Answers to these questions are in high demand because success in sourcing and innovation is difficult to achieve. Succeeding in either sourcing or innovation is far from easy, and succeeding in both at the same time is a real challenge. Yet, *practitioners* at many managerial and decision-making levels are faced with demands to devise innovative solutions in projects that involve various sourcing arrangements. These practitioners need guidance on how to make sourcing decisions. For example, IT-project managers need guidance on what type of sourcing arrangement to adopt at the strategic level and on how to organize the daily interactions among the sourcing partners at the operational level. At the same time, *researchers* are in need of concepts, case descriptions, and tool assessments that enable a better understanding of the challenges involved in successfully balancing sourcing and innovation. A good understanding of this balance will benefit research on software process improvement and it is a prerequisite for the creation of useful, research-based guidance on how to strike the balance. Apart from being useful to research and practice, this book provides cases and tools that can be used in *education*. With respect to education, we consider the book particularly relevant to advanced programmes in information systems development, software process improvement, and project management.

The basis for the book is the *SourceIT* project, a three-year research and innovation consortium with five partners: Roskilde University (the academic partner), DELTA Axiom (a technological service institute liasing between research and industry), CSC Scandihealth (a Danish IT vendor specializing in the development of healthcare solutions), Danske Bank (a Danish financial institution providing banking, insurance, and other financial services to citizens and businesses in Northern Europe), and Nets (a Danish and Norwegian financial institution developing and hosting payment services related to, e.g., credit cards). While CSC Scandihealth

has since 2005 been involved in partnership sourcing, Danske Bank and Nets have since 2005 and 2000, respectively, been involved in outsourcing, mainly to India.

2 Sourcing

In this book, sourcing is used as an umbrella term for outsourcing, insourcing, and partnership sourcing. Outsourcing can take various forms but at its core involves paying an external organization for performing functions previously performed internally in an organization (Lacity & Hirschheim, 1993). Conversely, insourcing involves starting to internally perform functions that were previously performed by paying external organizations to perform them (Hirschheim & Lacity, 2000). One possible reason for insourcing is to revoke an earlier decision to outsource a function, for example, to harness the internal innovation capability. Finally, partnership sourcing involves a redistribution of the allocation of functions between an information-systems vendor and the customer acquiring an information system. A report from IDC (Goepfert, 2002) concludes that outsourcing should be considered a strategic option by IT companies in all industry branches because all industry branches will face new conditions as a consequence of their own or their competitors' sourcing. This suggests that a huge number of managers at the strategic, tactical, and operational levels of IT organizations will be faced with sourcing decisions that involve considerable risks as well as opportunities.

While sourcing arrangements are typically regulated by detailed contracts, the complexity of many sourced functions is so high that contracts will often be incomplete (Schmitz, 2001). As a consequence, trust and relationship management become important components of sourcing decisions and of the resulting sourcing arrangement (Dibbern, Goles, Hirschheim, & Jayatilaka, 2004; Lacity, Khan, & Willcocks, 2009). In addition, the long-term nature of sourcing arrangements implies that it may be inopportune for the client to negotiate a sourcing contract that is too favourable because this will force the vendor to be inflexible throughout the duration of the sourcing arrangement in order for the sourcing arrangement to be profitable to the vendor. This phenomenon, known as the winner's curse (Kern, Willcocks, & Heck, 2006), further increases the importance of trust and partnership in sourcing arrangements.

2.1 Two types of sourcing

Sourcing arrangements may take many forms (Carmel & Agarwal, 2002; Dibbern et al., 2004; Lacity & Willcocks, 1998; Willcocks & Lacity, 2006). This book is, however, particularly about two types of sourcing: offshore outsourcing and partnership sourcing. Empirically, the book investigates examples of offshore outsourcing between Denmark and India and examples of partnership sourcing between IT vendors and healthcare organizations.

Offshore outsourcing consists of a client's subcontracting of an activity to an independent vendor working from an overseas location (Vlaar, van Fenema, & Tiwari, 2008). The large geographical distance between the client and vendor intensifies several of the challenges known from onshore and nearshore outsourcing, and it creates new challenges (Iacovou & Nakatsu, 2008). The new challenges include mundane issues such as large time-zone differences, which make it difficult to schedule meetings, and intricate issues such as cultural differences, which annul some of the elements that are otherwise taken for granted in interpersonal communication. Two important considerations in offshore outsourcing are to determine whether the vendor possesses the required knowledge and what type of relationship to establish with the vendor. The relationship may seek to gradually reduce the knowledge asymmetries between the client and vendor (e.g., by offering courses in the client's business domain to vendor staff) or to allocate tasks to the client or vendor only if they can perform the tasks on the basis of their existing knowledge (e.g., allocate coding to the vendor but retain needs analysis as a client task). Typically, the client–vendor relationship is quite hierarchical in offshore outsourcing, but in this book we also investigate relationships that aim at drastically reducing the knowledge asymmetries.

Partnership sourcing is characterized by a long-term, often strategic, relation between an IT vendor and a client. This partnership replaces the hierarchical client–vendor relationship typical of outsourcing. A partnership between the vendor and client becomes relevant because the technical development and organizational implementation of large IT systems extend over considerable periods of time and because the systems need to evolve over time to adapt to changing circumstances and emerging client needs. This flexibility or tailorability in IT solutions has been made possible by highly configurable standard systems, which are configured to meet client needs rather than developed from scratch. The question regarding which parts of the solution the vendor should configure and maintain and which parts the client should configure and maintain is, however, open. And, in partnership sourcing it is an important question because the client possesses

pertinent domain knowledge and is familiar with local particularities. The optimal balance may be for the client to take on some technical configuration tasks conventionally performed by the vendor and, conversely, for the vendor to become involved in some organizational implementation tasks conventionally handled by the client. An optimal allocation of the tasks may enable more innovative solutions that fit a broader range of local client needs. To avoid that system functionality becomes fixed prematurely, partnership sourcing is in this book based on effects-driven IT development, which aims to maintain a sustained focus on the effects to be achieved through the use of a system (Hertzum & Simonsen, 2010).

2.2 Four levels of sourcing decision

A sourcing arrangement goes through several stages. Based on the outsourcing lifecycle model by Cullen et al. (2006), we suggest that these stages can be usefully divided into four levels, each characterized by activities and decisions specific to that level, as shown in Figure 1.

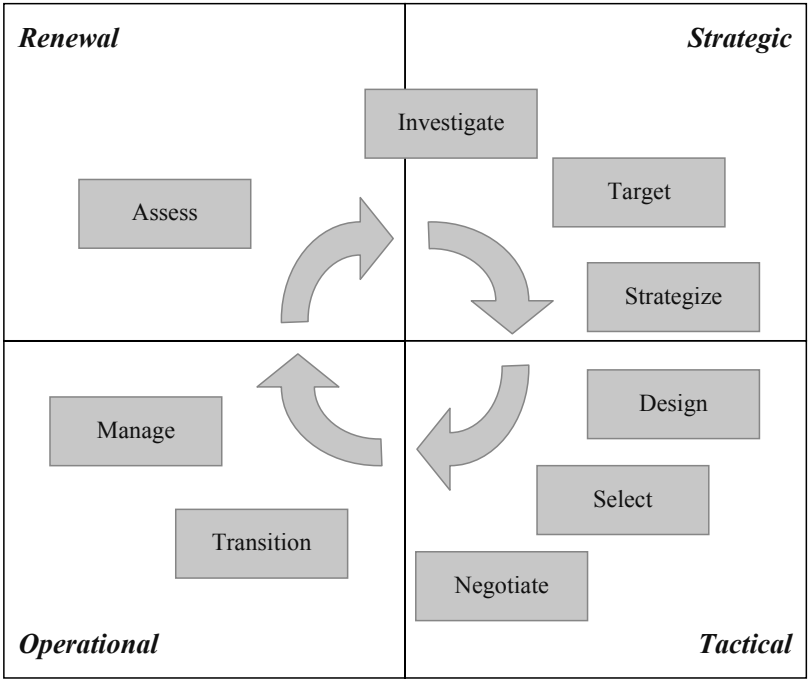

***Figure 1**: Four levels of sourcing, adapted from Cullen et al. (2006)*

At *the strategic level*, organizations investigate their needs and what sourcing can offer; then they direct their efforts toward identifying candidate functions for sourcing; and they develop a strategy for how to source the identified functions. A key consideration at this stage is to clarify whether sourcing is a means of cost savings, gaining access to new markets, acquiring the right mix of competences, becoming more innovative, or achieving some other goal. At *the tactical level*, organizations complete the design of the relationship between the parties involved in the sourcing arrangement; they select, in the case of outsourcing, the vendor to which functions will be outsourced; and then they negotiate any outstanding issues in the sourcing arrangement. A common decision to be taken at this stage is to determine whether a concrete task, or part thereof, should be outsourced as part of an existing sourcing arrangement. At *the operational level*, organizations make the transition from their previous way of working to the sourcing arrangement, and they manage the sourcing arrangement by planning, assessing, and improving their new way of working. Operational-level issues, for example, include continual coordination, communication, and cooperation among the members working on the projects that involve sourcing. At *the renewal level*, organizations revert from the day-to-day operation of the sourcing arrangement to a strategic assessment of whether to continue, change, or discontinue the sourcing arrangement. One consideration that may surface at this stage is whether to adopt a multi-sourcing strategy by sourcing functions to more than one vendor and thereby becoming less dependent on one vendor.

3 Innovation

Novel technologies are difficult to devise because it is difficult to be innovative and foresee solutions for problems and needs that have yet to be fully realized. User participation has been advocated as a means of identifying needs and assessing solutions, but to devise the solutions, designers may need to turn to special sub groups of users, such as early adopters (Rogers, 2003) or lead users (von Hippel, 1986). Novel technologies are also difficult to implement in organzations. For example, Day and Schoemaker (2000) find that even establihed organizations experience difficulties in implementing emerging technologies in spite of their many resources. As a consequence of such difficulties many organizations are inclined to postpone the adoption of new technologies – including new procedures such as sourcing – and simply proceed as usual. Factors that have been found to correlate positively

with organizations' capability to innovate include administrative intensity, external communication, functional differentiation, internal communication, professionalism, slack resources, specialization, technical knowledge resources, and a positive managerial attitude toward change, whereas for example centralization and formalization have been found to correlate negatively with innovation capability (Damanpour, 1991). According to Fichman (2000), many of these factors are more likely to be present in large than in small organizations. Conversely, Dybå (2000) argues that small IT organizations tend to be innovative because they are agile and, thereby, more responsive to changing conditions than large organizations.

A common distinction in the analysis of innovation is between process innovation and product innovation (e.g., Utterback & Abernathy, 1975). In relation to sourcing, it is relevant to subdivide process innovation into innovation in the systems-development process and innovation in the business process that the resulting system is to support. Innovation in the systems-development process may be an end in itself, for example, to devise more cost-effective ways of working, or it may be seen as a means of improving an organization's capability for product innovation or business-process innovation. Sourcing is an example of innovation in the systems-development process. It is presently unclear how sourcing concretely affects product innovation and business-process innovation (Dibbern et al., 2004; Kotabe, 1990; Nieto & Rodriguez, 2011).

Independently of the distinction between process and product innovation, Christensen and Overdorf (2000) distinguish between sustaining and disruptive innovation. Sustaining innovation consists of products and services that are better than their predecessors on quality attributes that are already appreciated by mainstream customers. Such innovation tends to build on exploitation, rather than exploration, of knowledge (March, 1991) and to lead to evolutionary change. Most sustaining innovations are developed and marketed by industry leaders for their existing markets. Conversely, disruptive innovation creates new markets by introducing products or services that mainstream customers initially see as being pointless or worse than their predecessors. Such innovation may lead to revolutionary change, but little is known about how to repeatedly produce disruptive innovations. Young, immature organizations do, however, seem to possess a higher capacity for disruptive innovation than established, mature organizations. The empirical work on which this book is based concerns organizations with an established position in two cautious and somewhat conservative business sectors – finance and healthcare. Thus, the predominant focus is on sustaining innovation.

4 Overview of chapters

Different readers may want to read different chapters. Figure 2 aims to guide readers in gaining a quick overview of the chapters and selecting those they want to read. In Figure 2, each chapter is positioned relative to the two types of sourcing and the four levels of sourcing decisions. In addition, we have divided the chapters into research chapters, which aim to address the researchers' need for concepts, case descriptions, and tool assessments, and industrial-experience chapters, which aim to address the practitioners' need for practical guidance. Research chapters and industrial-experience chapters are intermixed throughout the book (see below) because the themes that run through the book have been addressed from both perspectives.

Chapters 2 and 3 open the discussion on sourcing and innovation. In Chapter 2, Larsen et al. ask whether innovation can be outsourced. This is a central theme of the book and is analyzed in Chapter 2 on the basis of an empirical case in which

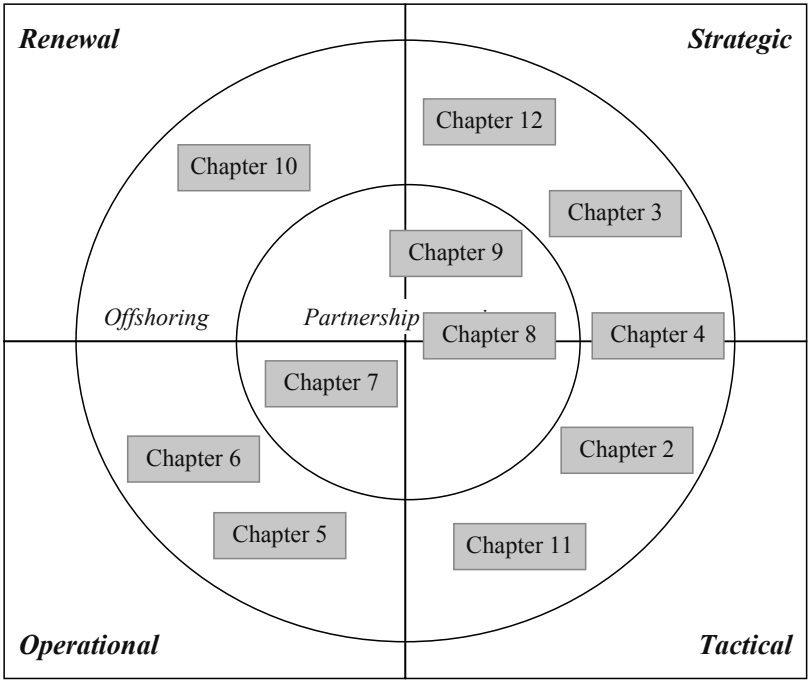

***Figure 2**: Positioning of chapters relative to the type of sourcing and the level of sourcing decision*

offshore outsourcing has partly been introduced to provide improved opportunities for innovation. Korsaa and Johansen, in Chapter 3, present a series of overall considerations that are important to establish a sourcing strategy. This chapter supplements Chapter 2 by introducing several of the other considerations that, besides innovation, enter into a company's decision about how to approach sourcing. While Chapter 2 is a research chapter, Chapter 3 is an industrial-experience chapter.

Chapters 4, 5, and 6 move from overall considerations about a sourcing arrangement to specific considerations about the interactions between onshore and offshore staff during offshore outsourcing. All three of these chapters are research chapters. In Chapter 4, Hertzum and Pries-Heje analyze a case in which a minimizing-interaction strategy was adopted to pay as little transaction cost as possible. The chapter asks whether this way of maintaining a clear distinction between onshore staff and offshore staff – and thereby between onshore tasks and offshore tasks – is an effective means of handling cultural and maturity inequality in offshore outsourcing. Chapter 5 by Madsen et al. addresses the need for transferring knowledge from the client to the vendor. In contrast to Chapter 4, the case in Chapter 5 involves a company that assigns a mix of onshore and offshore staff to most tasks in an explicit attempt to dissolve the onshore–offshore distinction. While this leads to a knowledge-transfer approach that goes substantially beyond minimal interaction, there are several similarities in the challenges faced by the companies discussed in Chapters 4 and 5. Pries-Heje and Pries-Heje, in Chapter 6, provide a framework for creating the teamwork relations necessary to succeed with knowledge transfer and teambuilding. The core of this chapter is a six-by-six matrix with techniques for building social capital in different phases of a team's lifecycle. By populating the matrix with different sets of techniques, it may be made to support interaction at different points between minimal interaction and more abundant interaction.

Chapters 7, 8, and 9 are about partnership sourcing and analyze the use of effects as a central instrument in managing the partnership. Chapter 7 is an industrial-experience chapter in which Simonsen et al. describe the process of effects specification. The chapter describes the series of workshops at which effects were specified in the case project and discusses the lessons learned from this effects-specification process. Chapter 8 extends the scope from the one project described in Chapter 7 to the six projects through which effects-driven IT development has, so far, been explored and elaborated. In this research chapter, Hertzum and Simonsen provide an account of the current status of the research on effects-driven IT development. Effects-driven IT development provides opportunities for a flex-

ible allocation of tasks between customer and vendor. Such partnership sourcing requires, however, that a close collaboration is established between customer and vendor. In Chapter 9 – an industrial-experience chapter – Barlach and Simonsen discuss what opportunities and challenges a vendor sees in partnership sourcing. The opportunities focus on improved conditions for innovation because the close collaboration is a way for the vendor to benefit from the customer's business knowledge. The main challenge is that the close collaboration may transgress typical customer–vendor relations.

Chapters 10, 11, and 12 describe tools developed for key decision points in a sourcing arrangement. The first of these three chapters is a research chapter, the other two are industrial-experience chapters. Pries-Heje and Olsen target, in Chapter 10, companies that have already outsourced something to a single vendor and now face the decision of either outsourcing more to the same vendor or to another vendor. This multi-sourcing decision is at the renewal level of sourcing and involves considerations about issues such as utility, transaction costs, and risk management. In Chapter 11, Jørgensen et al. describe a decision-support tool for the tactical-level sourcing decision about whether to outsource a specified project or area. Contrary to the tools developed in several of the other chapters, the tool described in Chapter 11 aims to support the outsourcing decision-maker exclusively by providing an opportunity for reflection, and not by recommending what decision to make. Chapter 12 by Korsaa and Johansen addresses the issue of assessing a company's sourcing capability. The chapter describes central concepts in capability assessments and then focuses on a particular model for sourcing capability assessment, the SourceAbility model. The importance of knowledge about a company's sourcing capability is emphasized by the frequent inequality in software-process maturity between the client and vendor in a sourcing arrangement.

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Can you outsource innovation?

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Abstract. This chapter focuses on how to enable innovation in an employee-augmentation sourcing set-up. Based on interviews with the employees of Danske Bank, Group IT in Denmark and with employees at the Danske Bank, Group IT Indian sourcing partner, it is concluded that the innovative capability of the sourcing partnership is very dependent on the innovative capability of the sourcing company. The study revealed that the off-shore sourcing partner will most likely contribute to the systems-development process innovation without being encouraged to do so. This is the case for two reasons. First, improving the overall systems-development process means in reality improving the business-process innovation seen from the sourcing partner's point of view , and the sourcing partner therefore encourages the staff to improve the process. Second, by improving the systems-development process, the employees of the sourcing partner are allowed to contribute good ideas at the same time as they improve their everyday work practice. The study also revealed that unless the outsourcing company encourages the sourcing partner to participate in dedicated innovation processes, no real innovation will occur at the sourcing partner's end within business-process and product innovation, potentially leading to a decrease in the overall innovative capabilities of the sourcing partnership. It is also concluded that domain knowledge and personal relationships with colleagues and partners are very important prerequisites enabling the creation of valuable innovations.

Keywords: Sourcing, Collaborative sourcing, Staff Augmentation, Outsourcing, Innovation Management, Idea Management

1 Introduction

An innovative IT company is a company that introduces new or significantly improved technology products on the market or new or significantly improved processes in the IT company (inspired by Christensen 2002). We coin the word *IT innovation* to refer to the combination of new IT products and/or new and improved products and systems-development processes.

A number of studies have pointed out that it is especially difficult to implement radically new and varied technologies. For instance, Day and Shoemaker (2000) found that well-established organizations have problems, inspite of the many resources available to them, in introducing emerging technologies. Therefore, such firms tend to delay deployment of such technologies.

In recent years, many new countries have been coming forward on the global stage. There is much talk about outsourcing to India, China, Eastern Europe and other countries, and one often talks about outsourcing the development or maintanance of IT and software solutions.

Outsourcing, however, is not without problems. The decision to outsource IT activities depends on the uncertainty that surrounds each activity and the measurability of this uncertainty (Aubert et al. 2004). IT activities with high risks and low measurability will therefore have a smaller probability of being outsourced.

The outsourcing transaction itself is based on a contract between the parties where it is specified exactly what needs to be done and at what price and at what timespan. It is therefore crucial for a successful relationship to have a fixed contract basis for cooperation. The complexity of many outsourcing tasks is so high that it results in often incomplete contracts (Schmitz, 2001); so, confidence or trust in the individual supplier will play a decisive role in the choice of a particular company to engage in outsourcing relationships with.

In addition, a mutual relationship between the client and the supplier based on trust is crucial for successful implementation of outsourcing (Brainov & Sandholm, 1999). The classic *Agency theory* suggests that the client and the supplier might have conflicting interests in working together and that information asymmetry between the two companies exposes the client to a variety of risks (Eisenhardt, 1989). The client, in fact, does not have the same information available as the supplier and the client does not know whether the employees allocated to the outsourced task possess the necessary competencies to implement the collaboration in a successful way.

Simultaneous to the outsourcing wave, there has been an increasing interest in innovation and innovation capabilities of firms, especially since sourcing might cre-

ate both risks and opportunites for innovation. In this competitive market, with more and more companies trying to reap the benefits of outsourcing, Danish companies might gain a competitive advantage if they can create and implement ideas for new products and services, aided by the opportunities made available through sourcing. This has been the subject of investigation of the SourceIT project. We need Danish companies that are *innovative* and can realize the advantages of sourcing.

This leads to the research question investigated in this chapter: *Which factors are critical to optimize the combined innovative capabilities of a sourcing partnership in an employee augmentation outsourcing set-up?*

The chapter is organized as follows: Section 1 presents the background, motivation and the research question of the study. Section 2 decribes the research methodology employed to answer the research question. Section 3 and 4 present the theoretical background of the study and the research findings respectively. Finally, Section 5 gives some concluding remarks and suggestions for further research.

2 Research methodology

To answer our research question, we decided to conduct an in-depth case study of a financial organization (Yin, 1994).

In answering the research question, we draw on our broad knowledge of Danske Bank, Group IT (hereafter Danske Bank) activities obtained through a longitudinal study of sourcing in Danske Bank over the last 3 years, with a specific focus on the relationship between outsourcing and innovation in Danske Bank. However, besides our broad knowledge of the bank and its outsourcing activities, the main data for this study have been collected through 14 semi-structured interviews. Being interested in the relationship between sourcing and innovations, we conducted interviews with ten respondents from Danske Bank located in Denmark as well as with 4 respondents from the outsourcing organization, DCI, located in Bangalore. We used the interview guide shown in Figure 1 for the interviews. The interviews lasted about 1–1.5 hours each. Semi-structured interview guides were used in all interviews. The interviews aimed at understanding innovation and innovation processes in relation to outsourcing. All interviews were tape recorded. Very good notes were also taken during the interviews. Moreover, an ongoing dialogue with the bank's employees who participate in the SourceIT project has helped to clear any misunderstanding and to obtain additional insights. Finally, the key roles that our respondents played in the innovation process give high levels of reliability and internal validity to the findings.

1. The interviewee: Could you briefly tell us about what you are working with, what is your background and how long you have been with the Danish Bank?

2. What is innovation to you?
Listen for: Renewal – Perceived as a new/Challenge your business (in Danish Bank)/Is it exploration or exploitation of knowledge?/Have there been leaps or significant changes?

3. Where do ideas come from?
Listen for: Customers/users/ strategy/needs

4. Which or what products are you helping to innovate?
Listen for: Renewal frequency/Renewal Scope/Typical development time (weeks, months, years)/How is the introduction/adoption of new products/ Typical problems

5. How does the innovation process take place? Could you please draw a "map"?
Listen for: Development model – Does it have a role? / Problems and solutions / Project planning, estimating and monitoring / Risk / Quality

6. Interaction with business: How have you gained domain knowledge?
Listen for: Formal and informal communication / Formal relations between IT and business?

7. Can you tell how one your own ideas was treated?
Listen for: Where and who and how / Value / Cost-benefit / Business Case

8. What have we forgotten to ask?

***Figure 1**: Interview guide used for 10 Dansih and 4 Indian interviews*

Data analysis was carried out in accordance with the main guidelines for thematic coding of qualitative data (Kvale, 1996; Creswell, 2003). First, all authors red the interview notes and coded relevant issues and potentially interesting observations. Second, all the interview notes were coded together by the four authors. During this step, we used numbered post-it notes for codings where the number pointed to the text to assure traceability. Code-notes were categorized into a number of finding themes. The identified themes were subsequently discussed in a meet-

ing among the authors, and based on this we developed a shared understanding, created a list of main and sub themes and took notes for the later write-up of this article. To ensure internal validation, we have deliberately divided the work among us during data collection and analysis. With regard to external validation, the write-up on the themes has been confirmed by Danske Bank management in a meeting in January 2011.

3 Innovation – What we know

We have carried out a literature survey and identified three main themes relevant to the findings of our study of the interviews:

1. Innovation stages
2. Types of innovations
3. Sources of innovations and innovation models

3.1 Innovation stages

A way to understand innovation is to understand the different phases or steps of the innovation process. Alam and Perry (2002) have described ten stages, which might be included in the development of new services (refer to Table 1, column 2 for a list of these stages). These stages are similar to the ones described by Rogers (1995) as a subset of his initiation and implementation stages (see Table 1, column 1). In addition, Alam and Perry (2002) argue that customers can be involved in all the ten stages of the service innovation process. However, they found that customers typically contribute to the idea generation phase or later phases such as service- and pilot testing, test marketing or commercialization.

Nambisan et al. (2002) have likewise identified a number of phases in a new product development (NPD) and the roles of customers in the different phases. Their study was based on observations of software development in virtual environments and found four main stages of NPD: ideation, design and development, product testing and product support (Table 1, column 3). In addition, Nambisan et al. (2002) have identified three roles for customers in the innovation process: customers as resources, customers as co-creators and customers as users (Table 1, column 4).

Innovation Process Stages (Rogers, 1995)	10 stages of new service development (Alam and Perry, 2002)	NPD Phases (Nambisan, 2002; Nambisan and Nambisan, 2008)	Customer's roles in NPD (Nambisan, 2002)
Initiation Step 1. Agenda setting is the general organizational problem that may create a perceived need for innovation.	(a) strategic planning		
Initiation Step 2. Matching is fitting a problem from the organization's agenda with an innovation.	(b) idea generation (c) idea screening	Ideation	Customer as resource
Implementation Step 1. Redefining/restructuring is when the innovation is modified and reinvented to fit the organization, and when the organizational structures are altered.	(d) business analysis, (e) formation of a cross functional team, (f) service and process design, (g) personnel training,	Design and Development	Customer as co-creator
Implementation Step 2. Clarifying is defining the relationship between the organization and the innovation more clearly	(h) service testing and pilot run, (i) test marketing,	Product Testing	Customer as user
Implementation Step 3. Routinizing is when the innovation becomes an ongoing element in the organization's activities	(j) commercialization	Product Support	Customer as user

Table 1: *Summary of innovation process stages, new service and new product development stages and customer roles in the different stages.*

In financial services, Alam and Perry (2002) found that user involvement may have a positive influence on all the phases of new service development. They found, however, involvement of users in idea generation and idea screening as the most important input to service innovation. User involvement in strategic planning, personal training and test marketing are of least importance. Finally, many models of the innovation process have been developed in the literature. Rogers' model (1995, p. 392) defines the innovation process in an organization as consisting of two broad activities: the initiation and the implementation process. Each activity is then subdivided into a number of stages that are rather similar to the

ones identified by Alam and Perry (2002) in NSD and by Nambisan in new product development (see Table 1). Table 1 summarizes and compares the stages in the innovation process as described by Rogers (1995) and the stages of the new service development and new product development model as developed respectively by Alam and Perry (2002) and Nambisan (2002). In addition, Table 1 illustrates the different roles that the customer can play in the different stages as described by Nambisan (2002) and Nambisan and Nambisan. (2008).

According to Alam and Perry (2002), customers may contribute in a number of ways including stating their needs, problems or solutions or by criticizing existing services. Customers may also help in screening ideas with their thinking, dislikes or preferences. In order to get these insights from the customers, the customer may be involved in face to face meetings, user visits or meetings, workshops, user observations or direct types of communication (Alam, 2002). Customers may, however, also be more closely involved as co-creators. In this case, the customer takes on a more active role in the development of new products or services (see e.g. Nambisan, 2002; Nambisan and Nambisan, 2008; Jeppesen and Molin, 2003 and Kristensson et al., 2008).

3.2 Types of innovations

According to Christensen and Overdorf (2000), it makes sense to distinguish between two types of innovations: "sustaining" and "disruptive". Sustaining innovation comprises evolutionary changes in the markets in which the company is already in. This innovative product or service is better in a way that the typical customer can appreciate. Sustaining innovations are usually developed and introduced to the market by industry leaders. Disruptive innovation in contrast creates entirely new markets by introducing a product or a service that typical (mainstream) customers initially see as bad. Only very few companies have routines and processes to handle disruptive innovation. Here the literature shows that the size of the company matters. There is evidence, in fact, that small immature businesses are more likely to develop disruptive innovation than large mature firms.

The concept of sustaining and disruptive innovations are similar to what in the literature have been described as incremental, synthetic and discountinous changes (e.g. Tornatsky and Fleischer, 1990). Incremetal innovations provide added features or enhancement to an existing product, process or service. Synthetic changes involve the combination of existing ideas or technologies in ways that create significantly new products, processes or services. Discontinous changes, also cal-

led radical innovation, involve the development of significant new products, processes or services (Rogers, 1995; Tushman and Nadler, 1986). Uncertainty and risk increase as innovations move from incremental to discontinous. In addtion, some authors (e.g. Tushman and Anderson, 1986) distinguish between two types of discontinous innovations: competence enhancing and competence destroying. A competence enhancing innovation usually provides the opportunity for a company to improve the product or service in a radical way. A competence destroying innovation would cause the expertize or the technologies of a firm become obsolete, thereby causing a shift in the industry.

Innovation literature also addresses the use of knowledge in relation to different types of innovations (March 1991, Benner & Tushman 2003) and distinguishes between what is known as utilization of knowledge, called "exploitation", versus "exploration" of knowledge (March 2001, Benner & Tushman 2003). For example, a Norwegian study shows that if the environment becomes turbulent the larger businesses go for greater use of existing knowledge, products, etc. – exploitation – and have less focus on research and innovation (exploration of knowledge). For small companies it is vice versa, that is they would be more inclined to adopt a knowledge exploration strategy (Dybå 2000).

3.3 Sources of innovations and innovation models

A classic distinction when focusing on the source of innovation is between need-pull and technology-push. For example, early studies of the innovation process suggested that innovations were born in the research laboratories of universities and big firms, followed by a development and manufacturing stadium dominated by the industry and then finally the marketing and sales departments would promote the product to the end users or customers (Trott, 2008). On the other hand, the market-pull model takes the starting point of the needs of the customers through the marketing department, then conduct research and development to create and develop suitable products and finally manufacturing gets involved to produce the goods. These models of innovations have dominated for many decades until the1980s, when new models of innovation were developed. These innovation models include coupling models of innovation recognizing the importance of both R&D and marketing as well as interactive models that recognized the interaction between technology-push and market-pull as the basis for innovation (e.g. Rothwell and Zegveld, 1985).

In the 1990s, with the emphasis on knowledge and knowledge creation (e.g.

Nonaka and Takeuki, 1995), the innovation process has been described as an information creation process that arises from social interaction. Therefore, the importance of both internal linkages within the organization and external linkages with the environment has been emphasized for the innovation to take place. Finally, the last extension of this innovation paradigm is the open innovation paradigm (Chesbrough, 2003; 2006). The open innovation paradigm basically states that the innovation process has shifted its focus from one of closed system internal to the firm to one of open system involving a range of players distributed across the supply chain. The open source movement can be seen as an example of this paradigm in the field of software development.

Finally, newer innovation studies look at innovation as a management process that has emphasized such elements as the innovative capacity of the chief executive, the importance of design, new product development etc. (Trott, 2008). Table 2 below summarizes the models, sources and characteristics of innovations seen from a historical perspective.

Date	Model	Characteristics	Innovation Sources
1950/60s	Technology-push	Simple Linear Sequential process; emphasis on R&D; the Market is a recipient of the fruits of R&D	Research
1970s	Market pull	Simple Linear Sequential process; emphasis on marketing; the market is the source for directing R&D, which has a reactive role.	Market
1980s	Coupling model	Emphasis on integrating R&D and Marketing	Integration of Research, Development and Marketing
1980/90s	Interactive models	Combinations of Pull and Push	Combination of Market and Research
1990s	Network Model	Emphasis on knowledge accumulation and external linkages	Internal to the firm (e.g. top managers, employees, etc.), but their linkages to the external environment are important
2000s	Open Innovation	Emphasis on further externalization of the innovation process in terms of linkages with knowledge inputs and collaboration with actors external to the firm to exploit knowledge outputs	Both internal to the corporation (e.g. top management, product champions, etc.) and external sources (e.g. suppliers, customers, communities, etc.)

Table 2: *Models and Sources of Innovations (Adapted from Trott, P. 2008)*

4 Innovation and outsourcing: what we found

In order to answer the research question, we have investigated IT development in the Danske Bank Group. The Danske Bank Group operates in more than 10 countries in Northern Europe, has more than 20 brands and a wide selection of physical and electronic channels through which the customers can interact with the Bank.

The IT division (Danske Bank, Group IT) is responsible for all the IT systems and infrastructure supporting the Danske Bank Group, covering everything from the physical infrastructure, core functionality, product systems and the channel IT infrastructure.

The Danske Bank works together with an Indian sourcing partner (called Development Center India, DCI) in Bangalore and several other IT outsourcing partners within technical infrastructure development. Danske Bank, therefore, continously works on improving its knowledge in the cross field of IT development and outsourcing.

This analysis focuses on the co-operation between Danske Bank, Group IT and the DCI. The DCI has 480 employees which together with the approximately 1,800 employees (incl. approximately 250 external consultants) in the Danske Bank, Group IT develops IT solutions for the Danske Bank Group and its customers.

IT (and innovation) governance

The vision of the Danske Bank Group is "one platform, exceptional brands" and the mission of the Group is "best local financial partner". The reasoning behind the vision and the mission basically is that the financial needs of the various customer groups are 95 % identical. Therefore, it makes sense to develop products and services that can be applied across the various brands and countries, reaping the benefits of economies of scale.

Danske Bank, Group IT therefore serves many different stakeholders across the Group, which makes the governance and organizational structure of the IT development fairly complex. The purpose of the organizational structure and the governance set-up is to ensure that all relevant stakeholders are taken into account when deciding on the development of the IT platform.

Co-operation between Danske Bank, Group IT and the Sourcing partner

In order to improve the co-operation between the Danske Bank employees and the employees of the DCI, the Danske Bank has decided to implement a model based on a close co-operation between the employees of Danske Bank and the DCI. Basically, this is achieved by "mirroring" the organization – meaning that the organization in India in principle is a copy of the one in Denmark, as illustrated in figure 2. The idea is to organize the work so that the employees in Danske Bank and in the DCI work together on system maintenance and on development projects.

The Danske Bank/DCI co-operation is an employee augmentation sourcing set-up; however, it differs from the standard definition of an employee-augmentation set-up because it combines the classical set-up with a partnership between the Danske Bank and the DCI, enabling close collaboration between the partners including an expatriate program, sharing tools, processes etc.

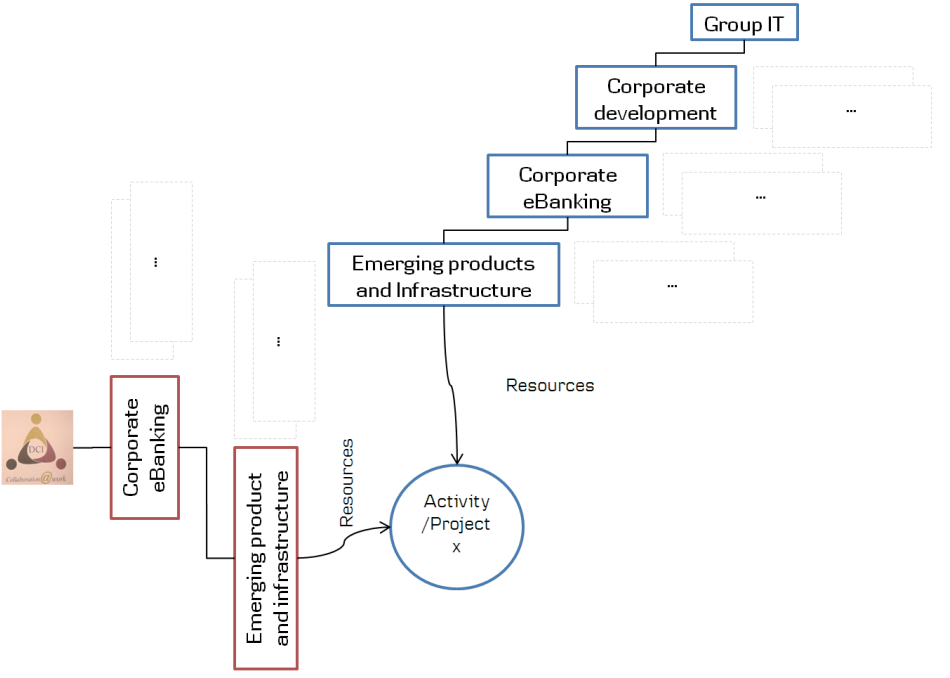

Figure 2: *Examples of co-operation between a Danske Bank, System Management area and a DCI System Management. Source: Danske Bank*

4.1 Innovation in Danske Bank, Group IT (Danske Bank, Group IT employee perspective)

In order to be able to analyze and adopt the recommendations for the way in which Danske Bank can help the employees of DCI to participate in innovation, it is necessary to gain an overview of how the Danske Bank "idea and innovation management" is perceived by the Danske Bank employees. The overview is based on interviews with nine employees from Group IT (with various backgrounds) and one employee from the business organisation. The analysis aims to provide input on:

- how the employees perceive the term innovation
- where the employees see the ideas and innovations originating from
- how the employees see the innovation process (including the screening and implementation of ideas and the most critical success criteria)
- what the employees see as important enablers in relations to contributing new ideas
- the evaluation of the DCI consultants in relations to being innovative

Defining Innovation

All 10 interviewees had their own definition of innovation, however, even though varying in the details, they all agreed on defining innovation as 'something that is new (to the organization) and value creating'. Some respondents thought it necessary to implement the idea, before it could be defined as an innovation.

A look at the details on how the Danske Bank respondents perceive innovation in the Danske Bank Group shows that there seems to be general agreement on *most innovations being incremental in nature*. The respondents emphasized that the Danske Bank Group based most of its development on *proven concepts and technologies*. Also, the interviewees pointed out that the development could be characterized by a fairly *high frequency of incremental innovations*.

Origin of ideas

The respondents mention a number of possible sources for idea generation:

- from external sources such as trade fairs, competitors, courses etc.
- from Group Business Development and the Brands
- from external requirements (e.g. legal requirements)
- from experience and from working with the systems and products
- from younger employees
- from working with business roadmaps (strategy for a development area)

One respondent (part of mid-level management) pointed out that Danske Bank, Group IT has improved its structure for collecting and evaluating ideas over the last couple of years by using a dedicated idea qualification process (IQ process) for all major IT projects.

Some of the younger respondents working in IT requested more knowledge about the internal and external users of a solution/application available in the IT department. However, the interviews were conducted in the fall of 2010, just before Danske Bank started working on implementing more structured ways of gathering input and ideas from the employees (using the intranet) and the customers (using facebook). It is therefore fair to assume that knowledge on customers and internal users (and their needs) is increasing across the Danske Bank Group.

The Innovation process

In Danske Bank, the later stages of the innovation process are well defined, especially if the innovation is established in an IT development project. This is also reflected in the answers given by most respondents.

To submit an idea for approval by management, the one holding the idea must identify the relevant person to submit the idea to. This person will most likely be the person responsible for the development area, where the idea is to be developed, if the idea is approved by management.

Most respondents state that it is fairly easy to pass on new ideas to local management; however, it is difficult to pass on ideas to other organizational units. Ideas involving co-operation among several units are also complex to pass on. The tools for collecting ideas mentioned in the above section (intranet and facebook) is already now used by some departments.

Finally, a few respondents have stated that they find prototyping a good way of passing on ideas to the final decision makers.

All in all, it is concluded that all the respondents have a good understanding of the later stages of the innovation process, whereas the understanding of the earlier stages of the innovation process is a bit unclear to some of the respondents.

Evaluation of ideas

As indicated above, the way ideas are managed and evaluated in the early stages of the innovation process is unclear to some of the interviewees, as not all respondents are aware what the individual decision organs / management groups use as criteria when evaluating ideas. However, all the interviewees pointed to the overall strategies (one group, one platform, and the four strategic focus areas of cost, credit, customer and capital) as important criteria, which they expect the management to work by.

There also seem to be general agreement among the interviewees that to get an idea accepted, it helps to know the relevant stakeholders. Below are three statements about the importance of networks:

- true innovations require participation of the "right" people
- everything depends on your personal network
- drive, networking ability and the ability to communicate are "must have's" to be successful in working with innovation

All in all, it can be concluded that all employees are welcome to hand in new ideas to system management, which is responsible for evaluating and passing on the ideas to the relevant persons. However, not all respondents seemed to know what they should expect from the local management in terms of feedback and evaluation criteria.

The importance of culture and management

Glancing across all the interviews, it is not possible to identify a singular pattern in relation to culture and management, however, some of the interviewees mentioned time, knowledge and culture as prohibitors to being truly innovative.

On the positive side, all respondents agree that it is possible to pass on ideas to local management, which is generally positive towards such new ideas, especially if local management can see that it is able to take action on the provided idea.

Attitude towards the innovative capabilities of the DCI colleagues

By checking on the area in which the Danish employees see a potential in DCI in relation to innovation, the respondents saw the biggest potential within technological innovations, for example, innovation within performance optimization, introduction of new technologies etc., as the respondents do not believe that the DCI consultants hold enough domain/business knowledge to be innovative within business process and product development.

4.2 Innovation in Danske Bank, Group IT, seen from a DCI perspective

As supplement to the interview with the Danske Bank, Group IT employees, four employees from DCI were interviewed to gather input on how they perceived innovation in general and in Danske Bank, Group IT, in particular. The interviews also focused on the expectations of the DCI consultants in relation to participating in innovative activities on the co-operation between the Danske Bank, Group IT and DCI consultants and on culture.

Defining innovation

The DCI respondents more or less define innovation in the same way as the Group IT respondents.They emphasize that in order for something to be an innovation it must be new and of value to the organization implementing it.

All the DCI respondents emphasized that innovations could not only be products and services, but also systems-development processes and tools improvements. The DCI interviewees pointed to the e-signing and mobile bank applications as the major innovation seen since DCI and Danske Bank started working together.

Origin of ideas

The DCI interviewees state that ideas come from individuals, who in their everyday life have experiences that when combined with relevant knowledge can lead to innovations.

According to the respondents, most business processes and product innovations originate from the Danske Bank, either from System Management in the IT organization or from the Danske Bank business organization . One reason why the DCI does not seem to contribute within these areas may be the domain/business knowledge available to the DCI consultants. In the event that the domain/business knowledge is not available to the DCI resources, it is challenging to combine this knowledge with the technologies the DCI consultants work with on an everyday basis, decreasing the likelyhood of innovation to occur.

In general, the ideas that the DCI respondents would consider forwarding to Danske Bank are ideas which they feel Danske Bank system management are interested in. It is therefore extremely important to state explicitly which kind of ideas that the Danske Bank would appreciate getting from the DCI consultants.

Several of the DCI interviewees emphasize that they would like to contribute more to the development of Danske Bank. They also emphasize that Danske Bank system managers have made it clear that they are welcome to contribute ideas (as a general statement). One respondent points out that there are two reasons why he would like to contribute with good ideas. First, contributing good ideas gives him a feeling of achievement and second because DCI management encourages the staff to contribute with ideas.

When asked about what kind of innovations have been initiated by the DCI, the four respondents exclusively mentioned systems-development process improvements. The mentioned initiatives have focused on implementing new systems-development processes, new methodologies, new tools (excel and word templates/ work products) and new ways of co-operating between DCI and Danske Bank. It should be noted that the Danske Bank systems-development process actually is part of the business process at DCI. Optimizing the Danske Bank systems-development process therefore is equivalent to optimizing the business process seen from a DCI perspective.

The Innovation process

The overall perception of the development process by the DCI respondents and the Danske Bank employees is more or less similar. There are, however, also some differences in the perception of the early stages´(idea management) between the

Danske Bank interviewees and those from DCI. It would seem that the DCI has implemented a process, which simply states that all innovations/ideas must be handed over to Danske Bank via System Management in Danske Bank. This is similar to the process within Danske Bank, Group IT; however, the communication of this seems to be more clear in the DCI organization.

All the DCI respondents state that they are very positive about the way the management of Danske Bank handle employees from DCI, who want to contribute an idea. Local management always listen and are positive towards the idea. It has, however, been noticed that adoption of good ideas in other development areas in Danske Bank, Group IT, seem to be complex and time consuming. An example of this is the establishment of the Test Competency Center in DCI, which offers flexible testing resources to Danske Bank, Group IT. Management in Danske Bank, Group IT, has been very positive towards the new service; utilization of the test centre has, however, not been as high as hoped for.

Evaluation of ideas

The DCI respondents are a little less informed about the Danske Bank governance and the way ideas are evaluated; however, they agree with the Danske Bank respondents that strategies and strategic focus areas play a role in evaluating ideas.

The reason for this may be that the DCI respondents did not have any practical experience with the evaluation of business process and product innovations, as all of the identified innovative ideas coming from the DCI are systems-development process improvements. According to the respondent, the most utilized type of evaluation for such ideas is a "pilot project," which is evaluated simply by evaluating whether it makes a positive difference in the every day work.

Co-operation and culture

In relation to knowledge transfer, the expatriate program ensuring that DCI resources come and work in the main development centres in Denmark is perceived as very positive. This program enables learning about Danske Bank, Group IT, and its culture and getting to know prospective colleagues. The respondents agreed that the knowledge transfer of, especially, domain (business) knowledge could be better. In relation to innovation, personal relationship is very important in an innovation relying on handing over ideas to Danske Bank staff and management.

In relation to tooling, there is a general agreement that the e-meeting functionality is quite good, as it makes it possible to share screens, presentations etc., which increase the quality level of the communication significantly. E-mailing and phones are also used intensively. The DCI staff would prefer the use of webcams if possible in connection with e-meetings as this would improve communication, making it easier to read the body language.

The TelePresence rooms are evaluated to be of very good quality, making it possible to communicate almost as if everybody were in the same room. The main feature making the TelePresence really good is the ability to read body language, which is very important, especially when establishing new relationships. The only real challenge in relation to the TelePresence rooms is the waiting time to get a free slot.

In relations to culture, the DCI interviewees noted that the Indian culture requires the Danske Bank, Group IT, staff to be better at providing feedback and recognition. The DCI respondents point out that the very restricted access to domain resources is a challenge, as it (especially combined with the lack of domain knowledge) makes it difficult to design and build well functioning applications.

How can DCI contribute to Danske Bank, Group IT, development?
There is general agreement among the DCI respondents that DCI can contribute to innovation in more areas than what has been the case until now. It is obvious to keep on improving the development process (incl workproducts etc.), and the DCI interviewees also feel that they hold competencies within various technologies, which could be of use to the Danske Bank.

5 Conclusion

The goal of this chapter has been to to investigate "*Which factors are critical to optimize the combined innovative capabilities of a sourcing partnership in an employee augmentation outsourcing set-up*".

To answer the research question, we have conducted an in depth case study of Danske Bank, Group IT, and the outsourcing partner, DCI. Data collection has included a number of semistructured interviews with respondents from Danske Bank and the outsourcing partner, DCI, and several meetings and workshops with Danske Bank employees.

Our research leads us to conclude that in an employee augmentation set-up the, innovative capabilities of the sourcing partnerhip depend very much on the innovative capabilities of the outsourcing company. The reason for this is that the employees and management of the sourcing partner most likely will "play by the same rules" as the outsourcing company plays by in relations to innovation. In order to ensure high innovative capability in the sourcing partnership, it is critically important that the outsourcing company has an innovation strategy and has implemented processes for idea and innovations management and that the strategy and process are implemented with the sourcing partner as well.

In our case organization, the overall process from the point of establishing an innovation project is very well described and implemented both in Danske Bank, Group IT, and the DCI. It would, however, based on the interviews, seem that it would be beneficial to improve the communication of the overall innovation strategy to the employees of Danske Bank, Group IT, and the sourcing partner, with a special emphasize on the idea management stage. Even though the employee augmentation set-up in its nature is a fairly equal co-operation, the interviews show that it is very important to motivate the sourcing partner and the employees of the sourcing partner to be innovative within a number of defined areas to ensure that 1) they know on what types of innovations they primarily are supposed to be focusing and 2) that they are required to be innovative within areas other than the systems-development process.

In order to motivate the sourcing partner to be innovative, the outsourcing company should include innovation in the contractual agreement, ensuring that the sourcing partner finds it attractive to take responsibility for innovation. The contract must also ensure that the sourcing partner knows within which areas, it must be innovative. Finally the contract should also include an agreement on IP rights.

When deciding on the areas within which the outsourcing company expects the sourcing partner to be innovative, it is important to take the knowledge of the sourcing consultants and the possibility to obtain domain/business knowledge into account. It is also important to be aware of any special cultural issues and means of communication.

It is noted that, if used as in Danske Bank, employee augmentation will not pose a large risk to the innovative capability of the outsourcing company, as all tasks are handled/processed in the Danish and Indian organizations; hence the competency and experience should still be available in the Danish organization. In cases where some routine tasks are placed at the DCI (the sourcing partner) exclusively, there is a risk of the overall innovation capacity deteriorating, as the

sourcing partner may lack the domain knowledge enabling true business oriented innovations.

Finally, communications and personal relationships seem to be of great importance to be innovative and especially in having ideas accepted by the different management layers. Tools such as TelePresence is considered of great value by the interviewees, especially in connection with meeting people (virtually) for the first time. The main reason for this is that teleconference tools make it possible to read the "body language". Also, actually knowing each other and the local conditions and culture is rated of high importance to develop and establish the trust and interest needed to foster an open and innovative environment.

Even though the study presents some interesting insights into *factors that are critical to optimize the combined innovative capabilities of an sourcing partnership in an employee augmentation outsourcing set-up*, the study is not free of limitations. The main limitation of the study lies in the generalizability of the results, since our findings and conclusions are based on the in depth case study of only one sourcing set up, Danske Bank and its sourcing partner DCI. This is, however, typical of qualitative, single-case-based type of research (Yin, 1994). In addition, the number of interviews is relatively small and the case study could have been strengthened by enriching the data with more interviews with respondents both from the Danske Bank and the sourcing partner DCI.

The study limitations also provide the starting point for future research. For example, it could be interesting to replicate the study in similar sourcing set-up in other organizations to see whether the results of this study are organization dependent or can also be found in similar case organizations. Also, it could be interesting to interview more employees, especially of the sourcing partner since we interviewed only four of their employees. In addition, a short follow-up of the interviews could be conducted with the same respondnets and possibly new ones by focusing more explicetly on the relationship between innovation and sourcing.

Nevertheless we believe that our study provides some new knowledge about the *factors that are critical to optimize the combined innovative capabilities of a sourcing partnership in an employee augmentation outsourcing set-up*. This knowledge and insights could be of interest to researchers in the innovation and outsourcing fields and managers involved in a sourcing relationship alike.

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Sourcing strategy

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Abstract. This chapter throws light on the general findings and recommendations to establish a sourcing strategy to support the business goals, including cost benefit analysis and risk analysis.

Keywords: Strategy, cost benefit, vision, Business case

1 Introduction and scope

It takes some time and effort to progress from the first idea of exploring the benefits of globalisation up to the point where the organisation masters the sourcing discipline. Low price services in foreign markets are obviously appealing to business professionals and the business potential should be investigated.

But nature has as always implemented a kind of balance and just as appealing as the low prices are, the vast majority of experience tells that the challenges are many. Disappointments are reported in many variations, but the authors find that sourcing is still a good idea, if you are good at it.

The steps between just jumping on the first plane to Bangladesh and to deliberately get the best return on the investment and the risks, includes creating a strategy to guide all involved in establishing the sourcing practices and to maintain consensus about the business potential.

If you are facing this challenge, we hope you will find his chapter practical and useful and we believe that if you have included the mentioned analysis in your strategy, your organisation will enter the journey towards successful sourcing with open eyes.

This chapter presents what the authors have found to be important on the basis of general findings from practical studies of sourcing strategy implementation and

from literature. The practicality of the implementation guidelines is deliberately prioritised over the research traceability to provide support to the readers' own strategy development. Each section describes an area of interest that requires a specific analysis to minimise the risk of sourcing and includes a description of how the result will fit into the strategy.

Except for Section 2 "Why", the sequential order of the sections may appear to be natural, but actually it is not. Many of the analyses are naturally performed in parallel and a finding in one analysis will introduce a new issue in another. Expect an iterative refinement leading up to the definition of the sourcing strategy.

1.1 Strategies in general

The purpose of the sourcing strategy is to document the business perspectives behind the sourcing activities and to guide tactical and operational decision making. From the strategy, the reader must be able to understand why sourcing is relevant and how he/she can support the business with sourcing activities – not detailed, but at a high level.

Strategies exist on many levels and are hierarchical in nature.

Business strategy (Why are we here)

IT strategy (How can IT support the business strategy)

Sourcing strategy (How can sourcing support the IT strategy)

1.2 Case story

All partners were already engaged with several sourcing partners, but one part of a partner organisation saw a need for an immediate and significant increase in resources and a need for a flexible resource pool in the foreseeable future. To support this, they established a project team that from summer 2010 to spring 2011included researchers from SourceIT.

The organisation's initial expectation from the team was to deliver a strategy document in 6 weeks, which seemed reasonable since there were practices that already existed to build on, and since the organisation quickly needed to know how much of the growth could be delivered by sourcing practices. This expectation was not met and it took more than 6 calendar months to establish the knowledge needed to create a strategy, during which the organisation grew more and more confident with the decisions made.

The first activity was to make a classic SWOT analysis of the existing sourcing arrangement. The experience has been both good and very bad, so there was a need to analyse what factors contributed to either success or failure.

This raised more questions to be answered before it was reasonable to make big investments.

The core team from the organisation was parallel to the strategy work responsible for the daily operation of the sourcing activities, which not only added significantly to the realism of the strategy, but also prolonged the strategy process. Three months would have been more reasonable and not less than two month would have been realistic if the team had been working full time on the strategy. Planning and conducting interviews and evaluations takes time.

In practice, the team met weekly for working on the strategy, it developed iteratively with new focus areas over time and became a document, of approximately 50 pages, that contains information that can lead and guide the sourcing decisions.

At printing time, the strategy is in the process being aligned with the new revised general it strategy. But already e.g. the defined sourcing principles have been very useful.

2 WHY – what problem/challenge should we solve by sourcing

Embarking on a sourcing adventure introduces a variety of business risks that are very hard to quantify. The number of risks by themselves introduce the general risk of losing oversight, often leading to sub optimisation. To mitigate this risk, it is imperative that the organisation maintains a strong focus on the problem they are solving with sourcing, and this should be manifested at the beginning of the strategy document. Management must also perform a yearly review of the strategy, including special attention to the relevance of the original problem and of course a detailed review of the business case.

The company has an overall strategy or business plan for its products and services. This creates certain requirements to the product development performance, in terms of cost of development, time-to-market and the quality of the developed product. The reason for investigating sourcing alternatives is that the current product development process is not performing well enough to fully support the business strategy; this is the general problem.

On the next abstraction level, the problems normally falls into one or more of the following categories, which will be referred to in the following sections that discuss the derived business goals/targets.

2.1 Cost

Problem: Product development is inefficient in its current form.

The ineffectiveness has two possible origins: product development process performance and labour cost.

Obviously, product development can be done in more or less effective and efficient manner. If the company has realised that product development is not performed well, and that improving performance is not prioritised, sourcing is a possible solution.

Labour cost is an all-time classic focus area for cost reduction in the industry and the most obvious cost item. This makes offshore sourcing to low cost countries very appealing, and the driving motivation for offshore sourcing is often exploitation of attractive hourly rates.

2.2 Resource availability

Problem: The company's growth target is not achievable with the current resources and the required resources cannot be hired through normal procedure.

If the company is challenged with a product development project that exceeds the current and planned development capability, sourcing should be considered. Special attention is needed on the essential aspect of resources – their qualifications. Qualified resources may not be locally available, and qualifying own resources may not be possible within the given time constraints. In this case, sourcing may be the only alternative.

2.3 Resource flexibility

Problem: Short term resource requirements cannot be met and long term commitment to employees is not wanted. The number of resources is expected to be reduced again within a relatively short timeframe. A sourcing partner who can deliver a qualified resource buffer can be considered.

2.4 Time to market

Problem: Competition is delivering new products faster to market and significant business is lost because of missing the market window.

Some businesses are extremely sensitive to being first on the market, and cost of development may be less important when compared to the lost sales due to late market introduction. This creates a different situation compared to the "cost" problem mentioned earlier.

2.5 Quality

Problem: The qualities of the products are not satisfying.

If a sourcing partner is expected to be able to develop the required quality products, it may be an alternative to in house development. A goal can also be to enable the company to meet the quality targets by including a knowledge transfer from the sourcing partner to the company.

2.6 Others

Most likely the problem falls reasonably into one or more of the above categories, but other problems may as well be driving the need for establishing a sourcing practice in the company.

2.7 Why is the "why" part so important?

Very important for the success of sourcing is to have a common and clear understanding of why (Jan Pries-Heje, Jørn Johansen, 2007) the company will introduce the complexity, risks and extended practices that are an inevitable part of a sourcing environment.

Make the result of the "why" analysis clear to all stakeholders who are important for the success of the sourcing initiative. You need their support and motivation along the way, so they need to know "why".

Include a statement of the consequence for the business if status quo is maintained to create a common understanding of the need for change. Introducing sourcing practices, inevitably makes employees feel insecure about their job. There

may or may not be reasons to feel unsafe, but anyhow the sourcing initiative needs support from many stakeholders in the organisation. A strong "why" statement is most likely to be the best way to get support from stakeholders. Both from those who were initially identified as important stakeholders and, even more important, from those not initially identified as important stakeholders but eventually falls into the role as first mover / opinion maker / advocate.

2.8 Quick check

You are more likely to get support for the sourcing strategy if you can answer yes to the following questions:

- ✓ Is the reason to establish a sourcing practice clear to all important stakeholders?
- ✓ Is the consequence of not doing it specified?
- ✓ Do all important stakeholders realise that the sourcing strategy will address an important problem?

3 Targets – What will we achieve?

What are the reasonable targets for the improved product development performance, which will solve the problem defined in the last section?

KPMG reported in 2007 that:

'Forty-two percent of outsourcing arrangements are not supported by a value measurement framework'

and that

'Seventy-two percent of customer organisations do not have a published list of criteria that define success or failure.'

This implies a clear capability level 1 approach where the definition of success and failure is defined by subjective judgement, which from a professional perspective is unacceptable for decisions that have business impact like a sourcing strategy. This section will focus on specifying quantified targets that will define success.

3.1 Cost

If cost is the main business motivation, the best way to set the target is by a definition of cost / unit. The challenge is defining the unit. This challenge appears to be so big that most of the development businesses do not have one! Instead, hours are used and the cost of man hours is used to define cost of development. But it does not address the fact that the personal productivity of developers can vary by a factor of twenty (20) and the number of defects produced by individuals vary by a factor of ten. (Capers Jones – 2008 p.401). A unit that somehow defines the size of a piece of software is imperative if you have ambitions above capability level 1. Lines of code (LOC) is the most commonly used measure. LOC is reasonably stable together with effective code reviews. Code reviews supports the desired situation thatthe different programmers work uniformly, but is only useful retrospectively, and can hardly be applied in different environments. LOC does not define how much functionality the user got, only how many lines of code it took to implement it. A bit like measuring the size of a house by the number of bricks it took to build it. Function points (FP) have been around for decades and promise to present the users perspectives and define the size of the functionality they get. FP is for software what square meters is for house building. Earlier, counting FP has been a specialised job for certified professionals which unfortunately has blocked the wide acceptance of the otherwise urgently needed practice. But FP practices have also matured and are now available in several versions and all have become ISO standards. If you do not have other preferences, FISMA is recommended for it is easy to learn and very operational. (Manfred Bundschuh, Carol Dekkers -2008 p. 376).

3.2 Resource availability

You need a specific answer to the question: Can we get the resources when we need them?

You need not only resources, but qualified resources, and so the target definition must include a definition of what qualified means. One success criteria is a pleased project manager. If the line manager and the project manager agree on the criteria of “qualified”, only the number and the timeframe remains to be defined.

Example target: ‘We need 20 COBOL programmers who can work self-governing on the xx platform within 4 month’.

Caveat – remember Brooks's law: 'adding manpower to a late software project makes it later'. (Frederick P. Brooks Jr -1995)

Success with adding resources requires a healthy process that supports the employees. If a project is late due to badly performing development processes, adding more resources does not improve the project performance. The implication is that the resource availability target is achieved, but it does not support the business.

3.3 Resource flexibility

If the volatility of the projects' resource requirements is high, you define a certain percentage of the workforce to be flexible over a timeframe of, e.g., five years.

The target is achieved if the total workforce can vary within the defined percentage, without laying off employees.

Example: The total available workforce must be at least 400, but scalable to 500 in the next five years.

3.4 Time to market

Two possible targets are suggested: Feature launch and FP to market.

Feature launch. In highly competitive markets such as that of mobile phones, what really matters is how early, that is before the competition begins, you are capable of delivering a new feature to the customer. One example could be an average of 2 weeks before, which is not satisfying. Then the sourcing related target could be to improve the feature launch from 2 weeks before to 6 weeks before.

FP to market: If the market is not so visibly competitive, compare projects of equal size and their schedule. In the U.S., 1000 FP takes between 16 and 44 months to complete, at an average of 21 per month. (Capers Jones – 2008, table 3–26). The sourcing related target will then be the decrease in schedule.

3.5 Quality

Use your existing quality metrics and define the sourcing target as the improved quality received from the sourcing partner.

Example: If your current performance measured in defects/function point is 7

(6 = U.S. average for commercial applications (Capers Jones – 2008 table 3–13.1)), the sourcing target could be to decrease the defects/function point to 5.

3.6 Targets and levels

A very powerful technique to get extended control over the targets is suggested by Tom Gilb (Tom Gilb – 2005) and deals with quantification of qualities. The idea is that every time you define a target you define more than one level:

- Past level: Historic performance
- Trend level: If we do not do anything, how will the performance develop?
- Must level: The lowest level that can be accepted. The level needed to avoid failure.
- Planned level: The optimal performance, given the assigned effort to achieve it.
- Wish level: The performance we dream of, if the effort to get it was free.
- Competition level: How is the fiercest competitor performing?
- World record: The best performance known.

The value of the strategy comes from the "magic of numbers". The moment your strategy team discusses the levels above, a strong sense of consensus develops – at least after the inevitable and healthy discussion of the specific values. The energy coming from this consensus can drive many decisions on the path towards a strong sourcing practice.

Pick the ones you find adding value to the strategy.

3.7 Quick check

Are the targets defined in a way that can be measured, e.g., two years from now and can success be determined by the measure and the target?

4 Baseline – how good are we today?

'If you don't know where you are, a map won't help you'. [many quotes]

To establish motivation for the sourcing strategy, the company must establish an agreed baseline of what sourcing experience the organisation has and how well the organisation is to perform the practices that are important and relevant to sourcing. When the baseline is established, the targets become more relevant to all stakeholders, and the challenges to reach them become more visible and obvious.

4.1 Experiences

A thorough study of the company's current sourcing practices serves to ensure the learnings to be used across the company. There are most likely good and bad experiences at the project level. Both good and bad experiences are valuable, but it takes special attention to make them valuable, not only for the projects that were directly involved, but also to the rest of the company. Special attention is needed because one practice that has been successful in one project may, for good reasons, have failed in another. The practice by itself is of little value, but a practice and the context in which it was successful is valuable. Then other projects can compare their context to the context of the best practice and evaluate if it will make sense to implement the practice. One goal of the study of experience is to establish a baseline of good and context specific practices.

Senior management should decide which experiences should be part of the organisation's pool of learnings and support the relevant participant's contributions.

Collect experiences in interview sessions with groups of up to ten participants.

You would like to establish a baseline of definitions as well, and the discussions between participants from different projects will reveal what terminology needs definition, and the discussions themselves will have a useful element of aligning terminology.

It may be needed to establish single project interviews for special reasons. Some may feel uncomfortable with sharing a particular unsuccessful experience in the presence of peers, but their experience may be of vital importance to the success of the sourcing program.

Describe the sourcing models that are currently in use. Try to simplify to a hand-

ful of generic ways of handling sourcing and give them a name that is recognised in the organisation. This will serve as a baseline when communicating eventual changes in the sourcing practices. E.g.: "We used to do 'type A' sourcing. Due to the xx disadvantage, in the future we will seek to minimise yy risk by doing zzz. This we call 'type B' sourcing."

To do:

- Note all the important decisions made, and who made them.
- Analyse if the mind-set changed during the experience. Other stakeholders who had not tried sourcing yet may have the initial mind-set.
- Analyse the context dependent factors that were motivating or demotivating the sourcing activities. They may have changed.
- Document figures and facts: numbers of resources, tasks, travel days, projects; costs allocated to sourcing activities; and specific benefits allocated to sourcing.
- What processes were necessary to establish. How were the sourcing activities organised.
- Establish a timeline based on the information elicited to learn how long it really takes.

Establishing a baseline of organisational experiences and creating the sourcing strategy using the terminology and practices from the baseline will support the succeeding change process . Employees will notice that by following the usual processes they will not achieve their target. To achieve the target, they must do something different. They must improve the process.

4.2 Capability

Awareness of the company's sourcing capability is needed to make the strategy trustworthy. Why should anyone trust a target of an average 15% decrease of labour cost if the capability so far only has been to cut 2%?

Unless of course "something" is changed so that it is possible to increase the capability from 2% to 15%.

That "something" requires detailed insight into the sourcing processes. The difference between 2% and 15% is the result of better performance in one or more processes. Only by knowing how well the organisation is performing the different processes today, it is possible to determine which of the processes needs to be

improved, and how much, if an overall decrease of 15% labour cost can really be obtained.

Analogy: You want to swim 400m Medley in 4:10:00 because that will give you access to the Olympics. Today you do 4:25:00 and you have to convince a sponsor that you can do it. Sponsor naturally asks: 'How can you improve with 15 seconds?' And you have the answers in terms of how much you will improve the specific sub processes (e.g. jump, 100 m breaststroke, turn 1, 100 m freestyle, etc. and you justify each improvement by historical data and benchmarking with competitors data and the related training program. Then you demonstrate professionalism and the sponsor is at least interested.

If your target is 4:00:00, because it sounds like a nice number, the sponsor will not even listen to you, if for no other reason, only because Michael Phelps's 2008 record is 4:03:84, and if you do not know you are nothing but a dreamer.

So to ensure a focused action on the most important areas we need to establish the baseline of the capability of different processes.

Gartner published in 2008 a research paper in which they identify '10 competencies and key activities for mastering multisourcing'. These 10 recommendations overlaps significantly with the practices described in the very thorough 'e Sourcing Capability Model' (eSCM) from Carnegie Mellon University and other capability models and articles on the subject. There seems to be a convergence against a common view that a specified set of competences is needed to carry out the required practices to have success with sourcing. Gartner states the view very clearly:

> 'Recommendation number 1: Organisations that do not have these competencies yet, should invest in developing them.'

Not knowing the current level of performance is a clear capability level 1 characteristic. Another level 1 characteristic is an overly optimistic view of the organisation's performance, not based on facts, but more on subjective – often politically twisted – points of view. This is critical from a sourcing strategy point of view, since important decisions will be based on subjective information, and if it turns out to be a wrong decision, it will be obvious that it should have been based on objective information.

If a company has no experience at all with sourcing, decisions obviously must be somewhat subjective based, but if experience exist, there is no reasons not to base future sourcing targets on the baseline of the current capability and performance.

4.3 Constraints and opportunities

Document anything that influences the sourcing strategy from outside the company. Examples include:

- General access to resources
- Labour restrictions
- Physical building restrictions
- Global/local financial conditions
- …

These issues are the baseline of the assumptions that are influencing the sourcing strategy and must be documented because they may slowly change over the years. If they are listed in the strategy they will be reviewed on a regular basis to determine if they are still valid.

Example: Around 2005, there was a general shortage of local IT resources in northern Europe and in 2010 that was no longer the case.

4.4 Quick check

Can all activities and targets be related to what is done today and how well it is being done?

5 Stakeholder analysis

For a sourcing strategy that is supported by all (or most) of the involved persons, and is aligned with business strategies, it must be based on a thorough stakeholder analysis. A well performed stakeholder analysis will give the confidence that all involved or those who may have influence on the success of the sourcing activities are known and dealt with, and will document how the risk of lack off acceptance has been proactively mitigated. The stakeholder analysis practice for sourcing is no different than what is taught in many books. But special attention has to be dedicated to groups of employees, who may feel that their job situation is unsafe. See table 1.

Project near	*Organisational*	*External*
Employees	HR department	Public offices providing regulations
Key employees and families	Accounting department	Customers
CIO / IT representatives	Finance department	Unions
Process owners	Procurement department	
Contracts management	Legal department	
Business area representatives	Audit department	Suppliers or partners to service providers
	Risk management department	Consultants and advisors
	Corporate communications department	Service providers
	Facility management department	
	Environmental health and safety department	
	Client management department	
	Security and privacy department	
	PR	

Table 1: *Sourcing relevant stakeholders.*

5.1 Quick check

Is anyone who can influence the success of the sourcing project not in your list?

6 GAP analysis

By comparing the targets and the current baseline, this section will confirm to the organisation if the targets are realistic or if some practices needs to be improved.

This analysis demonstrates what is called maturity level 2 mind-set because it reflects the individual learning in the organisation based on measures of targets and performance, and prepare the organisation for a maturity level 3 approach for the sourcing strategy.

6.1 Gap definition

'If you do like you have always done – you will receive the same results'. This statement is very true when it comes to process performance and it should guide your gap analysis. Expect the same performance as last time, if you had not done something specifically different.

Examine each identified target and see if the history as described in the performance/capability/constraints baseline proves that it is realistic to achieve.

Maturity level 1 attitude: Close your eyes.

Maturity level 2 attitude: Learn from history

Maturity level 3 attitude: Look in the performance baseline list

Maturity level 4 attitude: Gaps are predicted by analysing the performance baselines using statistical methods.

Document all identified gaps in a list including:

- The business target that is compromised (e.g.: 20% reduced time to market)
- Part of the performance/capability/constraints baseline that suggests the compromise. (e.g.: User acceptance test is not efficient, and takes up too much calendar time)
- How much of the target is compromised and what is the cost related to the compromise? (e.g.: Half of the 20% target can only be achieved if UAT is compressed with 14 days)

Gaps that are not immediately mitigated must be transferred to the risk list.

6.2 Cost of improvement activities

Improvements in the employee's competencies and the company's performance do not come for free. Every little improvement is a little change project. Every project has its cost. The level of details needed here are:

- Activity name (e.g. UAT compression)
- Expected result on performance target (e.g. 10% reduced time to market)
- Estimated cost of activity (e.g. physical establishment of user accepted test environment: €xx.xxx)

6.3 Quick check

Can you prove that the sourcing targets are realistic?

7 Risk analysis

'When you tie a slave to you – you also tie yourself to a slave'

Sourcing practices introduce risks. The moment you let a different legal entity manage topics that are important to your business, new business risks arise. You will face the dilemma of trying to reduce the price while still maintaining stability in the delivery. The service provider may change priorities that have huge effect on your business. This can be troublesome enough when dealing with the cleaning service. Product development is in a completely different sphere of complexity and the consequences are suddenly business critical. The "risk management approach", which is very well suited to deal with this kind of problems, should be applied as a management principle throughout the sourcing strategy, tactics and operations.

"What happens to the business if the service stops" appears to be the most important "guts feeling" factor when senior management decides whether a task can be outsourced or not. When no formal risk management is applied, it is still the most used go–no-go decision factor. The challenge is to define in each case what constitutes the core business tasks. Those factors must be continuously monitored to take the right decisions.

Risk management at capability level 2 deals with tactical and operational risks related to a specific sourcing activity, which is out of the scope of this chapter, which focuses on the strategic issues. However, the generic knowledge that originates in the tactical and operational risk assessments is unique and an important input to the strategic level.

In this chapter, we focus on risk management at capability level 3, where the focus is on the business and how the organisation provides stakeholders with confidence that the business will continue even if problems occur.

7.1 Identify types of risks

First study the company's experience and identify what were the potential or realised problems and what went nearly wrong. Maintain a list of risk types to use for future risk reviews.

KPMG reports in 2007 (KPMG – 2007) that 'Customer organisations report that people related issues make up 60% of sourcing problems, 59% of service providers agree with this view' and 'Technology-related issues are responsible for only 12 percent of customer problems.' These figures imply that it is the soft areas that require special attention. Being as specific as possible on the risks related to people issues provides insight and alerts the organisation. Useful indeed, if the organisation normally takes more pride in technology expertise than multicultural people relationship issues.

Risk types may include the following:

- Known process weaknesses
- Insufficient resources(personnel, technology, infrastructure etc.)
- Inadequate skill availability
- Inadequate security coverage
- Obsolescence of technology
- Merger/acquisitions
- Quality issues

Suggestions from the industry include the following:

Flexibility: Vendors are not able to access a flexible resource pool as initially promised

Small fish syndrome: The workload that the client has to offer in the outsourcing field might be too small to garner interest from multiple offshore vendors or even warrant the attention from the vendor that the client expects.

Sourcing models preference: Propensity to choose on-site options could easily undermine the potential savings to be reaped from remote-based models.

Staff turnover: Offshore staff turnover rates are high and hence domain knowledge and key offshore staff are hard to retain

Business priority: In some cases, the client may have to choose between implementing sourcing recommendations and urgent projects related to business growth.

Governance: Insufficient access to outsourcing governance competencies (sourcing managers, QA resources etc.)

Vendors assignments: The client's cost focus gives vendors incentives to offer junior staff and/or lowering quality of deliverables
Vendor security: Inadequate security coverage
Internal resistance: Due to previous failures with outsourcing, there may exist a resistance in the organisation towards using offshore vendors
Opportunistic price increase: The vendor might use his position as a stranger to increase the price.
Changed client value: The client becomes less important and valuable to the vendor for some reason that was not foreseen.
New kid on the block: A new vendor becomes popular, but does not have the necessary capacity to replace the old vendor.
Lock-in: Commercial and technological vendor lock-in. When the relationship has reached a point of no return, the distribution of power in the relationship changes dramatically.
Salary increase: The basic salary for the qualified resources increases unnoticed behind the still attractive salaries for the not qualified resources.
Geopolitical risk: Unexpected instability in the vendor's home country may lead to all kinds of risks.
Hostile takeover: The vendor gets strategic insight into the client's situation and uses the information to take over the business.
Key persons leaving: Key employees leave the vendor company.
Vendor dispersion: The vendor organisation is dispersed to the level where it takes too much of coordination effort from the client's side.
Relationship changes: In low maturity organisations, the sourcing practice is driven by personal relationship. If one manager leaves the project, it may jeopardise the entire practice.
Capacity challenges: Some physical problems prevent the vendor to scale up as expected.
Jealousy: One existing sourcing vendor may change his priority when he realises that he is not alone in serving the client.
Innovation incompatibility: Different expectations regarding the level of innovation lead to disappointing results.
Quality incompatibility: If quality is not well defined, different understandings lead to disappointments.
Qualifications: Resources lack basic IT skills such as data modelling.
Imprecise agreements: Ambiguous agreements are used by both parties to their own advantage.

Communication delay: One party take advantage of delaying important communication.
Language barriers: Language challenges can lead to all kind of problems.
Unrealistic process maturity expectations: Client has too large expectations regarding their own sourcing process maturity
Vendor stability: What are the probabilities of the vendor suddenly not meeting his obligations (financial and service focus)?
Bad quality recognition: When is a bad quality issue recognised? What could you do if you knew one month before? What is that knowledge worth?
Added complexity: Sourcing is adding to an already overwhelming complexity. If the company is struggling with processes that are not capable of dealing with the complex nature of product development, adding complexity may be a dangerous strategy
Unclear targets: "If you don't have clear targets, clearly – you will miss these targets"
Lack of size unit: If no functional size units are used, sourcing is like buying rubber band by the meter.
Architecture quality: The architecture cannot support deploying the sourced objects.
Hysteresis symptom: The time it takes to make a team efficient may exceed the required flexibility time. For example, if the sourcing mind-set operates with one year scaling up and the next year scaling down, and it takes two years for a team to be efficient, the flexibility target is unrealistic
Qualification recognition: Personal competencies are recognised to be too low and too late
(Level 1 and 2 companies are not capable of sufficient determination of qualifications and will experience this late in the relationship)
Underestimated operation effort: The complexity of multisourcing operations is underestimated

7.2 Categorise risks

For each risk, analyse which of the targets are jeopardised. This analysis makes the team more specific about what the impact of the risk may be and is an excellent warm up exercise before the real impact and probability analysis. A risk related to more than one target may deserve more attention than one that only relates to one target. This analysis will support the prioritisation.

7.3 Establish measures of risk probability and impact

By defining a common set of scales, you get the ability to compare risks across the organisation, which is a great advantage when you need to prioritise where to invest in mitigation activities. Many classic risk management methods use 1–5 for both probability and consequence. That is easy to start up with (capability level 2), but it does not demonstrate understanding of risk management, and it does not leave any impression when communicated. Taking the next step is highly recommended. Capability level 3 risk management include predefined scales that are coordinated and tells a story.

The scale of probability is by definition a figure between 0 and 1 or between 0% and 100%.

Example:

Remote – Probability of less than 10%
Highly Unlikely – Probability between 10% and 35%
Possible – Probability between 36 and 50%
Probable – Probability between 51 and 60%
Highly Likely – Probability 61 to 90%
Certain – Probability above 90%

You need both a value to make the measure operational and the attached words to make it communicable. Change the wording according to the requirements of your organisation.

The scale of impact is a little trickier. This often requires some effort to define a set, that is common across the domain where you would like to compare them, and easy understandable. Relate the measure to the project objective where risk will hurt.

Table 2 is a generic example of scales for impact on major project objectives.

For your own, be more specific, and translate the relative scale to an absolute scale that will make sense for your business

If the main consequence is loss of money, then define the scale relating to the cost of impact. Then the scale will be some graduation of the cost of impact from a non-significant value and up to an amount that make the company bankrupt. Still apply descriptive words to each level on the scale.

If the main consequence is loss of customers, then define a scale relating to how many customers the company will lose.

Project Objective	*Very low / 0.05*	*Low / 0.10*	*Moderate / 0.25*	*High / 0.40*	*Very High / 0.80*
Cost	Insignificant cost increase	< 10% cost increase	10–25% cost increase	25–40% cost increase	>40% cost increase
Time	Insignificant time increase	< 5% time increase	5–10% time increase	10–20% time increase	> 20% time increase
Scope	Scope decrease barely noticeable	Minor areas of scope affected	Major areas of scope affected	Scope reduction unacceptable to sponsor	Result is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction is unacceptable to sponsor	Result is effectively useless

Table2: *Examples of impact scales*

By having a common defined scale with the accompanying description, the risk assessment will have the possibility to sound like this:

> Dear CEO, we have identified this risk, which, if it materialises is "highly likely" to cost €20 000. We have mitigation plans that cost €10 000 that would reduce the cost to €2000. Should we pursue those?

> Dear CEO, we have estimated that it is probable that we lose xx customers if this situation occurs. By spending €yy on this mitigation it is highly unlikely to happen. Should we do that?

7.4 Tolerance

Discuss and define what levels of probability and consequence are acceptable in the organisation, and what to do if they are exceeded. You may need a "don't care" level, an observe level and a mitigate level for each of the defined objectives.

7.5 Prioritise – review – update – manage – control

Review the risk list on a regular basis with senior management. Serious risks are mitigated and plans are updated accordingly.

7.6 Why focus on Risk management?

The benefit of using risk management as the driving project management paradigm is maximum control over an environment that has many different uncertainties to deal with, just like sourcing operations.

7.7 Final check

If you can answer yes to these questions, the hours spent on risk management is worth every second.

- ✓ Are your stakeholders able to make tactical sourcing decisions based on the content of your risk analysis?
- ✓ Are priorities and activities in the sourcing project changed when the risk profile changes?

8 Business case

This analysis must prove that there is a balance between the expected business benefits and the expected cost, both in relation to the sourcing strategy.

If the sourcing object is close to the core business or if the risks or a cost for any other matter is critical to the business, the business case/sourcing strategy must be approved at the board of directors level. A lower level of approval is appropriate for less risky objects.

The challenge for the business case is to get a realistic picture. To be realistic the business case must include every related cost and benefit, which is not possible at all, but that is never an excuse for not trying to be as specific as possible and it is exactly the reason to document all information behind the decisions.

Some of the information will be very hard to quantify to a level of accuracy that

1 Set up costs • Cost of collecting information to search for suppliers (e.g. participate in trade fairs, pay for agents, etc.) • Cost of engineering time involved for the transfer (e.g. gather information, modify the design due to different environment and IP concern, etc) • IP registration fee in the host country • Payment to the previous supplier for the design • Quality audit and validation cost • Staff's time cost for searching for, visiting and negotiating with supplier, preparing contracts, adding the supplier to internal IT system etc. • Travel expenditure (transport, food and hotel) • Invest in suppliers' IT systems (e.g. MRP, ERP) • Personnel recruitment and training • Cost of removing redundant capacity and labour • Cost of sending employees to work overseas for a long term (e.g. costs of settlement, children's international school, insurance, etc.) *2 Extended Price (ongoing)* • Price • Tax and import duty • Loss from payment terms changes • Loss from currency exchange rate fluctuation *3 Administrative costs* (ongoing) • Extra cost of payment/billing process • Bank charges *[4 and 5 deleted]*	*6 Quality issue (ongoing)* • Rejection, returning and re-receiving • Rework • Cost of disposal or discarding of defective products • Loss from scrap, including labour cost of handling scraps • Loss from production line downtime • Cost of staff's time for analysing quality problems, re-arranging schedules, compensations • Cost of handling warranty and customer complaints • Loss of sales because of quality *7 Supplier management (ongoing)* • Ongoing travel expenditure (transport, food and hotel) • Cost of engineering time for technical support • Cost of staff's time for performance review and meeting and renegotiation • Costs of phone calls, faxes, video conferences with the supplier • Costs resulting from culture and language differences (translators, gifts, social events, etc.) • Cost of litigation with the supplier *Other costs related to China sourcing* • Cost of dealing with inferior infrastructure (e.g. road, power supply, internet) • Cost of dealing with special regulations or even corruption from local government • Cost of dealing with counterfeit products or IP infringement

***Table 3**: Examples of sourcing costs (physical items from China)*

will make it trustworthy. Nevertheless, the process of trying will create enough awareness and consensus about the issue to make it worth the effort. What happens is known as "the magic of numbers". It is easy to get consensus, as long as you only use adverbs. 'We will take advantage of the low cost opportunity in China!' is easy to agree upon, but not very precise, and useless to base agreements on. 'A bonus will be paid if we take advantage of the low cost opportunity in China'; but the moment you add numbers, stakeholders will immediately be more precise. 'A bonus will be paid if we reduce the cost price with 55% utilising the low cost opportunity in China'. The moment the 55% is mentioned, a validation process starts inside our heads, and the response will be much more deliberated. That's the magic of numbers.

8.1 Costs

The best you can do to be precise is to collect a list of possible costs. Then evaluate each of those and use those that make sense.

Table 3 is a reduced list from 'The true cost of overseas sourcing' by Platts and Song from University of Cambridge (Ken Platts, Ninghua Song -2009). There focus was sourcing physical items from China, but many issues still apply.

8.2 Benefit

The benefit analysis is equally tricky. Remember to include the business benefit from opportunities made possible by sourcing.

8.3 Question?

Are we willing to pay the cost and accept the risks to get the benefit?

The business case must provide input to the answer.

8.4 Quick check

Will a member of the board of directors be able to understand the benefits, costs and risks related to the implementation of the sourcing strategy to a level at which he can commit his support to it?

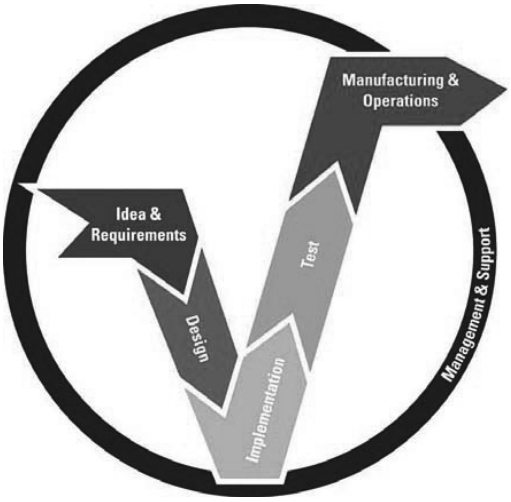

***Figure 1**: Lifecycle phases*

9 Alternative sourcing strategies

More than one way to achieve the target should be considered through the development of the sourcing strategy. Document the two or three most appealing alternatives in good detail, and the rest in little detail, maybe just pointing out where they differ and why they where excluded. The reasoning behind the prioritisation is valuable information in case some assumptions change and the current strategy needs to be revised and the time spent on adding the learnings to the records of the company may seem worth the effort.

9.1 Market survey

You need knowledge of the different vendor markets. Few will have the overview, but the large international consultancy companies often perform a market analysis, comparing, for example, Indian based service providers, Multinational service providers and Regional serviceproviders. A SWOT analysis on each group provides valuable input to the sourcing model decision. Even if the information only confirm what is assumed already.

9.2 Sourcing models

The strategy includes different sourcing models to implement in the specific sourcing cases.

The primary differentiator has to do with the processes in the application development lifecycle that are outsourced. See figure 1 for the definitions used here.

Idea & Requirements are rarely outsourced, however, not impossible and may introduce innovations beyond the company's traditional horizon.

If few phases are sourced, body shopping and keeping the responsibilities inhouse is a popular sourcing model. The work can be done either on site or off site depending on the characteristics of the work. The service is often paid by T/M, but specific tasks can be negotiated at a fixed price where applicable.

If the Design – Implementation – Test is sourced, it opens up for sourcing models in which the delivery is a well specified product and the control over the development remains with the vendor. Fixed price contracts are prevalent.

For all models the optimal Audit/Trust level must be defined. If any doubt, do more audits!

Parameter	*From*	*To*	*<insert your value>*
Resource control	Hourly reports	None	
Type of service	Brain	Muscle	
Delivery place	Offshore	Inhouse	
Pricing model	T/M	Fixed price	
Process control	Audit	Trust	
Design responsibility	Customer	Supplier	
Product complexity	Simple function	Complete subsystems	
Specification level	Complete design	Concept	
Supplier influence on specifications	None	Collaborate	
Timing of supplier involvement	Prototype	Preconcept	
Component testing responsibility	Customer	Supplier	
Need for sustained support	One time delivery, no warranty or support needed	Supplier is responsible for maintenaince for 30 years	

Table 4: *Sourcing type parameter list*

9.2.1 Parameters

The specific sourcing model is a defined by how the characteristic parameters in table 4 are implemented:

Use a tailored version of the model above to descrive the characteristics for the relevant models, and give them a name that is understood in the organisation. The names of the sourcing models are very important when communicating the strategy. Be carefull and pick some good names – preferrebly ones that has been used in previous sourcing experiences.

Present the strategy in this terminology:

In [sourcing alternative 1] we expect to see [sourcing model x] used on [b type] applications, which should improve [performance target w].

Example: If we go for the "Max China" strategy we expect "full sourcing" to be used on all applications in the public sector domain, to reduce our time-to-market with 20%.

9.3 Sourcing governance

For each sourcing model, the strategy must include guidelines for the following areas:

Vendor management:

- Vendor selection
  Evaluation criteria; Prepare requirements; Communicate requirements; Evaluate potential vendors; Select vendor
- Relationship management

Cultural:

- Coordination of requests for services
- Coordination/management/approval of statements of work or work orders
- Quality audits

Governance:

- Definition of guidelines for managing scope change and change requests
- Facilitation of communication between the company and sourcing partners
- Intermediation between individual project teams and vendors
- Oversight/coordination of network connectivity and environment set up/changes

Contract management
- Contract administration, escalation procedures, renegotiation procedure, etc.
- Monitoring and management of metrics: analyzing vendor performance, SLAs, engineering improvements when necessary
- Monitor, review and approve billings and costs

Sourcing model management
- Definition of sourcing models
- Facilitation of the choice of sourcing models
- Facilitation of sourcing model operationalisation and optimisation

9.4 Quick check

Are the
- ✓ alternatives relevant
- ✓ pros and cons well defined
- ✓ different consequences defined.

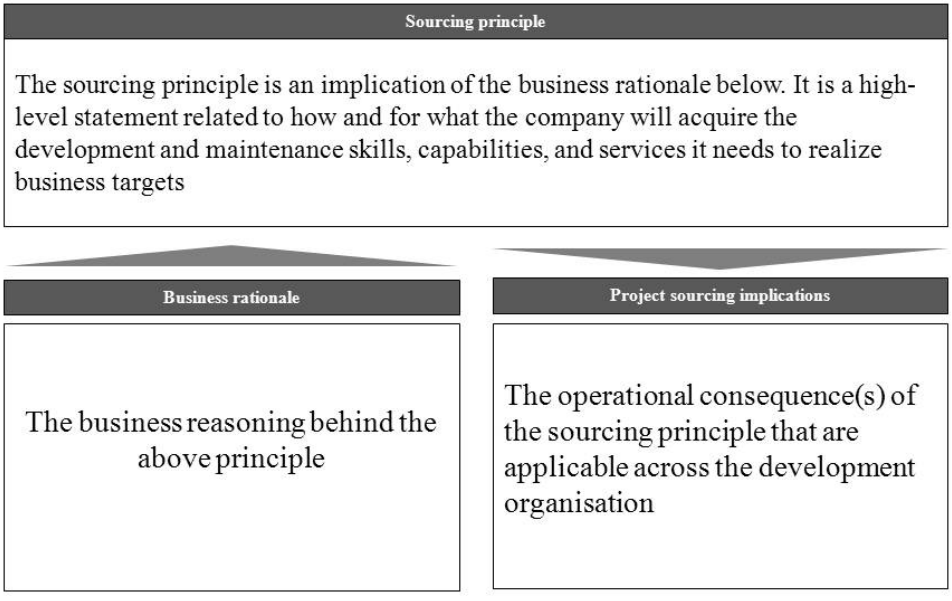

***Figure 2**: Principle template*

10 Sourcing principles

Principles that guide strategic decisions regarding sourcing implementation.

The principles explain what will guide the implementation of the sourcing strategy. The principles are a communication vehicle and make the strategy more "present" to the reader because he can interpret the principles in his own situation and relate to the consequence.

Examples of areas to define a principle for include:

What are core competencies, how to choose a location, what commercial model is preferred, responsibilities and roles, etc.

The template in figure 2 has proven to be useful.

10.1 Quick check

Do the operational managers feel that the principles are supporting their decision making?

11 Sourcing potential

In what areas are sourcing an opportunity and what criteria decides that?

In practice, at least two levels of filtering tasks apply.

At the strategic level, the organisation must decide which top level of tasks/applications/services is not suited for sourcing. Often it is a risk-based decision related to the business core competencies, but what is important in your organisation needs to be defined. Consider to make this process a part of a sourcing workshop with the senior management to establish consensus on what – from their point of view – is reasonable to source. Document the criteria and the decisions in the strategy document including a list of applications/services, maybe applications/services-types, that have sourcing potential. Also consider if even core competencies can be sourced using a low risk sourcing model.

The tactical level is when you have a sourcing framework, and must decide if a given task should be sourced or not. This is the subject of chapter 11 and will not be touched upon here. The strategy should include guidelines to the tactical level.

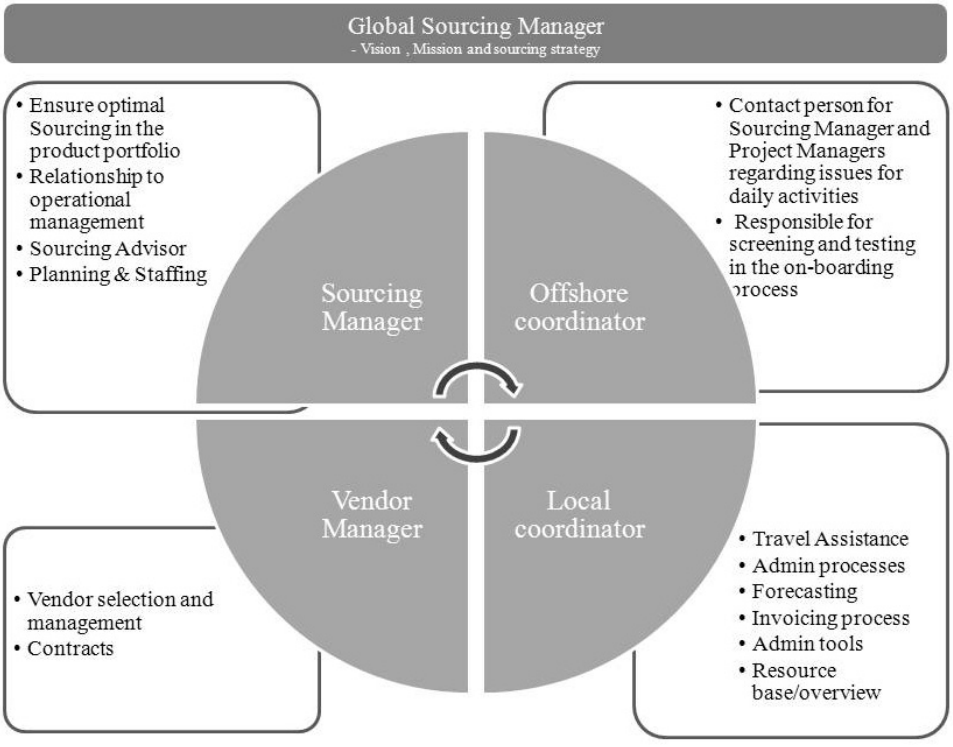

***Figure 3**: Sourcing responsibilities*

11.1 Quick check

Does the strategy include directions for deciding what the sourcing potential is for different objects?

12 Roles and responsibilities

The strategy must include definition of sourcing related roles, responsibilities and authority. If you compare a development situation completely whithout sourcing, and then add sourcing activities, you will find areas with overlapping responsibilities. Special care has to be taken in those overlapping responsibilities. These include:

- ✓ Responsibility for project performance
- ✓ Responsibility for sourcing vendors performance
- ✓ Responsibility for communication

An example of the distribution of responsibilities is seen in figure 3.

12.1 Quick check

If a project is late due to lack of resources from an offshore service provider – who is really responsible?

13 Conclusion

The strategy document is a communication vehicle that must support the organisation in its changes towards acquiring more benefit from sourcing activities. It represents the experience of the employees involved and the expectations of the senior management about future sourcing practices. This implies that the organisation must improve some processes, and the structure of this chapter is designed to guide you through a series of analyses that will support the design of the change and not least the motivation behind. The results of the analysis are the input to your strategy.

The more energy and alignment the sourcing strategy creates, the better it is.

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Is minimizing interaction a solution to cultural and maturity inequality in offshore outsourcing?

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Abstract. Many companies consider and some undertake outsourcing of their software development activities. Often, information systems development is outsourced to vendors in different cultures or with a different level of software-process maturity. Recommendations for managing such offshore outsourcing arrangements typically involve more interaction between the client and the vendor to understand each other's culture better, improve communication, form partnerships and the like. We have studied a client that did the opposite. On the basis of a case study, we describe how the interaction between the client and the vendor was minimized on purpose. What mechanisms were used? What worked and what did not? We conclude that minimizing interaction can be a viable strategy to follow when clients face large cultural and maturity inequality in offshoring their software development activities but that the strategy also has important limitations.

Keywords: Offshore outsourcing, culture, maturity, minimal-interaction strategy, extra costs.

1 Introduction

Many companies consider and undertake outsourcing of the development of information systems (IS). It has been estimated that global IS outsourcing will reach $260 billion by 2009 (Vitharana & Dharwadkar, 2007) and that it will grow at an

annual rate of about 30% in the foreseeable future (Fish & Seydel, 2006). The reported benefits of IS outsourcing have been reduced time and cost, increased quality, improved business performance, and increased ability to concentrate on the core of the business (McFarlan & DeLacey, 2004). Recently, offshore outsourcing has become popular because large numbers of technically skilled developers are being educated in countries such as India where wages are low compared to Western Europe and North America, in which skilled developers are in short supply. Offshore outsourcing is defined as 'the subcontracting of an activity by a client organization to an independent service provider working from an overseas destination' (Vlaar, van Fenema, & Tiwari, 2008, p. 228) or simply as 'intercountry outsourcing' (King & Torkzadeh, 2008, p. 207).

While geographic distance is a defining characteristic of offshore outsourcing, the challenge is not geography as such but overcoming communication bottlenecks, knowledge asymmetries, psychological dissociation, and socio–cultural differences. General recommendations to manage collaboration at a distance include establishing common ground at the outset and distributing tasks such that only loosely coupled tasks are allocated to different sites (Olson & Olson, 2000). For offshore outsourcing, two specific challenges are that the client and the vendor often have different cultures and are at different levels of maturity with respect to their software-development processes. To handle these challenges, it is frequently recommended to increase interaction, learn more about the culture of the other part, communicate more, form partnerships, or the like (Bhat, Gupta, & Murthy, 2006; Hendry, 1995; Krishna, Sahay, & Walsham, 2004).

In this study, we analyze a company that did the opposite, namely minimized interaction between the client and the vendor. This approach is contrary to the prevalent recommendations in the literature, and we therefore consider it interesting to study. In doing so, our research question is whether minimal interaction between client and vendor is a practicable way to overcome cultural and maturity inequality in offshore outsourcing. We note up-front that minimal interaction is not a panacea. The company has experienced costs and challenges with its minimal-interaction approach. The approach has, however, been successful in the sense that at the time we concluded this study, the company decided to renew its outsourcing contract with its Indian vendor on the same terms as the previous four years.

The next section sets the context for our study by describing related work on offshore outsourcing, culture, and maturity. Section 3 accounts for the method we used in our empirical study, and Section 4 introduces the client and vendor organizations. Section 5 analyzes the client's minimal-interaction approach to off-

shoring and identifies the mechanisms established to succeed with this approach. Section 6 discusses how the minimal-interaction approach has affected the client's software development activities and at what costs.

2 Related work

In continuation of Hertzum and Jørgensen's (2011) introduction to offshore outsourcing in Chapter 1, this section provides more detail about previous work on offshore outsourcing and on the cultural and maturity inequality that is often associated with it.

2.1 Offshore outsourcing

Carmel and Agarwal (2002) propose four stages of offshore outsourcing of information systems development. An organization is at the first stage if it is still an offshoring bystander. While there may be a variety of reasons for remaining at this stage, more and more organizations choose to proceed to one of the subsequent stages. Organizations at the second stage start experimenting with offshoring, for example, through pilot projects. Often, their motivation for offshoring is the unavailability of onshore developers rather than a proactive focus on offshore possibilities. Loaded wages for skilled Indian developers at 30–50% of onshore wages in Western Europe and North America is an important motivator for offshoring, but rarely realized at this stage. One reason for this is that the stage is transitional; when some experience has been gained and cost savings start to occur, organizations move to the next stage. At the third stage, organizations are characterized by a proactive cost focus. A typical recommendation at this stage is to restrict offshoring to non-core and structured tasks, such as construction based on detailed specifications (e.g., Cusick & Prasad, 2006). Often, onshore project managers receive targets specifying that a certain percentage of the developer hours on their projects should be offshore developer hours. At least one study finds that onshore staff tended to perceive offshore developers as cheap worker-bees who could be ordered around (Levina & Vaast, 2008). At the fourth stage, organizations no longer view offshoring as simply a source of low cost work but adopt a proactive strategic focus. The strategic objectives pursued at this stage include access to new markets and offshoring of entire projects, from requirements to support, also of

projects involving innovation and new product development. The best offshoring practices described by Bhat et al. (2006) appear to be directed solely at this fourth stage and focus on achieving shared goals, culture, processes, and responsibilities for the client and the vendor.

While the vast majority of research looks at offshoring from the client's point of view, some studies do investigate vendors' views on offshoring (e.g., Bhat et al., 2006; Oza & Hall, 2005). A theme common to client and vendor research is asymmetries in knowledge and experience. These asymmetries concern, among other things, the business domain, typically with the client in possession of business knowledge and the vendor less so (e.g., Levina & Vaast, 2008), and development processes, typically with vendors that have more structured development processes than clients (e.g., Oza & Hall, 2005). Technical knowledge exhibits another type of asymmetry in that the vendor typically employs a large pool of technically skilled developers while this resource is scarcer onshore.

The top risks associated with offshore outsourcing include a lack of commitment from the top management, miscommunication of requirements, inadequate user involvement, failure to manage end-user expectations, and poor change control (Iacovou & Nakatsu, 2008). These risks do not appear to be specific to offshoring but rather to apply to information systems development in general (cf. Schmidt, Lyytinen, Keil, & Cule, 2001). Some of the top risks associated with offshoring are, however, specific to offshoring, including language barriers, lack of offshore project management know-how by the client, lack of technical or business know-how by the offshore team, and failure to consider all costs (Iacovou & Nakatsu, 2008). Many client organizations expect cost reductions from their offshoring arrangements due to the lower offshore wages but have not fully understood all the costs involved in outsourcing (Barthélemy, 2001). Dibbern et al. (2008) identify specification costs, design costs, knowledge-transfer costs, coordination costs, and control costs as the five main categories in which clients face extra costs when projects are offshored. The five categories of extra costs relate to the less effective possibilities of communication between the client and the vendor and the resulting degradation in their mutual awareness of each other's work and day-to-day activities.

2.2 The role of culture

Hofstede (2001, p. 9) defines culture as 'the collective programming of the mind that distinguishes the members of one group or category of people from another'. Hofstede's work shows that even within a single organization, different national

groups of employees exhibit different cultural characteristics. These characteristics have been specified in terms of five cultural dimensions: power distance, uncertainty avoidance, individualism/collectivism, masculinity/femininity, and long-/short-term orientation (Hofstede, 2001). It appears that managers in organizations chronically underestimate the magnitude and importance of cultural differences (Hofstede & Hofstede, 2005).

Prior surveys indicate that national culture is a leading cause of problems in the offshoring of services (Metters, 2008). Metters (2008), for example, refers to a survey where 60 executives involved in offshoring information technology (IT) services cited "cultural differences" as the most important problem in relation to offshoring. Also, Terdiman and Berg's (2001) framework for evaluating a potential offshoring country has "cultural issues" as one of three main areas. The interest in nearshoring is another indication that similar cultural characteristics, such as ways of doing business, are considered important to outsourcing decisions (Carmel & Abbott, 2007). In contrast to nearshoring, offshoring typically implies profound cultural differences between client and vendor.

In relation to the client and vendor countries of this study, Denmark and India differ along several of Hofstede's cultural dimensions but in particular with respect to power distance, which is defined as the extent to which the less powerful members of institutions and organizations expect and accept that power is distributed unequally. In India power distance is very high; in Denmark it is very low (Hofstede, 2001). Consequently, in the Danish business culture, rank and title are less important than in India where hierarchical forms of behaviour are expected. In Denmark, subordinates are expected to speak up and offer suggestions; in India superiors and seniors enjoy more respect, and decisions tend to be top–down. This affects, for example, communication styles and ownership of results (Schomer, 2006).

Recommendations for handling cultural differences in offshoring arrangements include facilitated communication sessions (Dubé & Paré, 2001), building consensus on norms for meetings and deadlines (Paré & Dubé, 1999), and other efforts to establish a shared culture (Bhat et al., 2006).

2.3 Maturity and software process improvement

Maturity models are used to improve the performance of organizations, processes, technology, and people. The Capability Maturity Model (CMM) is a framework describing a five-step path for software process improvement (Paulk, Curtis,

Chrissis, & Weber, 1993). The path describes key processes and goals at each of the five levels. An organization has to meet the goals at one level to proceed to the next level. For example, to go from the basic level 1, in which behaviour is characterized by being ad hoc and intuitive, to level 2, you need to achieve the goals incorporated in six key process areas: requirements management, subcontractor management, project planning, project tracking, quality assurance, and configuration management. CMM has become so popular that a large number of other models using the same five-step path have been invented, including People-CMM, Integrated Product Development CMM, Systems Acquisition CMM, and Testing Maturity Model. Finally, a large number of the CMM models have been summoned in CMM-integrated – or just CMMI (Ahern, Clouse, & Turner, 2008; Chrissis, Konrad, & Shrum, 2003).

In relation to offshore outsourcing, it is noteworthy that India has embraced CMMI. Four countries in the world have used the CMMI model extensively: Australia, India, Japan, and the US (India Express Computer, 2003). The highest level of maturity is level 5, and in 2003 as much as 75% of all the companies in the world at level 5 were from India (Mohnot, 2003). In Denmark, only one or two companies have reached level 5 (Pries-Heje, Nørbjerg, Aaen, & Elisberg, 2008) and the majority of Danish companies are at level 1. Thus, when Indian and Danish organizations enter into offshoring arrangements there may be huge maturity inequalities between them.

3 Method

Our empirical study is a case study based on interviews in one Danish organization (which after our study merged with a Norwegian organization). The case study is single-case and embedded (type 2) according to the typology by Yin (2009). We have not obtained data from the vendor. Thus, the empirical data are restricted to a client-side perspective on offshoring. One of the authors has worked with the organization since 2003 and has carried out several assessments and training sessions in the organization in 2003–2007. We believe that it is fair to claim that this author has extensive knowledge on how software development is carried out in the organization.

Concerning offshore outsourcing, however, the case study reported here took place in 2008 and was carried out by both authors. We conducted an initial interview with three staff members involved in the client's offshoring at the managerial

level. During this interview, we got an overview of the client's offshore-outsourcing history and identified seven persons for in-depth interviews. The interviewees comprised persons involved in or responsible for (1) the start-up of the offshoring activities, (2) the entire course of offshoring activities, (3) the offshoring contract, (4) the offshore development centre, (5) concrete offshoring projects and certification of offshore staff, and (6) improvement of the client's development processes; and (7) an offshore coordinator recently returned from a long-term placement at the vendor.

The seven in-depth interviews were loosely structured by an interview guide addressing:

- The offshoring arrangement between the client and the vendor, and its evolution
- Client–vendor interactions at the levels of the offshore agreement, projects, and individual staff
- The creation of a project identity in projects involving offshoring
- The coordination of such projects
- Initiatives undertaken to facilitate offshoring and the lessons learned from them
- Issues relating to differences in the cultural background of onshore and offshore staff

In addition, the interviewees were asked to reflect upon the factors critical to the client's experience with offshoring. This part of the interviews was based on a walkthrough of Iacovou and Nakatsu's (2008) ten-item list of top offshoring risk factors.

The interviews were conducted at the client's premises, except one interview which for practical reasons was conducted at the authors' university. The initial interview was documented in written notes; the in-depth interviews were audio-recorded, and subsequently an extensive written record of the main points was produced. The written record included selected quotes, but the interviews, which lasted 1–2 hours, were not transcribed verbatim. The interviews were analyzed by reading through the written records several times, noting issues stated in individual interviews and patterns emerging across interviews. These issues and patterns were then grouped into themes, resulting in the analysis in this chapter.

4 The empirical setting

At the time of this study the client was a Danish organization with approximately 850 employees, some 450 of which were directly involved in the development of IT systems. The client has subsequently become the Danish part of Nets. The client has for 40 years developed and hosted services for the Danish banks, particularly with regard to payment solutions. The financial sector is characterized by high volumes of safety-critical transactions and, thereby, a need for efficient and secure systems. Moreover, the financial sector is dynamic with changes in national and, increasingly, international legislation forcing revisions of systems, with mergers and acquisitions among banks necessitating integration or redesign of systems, and with considerable competition among providers of financial services creating continual pressure for the development of new services.

After an early, unsuccessful attempt at outsourcing in the late 1980s, the client refrained from further attempts during the next decade. In 2000, the client started offshoring to India, and in 2002 they started working with their current vendor. The vendor is an Indian software-development organization, which employs over 8000 software developers and has years of experience as an offshore-outsourcing vendor of financial and other services. While the vendor has been certified at CMM level five since 2002 and CMMI since 2006, the interviewees estimate that the client is at CMM level 1 or 2. The collaboration between the client and the vendor has been going on for six years prior to this study, and it has been decided that the collaboration will continue for at least four more years by renewing the contract without changing anything but its date of expiry.

The client's rationale for entering into an offshoring relationship was to increase capacity. This is stated by several interviewees, who also state that thanks to this increased capacity the client has been able to carry through projects it would otherwise have been unable to take on.

5 Offshore outsourcing with minimal interaction

When setting up an offshore arrangement, some interaction is required to negotiate the terms of cooperation, write a contract, and start working together (Willcocks & Lacity, 2006). In the phase following – the operational phase (Cullen, Seddon, & Willcocks, 2006) – there also needs to be some interaction; the salient question is: how much? At one end, we can talk about minimal interaction, that

is, just enough to make things work. Minimal interaction is about paying as little transaction cost (Williamson, 1979) as possible. Minimal interaction also entails that as few changes as possible are made in the client's and vendor's internal processes. It should be noted that when one reduces transaction costs, the remaining interaction will appear to be more intensive at particular contact points. At the other end, we can maximize interaction trying to come as close together as possible. This may involve more communication, more learning about the culture of the other part, trying to balance maturity, forming a partnership, and maybe even blurring the distinction between a client and a vendor.

5.1 Keeping distance

An illustrative example of minimal interaction is project A of the Danish organization we are studying. This was the first project the client offshored to the vendor. The project, which lasted three years, consisted of converting an existing system to another platform. That is, the existing system in itself comprised a complete and, by definition, fully accurate specification. Such a task involves little analysis and design compared to the amount of programming. This characteristic of project A was the main reason it was chosen for offshoring and it implied that the client could specify the project very accurately and very easily. This made the project suitable for the client's minimal-interaction strategy because minimal interaction could be attained at low risk.

Also, project A was only economically feasible for the client if it could be offshored. The project showed that the vendor had the technical knowledge required to make the conversion. Very few errors were detected during testing, and some of them turned out to be errors in the "specification", that is, hitherto unnoticed errors in the old system.

After having completed project A, it was decided to set up a more permanent outsourcing relationship between the client in Denmark and the vendor in India. It was at this point that the idea of minimized interaction really came into play. A manager says: '*The point of departure is that they are vendors. They are not employees. They are a vendor like an external company we cooperate with. The idea was to establish it out there [i.e., at the vendor], so that they can maintain their culture and keep working the way they are used to; and people here [i.e., at the client] work in their way. Actually, reducing the need for intercultural interaction to as little as possible was part of what I was trying to accomplish.*'

5.2 Exchanging people

The client has made use of two mechanisms for exchanging people to accomplish offshoring projects while maintaining minimal interaction. Both mechanisms involve intensive interaction but for selected people and selected periods of time. First, offshore developers have been on placements at the client to work with onshore staff. This mimics how new onshore IT developers acquire business knowledge, but in addition to improving the offshore developers' business knowledge it has also facilitated the general relationship between onshore and offshore staff. However, the placements require that onshore staff has the necessary time for communicating and interacting with the offshore developers; and the placements temporarily cancel the economical effect of offshoring because the offshore developers get onshore wages while they are onshore.

Second, the client has placed an offshore coordinator at the vendor. The few onshore employees who have had this position have been at the vendor on long-term placements. The offshore coordinator has a mediating role involving frequent phone contact with client staff, with whom they are well connected, and participation in project meetings with vendor staff. Collaboration between the offshore coordinator and vendor staff is face-to-face, thus avoiding the limitations of communication and collaboration at a distance and providing more opportunities for becoming aware of cultural and maturity issues in need of attention. Periodic onshore visits have been necessary for the offshore coordinators to maintain their network among the client staff. Moreover, the vendor may occasionally feel that the presence of the offshore coordinators transgresses the client–vendor boundary.

In addition to these two mechanisms, an effort has been made to motivate offshore developers to work for the client for a longer period of time. In the Indian offshore-outsourcing industry, it is not uncommon for IT developers to begin to move into the management ranks after only a couple of years as developers. This is very different from the career path of Danish developers, who often work a decade or more as developers in the same business area. This cultural difference threatens the client's minimal-interaction strategy because the continuous renewal of offshore developers implies that most of them will have insufficient business knowledge. The client has therefore aimed at making their relationship with the vendor sufficiently interesting for offshore developers to make it attractive for them to stay for a longer period of time. The onshore placements of offshore developers have been effective in this regard.

5.3 Exchanging knowledge

The client has set up business courses at the vendor. The courses have been run by visiting onshore staff and by some of the offshore developers who have been on onshore placements. In some areas of the client's business, the courses form an entire certification program, which ensures that offshore developers have a basic understanding of the business area for which they develop systems. While the offshore developers are not at a level of business understanding comparable to the onshore staff, improving their understanding of the business increases their ability to work autonomously and decreases the amount of interaction they need to have with the client staff.

The courses and certification programs are an attempt to exchange knowledge in concentrated packages and with several offshore developers at a time. This is considered preferable to frequent ad hoc interactions, which are complicated by the geographic distance. Extensive ad hoc interaction is also seen as time consuming, especially to the client, and therefore as being contrary to the intention of shifting work from the client to the vendor. A manifestation of this is that a single point of contact has been enforced when offshore staff needs to communicate with onshore quality-assessment staff. This has been decided upon to protect the majority of the onshore staff from becoming engaged in too many, time-consuming communications. In this case, it appears that the client has been more concerned with not making offshoring unpopular among its onshore staff than with providing the offshore staff with access to the required knowledge, especially business knowledge.

Restricting access to the required knowledge to minimize interaction creates problems because it prolongs the period during which business knowledge is unevenly distributed between the client and the vendor. As an example, the present assessment of the client's largest ongoing offshore project, project B, is that it has been hard to strike the proper balance between technical and business development. Project B consists of converting a standalone system that has been maintained for more than two decades into a set of services available to other systems. This conversion requires both technical and business knowledge, but the uneven distribution of knowledge between the client and the vendor entails that the vendor, who is involved in the project with a massive 300–400 person years, often has only the technical knowledge. In working on project B, the vendor proceeds on the basis of its technical knowledge and remains unaware of some of the issues that might warrant further business considerations. An example of the need for further business considerations is to weigh the evolving understanding of the potentially

available services and the amount of work involved in extracting them from the old system against the benefit of the services to the client's other systems. The client has the business knowledge pertinent to such considerations but lacks detailed knowledge about the amount of work involved in extracting the services and is at too great a distance from the vendor's day-to-day work to spot the windows of opportunity for discussions about the extraction of some of the potential services. In addition, the client has not been able to specify up front the full set of services to be extracted. As a consequence, opportunities are unintentionally missed and project B becomes to an excessive extent about technically reprogramming a system.

5.4 Developing software in two places with minimal interaction

Today, the client uses the vendor in India on a regular basis. Project B provides an interesting example because the client considers a move toward a more service-oriented architecture crucial to enable reuse across systems and to enable flexible assignment of the development of individual services to onshore or offshore groups with the ability and capacity to take them on. A main reason for completely reprogramming the system is, however, that the existing system has evolved over a long period of time, and due to extensive changes in the staff working on the system nobody any longer has a comprehensive overview of the programming code. In addition, the documentation is not trusted to be current. Thus, it has become exceedingly difficult and costly to make revisions of the system (cf. Naur, 1985). The capacity and lower price of the offshore vendor compared to onshore developers make it feasible to solve these difficulties by reprogramming the system from scratch.

However, turning a system into a set of services is not merely a programming task but one that requires considerable understanding of the client's business and suite of systems. Such knowledge is necessary to know the applications to which a service is relevant and the differences in what these applications require from the service – business-wise as well as in terms of technical architecture. To overcome this challenge, the client decided to apply use cases (Cockburn, 2008; Jacobson, Christerson, Jonsson, & Overgaard, 1992). At first, some of the offshore developers that had been on onshore placements, but had returned to India, were asked to lead the writing of use cases in India. It was agreed to use a writing style with four abstraction levels with the first being mostly business oriented and the fourth very technically oriented. But when the results came in, the more business oriented use-case levels just consisted of pointers to lower levels, and the client discovered

that it took way too much effort to review the very detailed technical use cases at the fourth level. Thus, that way of dividing work did not minimize interaction. In the second round, business staff at the client was taught to write use cases. These upper-level use cases were then given to the vendor who wrote the technical levels. This proved to minimize interaction much better.

6 Discussion

Cultural differences between the client and the vendor are an inherent characteristic of offshore outsourcing. For offshoring to India it is also common that the vendor's development processes are at a higher maturity level than the client's development processes (Levina & Vaast, 2008; Vlaar et al., 2008). The case investigated in this study concerns whether such inequalities can be handled by minimizing the interaction between the client and the vendor.

6.1 Costs and challenges of minimal interaction

Project A is an example of minimizing interaction. While the project was successful in the sense that the offshoring arrangement produced a high-quality system, it was restricted in the sense that only a modest part of the activities of a full project were performed by the vendor. The entire project A was offshored to the vendor, but project A was special in the sense that it consisted almost exclusively of programming. In this sense project B is a better example of the client's minimizing interaction strategy because a larger amount and variety of development activities were offshored to the vendor.

The division of work between the client and the vendor has shifted in the course of the offshoring arrangement. Early in the offshore arrangement the bottleneck was the middle part of the systems-development process. It was difficult to offshore enough coding activities to the vendor and test the quality of the produced code. Today, the bottleneck has moved to the front and back ends of the process. About 400 people are ready to work at the vendor site, starting from business oriented use cases and delivering integrated code ready for acceptance. The hard part now, tells a manager at the client, is to get the business people to write enough, high-quality use cases – that is, to decide and specify how they want the business processes to be.

The main limitation of the client's approach has been that to minimize interaction with the vendor, it has become necessary to perform considerable extra work. This work is required to enable the vendor to take on tasks in spite of its limited business knowledge. The extra work consists of preparing tasks for offshoring, preparing the vendor for working in the client's application domain, and assessing the quality of the vendor's work. In the terminology of Dibbern et al. (2008), this extra work corresponds to specification costs, knowledge-transfer costs, and control costs. While the knowledge-transfer activities and certification programs are intended to gradually enable the client to offshore the specification of systems and the assessment of work products also, the currently offshored activities are somewhat biased toward programming. Thus, the client has been succeeding in the offshoring of programming but, at least currently, at the cost of extra work on other activities. Compared to previous onshore development, the client's activities have shifted toward the start and end of the development process.

This shift has important consequences for the client. First, it implies that the client is to a considerable extent doing work in order not to have to do work. The amounts of extra work have not been fully foreseen, and cultural differences entail that the extra work is perceived differently by the client and the vendor. For example, the vendor organizes activities partly from the implicit perspective that hours are cheap and capacity large, but this perspective is defective when some of the hours (e.g., control activities) are to be performed by the client. It is an ongoing learning process to identify and reduce areas of extra work but also to realize that offshoring is increasing the amount of some of the client's tasks. Second, the extra work may exceed the capacity of the client staff and thereby prevent the client from offshoring as much work as the vendor would be able to perform. While the bottleneck that initially motivated the client to offshore was perceived as a shortage of programming capacity, it may now emerge as a shortage in the client's capacity to specify systems and control work products. This way, the uneven distribution of business knowledge may be the factor that limits the client's minimal-interaction approach to offshoring, making a reduction of the knowledge asymmetry central to continued success with this approach. Third, the tasks of the client staff are changing. This implies that the client staff increasingly needs a different mix of competences with more focus on business understanding and abilities to facilitate the formulation of requirements, the transformation of requirements into system specifications, and the follow-up on whether developed systems match business requirements. Some client staff may welcome this change of focus; others may be reluctant to give up the time spent on programming in favour of activities at which they feel less proficient and comfortable. Fourth, the

client is at a considerably lower level of software-process maturity than the vendor, as indicated by the interviewees' estimate that the client is at CMM level 1 or 2, whereas the vendor is certified at CMM level 5. This implies that the client does not have strong processes in place for making precise and detailed specifications and for thorough quality assessment. In the absence of such processes, it is a demanding and novel task for the client to make, especially, specifications that are sufficiently precise and detailed to define the vendor's tasks in the development of the systems.

6.2 Conway's law

Conway's law (Conway, 1968) states that 'organizations which design systems … are constrained to produce designs which are copies of the communication structures of these organizations.' Thus, the communication bottleneck between the client and the vendor in offshoring arrangements will lead to system designs that reproduce this structure. Conway concludes that flexibility of organization is central to effective design. Flexibility is needed to be able to adjust the organizational structure to a system architecture that matches the needs of the use situation. Because designers' understanding of these needs will probably evolve during the development process, flexibility of organization is required throughout the development process, not just when projects are set up.

Conway argues that especially for large systems the required flexibility is rarely present and that the structures of large systems therefore tend to disintegrate during development. This disintegration is the result of a three-step process. First, when designers realize that a system will be large they are tempted to assign too many people to the project. This temptation is exacerbated by access to a large pool of development staff, as is typical in offshoring. Second, in a large project the communication paths must be restricted in order to avoid a scenario in which communication consumes all people's time, as exemplified by the single point of contact enforced between offshore staff and the client's quality-assessment staff. This causes the communication structure to disintegrate. Third, Conway's law ensures that the disintegration of the communication structure will be reproduced in the system structure, which therefore also disintegrates. This argument appears pertinent to offshoring because the client gets access to the vendor's large pool of development staff and because the communication between client and vendor is restricted by their physical separation (e.g., Herbsleb, 2007; Herbsleb & Grinter, 1999).

In projects A and B, we can clearly explain part of what we see by applying Conway's law. Project A, for example, complied with Conway's law by reproducing the organizational separation between an onshore group with business knowledge and an offshore group with technical knowledge in the system: The system was completely rebuilt technically but remained completely unchanged functionally (as it was planned). This was not a problem for project A itself because it was the client's first offshore project and a lot was learned from it. However, project B gives some indication that the client's aim of eventually offshoring entire projects from requirements to implementation is still hampered by the uneven distribution of business knowledge. This makes communication about business knowledge a central bottleneck because it leads to missed opportunities in the offshore developed systems.

6.3 An end point or a transitory stage?

Whereas the point of departure for the minimal-interaction strategy was to maintain a clear separation between the client and the vendor, the alternatives to minimal interaction involve transcending this view of the vendor as a fully external company. Madsen and Bødker (2010) provide a framework for discussing such alternatives in terms of four different strategies for managing the relationship between the client and the vendor in offshore outsourcing. The framework differentiates between a business friend and a business person and is based on the assumption that 'in a situation where much interaction and cooperation is needed to ensure high performance the business friend role is the most suitable, while in a situation where goals can be measured and/or the task is well understood, the "business person" perspective is the most appropriate' (Madsen & Bødker, 2010, p. 8). The four strategies are select-a-friend and develop-a-friend (both with a business-friend perspective) and control-a-person and control-of-output (both with a business-person perspective).

The minimizing interaction strategy entails a strong preference for a business-person perspective, rather than a business-friend perspective. This points toward a clear separation between onshore client tasks, such as system specification and quality assessment, and offshore vendor tasks, such as detailed use cases and coding. Conversely, Madsen and Bødker (2010), see also Madsen et al. (2011) in Chapter 5, analyze an offshore outsourcing arrangement that aims to dissolve the distinction between the employees of the client and the vendor in favour of looking at them as a joint pool of staff resources. This has led to the introduction of multiple business-

friend practices, for example, about 20% of the vendor staff is, at any given time, on onshore placements. Such practices are costly and stand in stark contrast to the single point of contact enforced in our case between offshore staff and onshore quality-assessment staff. However, reducing or dissolving the distinction between onshore client tasks and offshore vendor tasks may be necessary to avoid that a shortage of onshore staff becomes a chronic bottleneck in the offshoring arrangement. The presence of such a bottleneck suggests that a strategy of minimizing interaction may not scale well and that the client may eventually be faced with a choice between:

- Offshoring only the tasks for which the client has the onshore resources to make detailed specifications and conduct thorough quality assessments
- Transitioning to another strategy where higher transaction costs are accepted to (gradually) avoid the scenario in which certain tasks can only be performed by onshore client staff

A transition from a business-person to a business-friend perspective resembles the transition from the third to the fourth stage in Carmel and Agarwal's (2002) maturity model for offshoring arrangements. Carmel and Agarwal (2002) formulate the difference between these two stages as a difference between a proactive cost focus and a proactive strategic focus. In Madsen and Bødker's (2010) case, there is evidence of practices reflecting a business-friend perspective as well as practices reflecting a business-person perspective, indicating that the two perspectives are not mutually exclusive. Similarly, the onshore placements, courses, and certification program in our case have business-friend elements, which complement the predominant business-person perspective. The client is well aware that these elements are central to improving the vendor staff's business understanding and, thereby, the range of tasks they can perform competently. The client's aim is that the courses and certification program will make it possible to offshore system specification and quality assessment to the vendor in addition to programming. To the client, this is consistent with the minimizing-interaction strategy, not a deviation from it, because the vendor will be able to perform still more tasks autonomously. This way it may become possible to offshore more work while maintaining that each task is allocated to either onshore client staff or offshore vendor staff. If the client and vendor succeed in this, the minimizing-interaction strategy may solve the current capacity bottlenecks. It appears, however, that the communication bottlenecks pointed out by Conway (1968) remain a limitation with negative consequences for the developed systems.

7 Conclusion

Minimizing the interaction between the client and the vendor is contrary to common recommendations about how to conduct offshore outsourcing. Yet, this chapter shows that the strategy followed by the client in our study was one of minimizing interaction. Concretely, we have shown how keeping distance, exchanging people, and exchanging knowledge can be used to develop software in a way that minimizes interaction. It should be noted, however, that achieving minimized interaction requires a lot of work. It is not a cheap solution; the price incurred by the client was larger than expected. In addition, the minimizing-interaction strategy may foster communication structures with negative effects on the structure of the developed systems.

A major consequence of the client's minimizing-interaction strategy has been that the onshore staff's work is shifting toward making specifications and conducting quality assessments. This shift happens to make use of the offshore capacity of vendor staff who are skilled in coding, but it has also revealed that the modest maturity level in the onshore software processes creates a new bottleneck that makes it difficult for the client to perform the necessary quantities of detailed specifications and thorough quality assessments. While the minimizing-interaction strategy has enabled the client to carry out projects, it would otherwise not have been able to take on; the strategy has been most successful in projects for which a complete specification could be produced up front. The strategy has been more of a challenge in projects for which business opportunities were, in part, realized in the course of the projects. We conclude that minimizing interaction can be a viable strategy to follow when clients and vendors face cultural and maturity inequality in offshore outsourcing. However, the strategy has limitations that are important to consider in deciding whether to adopt it.

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Knowledge transfer in outsourcing: From theory to tooling

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Abstract. This chapter deals with knowledge transfer in outsourcing and more specifically in an outsourcing arrangement with a company headquarter in Denmark and an offshore dedicated development centre located in India. Challenges involved with respect to transferring the required knowledge when getting a new group in the offshore centre ready to take on new tasks inform the design of a systematic five-step approach to knowledge transfer. We discuss main design decisions and reflect on the pros and cons of a systematic, tool supported approach to a "soft", and less tangible issue such as knowledge transfer.

Keywords: Outsourcing, knowledge transfer, IT support.

1 Introduction

Research shows and companies know that it takes time before employees who are newcomers to an organization, or to a specific department, job, or project achieve the same level of productivity as their colleagues (Rollag et al., 2005). Similarly, it is recognized that to get newcomers up to speed, they have to be introduced to and learn about their tasks and the particular context in which they are to perform these tasks (Rollag et al., 2005). Many companies handle this challenge through formal introduction programmes, and subsequent on-the-job training, where experienced colleagues show the newcomers the robes. Moreover, much knowledge transfer takes place informally and ad hoc through co-presence and socialization (Nonaka, 1991; 1994; Nonaka & Takeuchi, 1995).

However, when it comes to outsourcing of activities to another company, the lack of co-location and opportunities for spontaneous interaction mean that knowledge transfer between employees from the two companies does not happen as easily, if at all. In case of sourcing to offshore destinations this is further complicated. In this chapter, we discuss knowledge transfer in such a situation based on a longitudinal case study. The case study has taken place in Danske Bank – a major financial company – with substantial operational experience from collaborating with an Indian IT vendor since 2005. In the Indian company, a specific unit working only with Danske Bank has been established as a dedicated development centre. Five hundred Indian associates work in different development projects and in various system management areas in close cooperation with employees from the case company situated in Denmark. To enable this, initial training programmes have been set up where newly hired Indian associates receive a general introduction to Danske Bank's business domain, as well as information about the company's IT development model and system management procedures. However, following the initial training programme, project and system managers in Danske Bank who are responsible for outsourced activities have to ensure that further and more specific knowledge transfer about the project or area takes place. This means that they have to figure out what kind of knowledge the Indian associates need and how to transfer it. Geographical distance and cultural differences add to the complexity of this task. Thus, many project and system managers face the challenge of dealing with knowledge transfer that ensures that the Indian associates reach the desired level of productivity – a new and unknown territory. With the approach described in this chapter, Danske Bank is moving from a situation where it is taken for granted that people will automatically share knowledge when they start working together towards a situation with a proactive and management initiated approach to knowledge transfer.

The knowledge management literature has looked extensively at the concept of knowledge; different types of knowledge, e.g., the well-known distinction between explicit and tacit knowledge (Polanyi, 1962; 1966); different types of knowledge processes, e.g., knowledge creation, sharing, transfer, etc. as well as at the mechanisms that support the creation, sharing, and transfer of different types of knowledge, see for example Nonaka & Takeuchi (1995). However, the definitions, discussions, and normative prescriptions found in the knowledge management literature are largely abstract and philosophical in nature. Thus, even though much research about different types of knowledge and knowledge transfer mechanisms exists, there is quite a distance to travel between the theoretical recommendations and the concrete task of establishing and executing a knowledge

transfer plan. In line with this, there has also been a call for more research about knowledge transfer at the operational level as well as about the ways in which IT can play an important role in supporting knowledge transfer in practice (Markus, 2001).

Studies in the field of computer supported cooperative work (CSCW) have highlighted the impact of geographical distance and the importance of common ground, coupling of work, collaboration readiness and collaboration technology readiness, see for example (Olson & Olson, 2000). Moreover, virtual-teams research has studied the challenges with regard to creating and maintaining trust, mutual liking and shared meaning as well as of managing conflicts in teams where members work together across time, space and culture (Bjørn & Ngwenyama, 2009; Hinds & Bailey, 2003; Hinds & Mortensen, 2005; Jarvenpaa & Leidner, 1999). Also, in the outsourcing literature the problems and influence of geograpichal distance, cultural differences, the onshore staff's motivation for engaging in cross-cultural interaction, the offshore unit's lack of domain knowledge, etc. have received considerable attention (Beck et al., 2008; Carmel & Agarwal, 2002; Gregory et al., 2009).

In this chapter, we are interested in understanding how the problems of knowledge transfer at the operational level in outsourcing might be solved. We address the following research question: *How can a systematic, IT tool supported approach help managers establish and execute a knowledge transfer plan that overcomes the challenges of knowledge transfer in outsourcing?*

The chapter is structured as follows. In Section 2, we explain the definitions and theories that we use, while Section 3 contains a short description of our research approach. Section 4 presents the case company and its outsourcing arrangement as well as the main knowledge transfer challenges experienced through the four and a half years of operation. Based on an understanding of these challenges, in Section 5, we propose a systematic, tool-supported five-step approach to knowledge transfer. We present this approach in some detail in an attempt to make our design decisions and their rationale concrete for the reader and because when designing IT tools that are intended to support complex use and decision situations "the devil is in the detail" (Bødker et al., 2005). Lastly, in the conclusion we present a short summary of our research.

2 Theoretical background

Getting new employees and project participants up to speed is a well-known organizational challenge, which has many dimensions. In this chapter, we discuss it as a knowledge transfer problem. Below, we present the definitions and views on knowledge and knowledge transfer that have informed our research.

2.1 What is knowledge?

Knowledge is a complex and multifaceted concept that is studied both at the individual and organizational level, and as something that can be acquired, created, shared, transferred, stored, etc. Moreover, knowledge is seen to be embedded in routines, processes, and artefacts; inherent to action; and necessary for interaction.

We adopt the view that knowledge is acquired by the individual as he or she identifies, interprets, and internalizes theoretical or practical knowledge (Pries-Heje, 2004; Myers, 1996), either by hearing about a topic or by doing something. The acquried knowledge is unique to the individual because the information and experience is filtered through and "added" to the stock of knowledge that the individual already possesses.

The knowledge that the individual has can be used to get the work done and can be articulated and codified for the benefit of others or for one self as part of reflective activities. Knowledge that can be articulated, codified, stored, and shared with others is often referred to as explicit knowledge (Nonaka, 1991; 1994). However, not all the knowledge that an individual possesses can be easily shared. Tacit knowledge is difficult to communicate to others via words and symbols because it is deeply rooted in action and the person's understanding of a specific context (Nonaka, 1991). Moreover, tacit knowledge consists of both a technical/bodily skills dimension where the individual "just knows" what to do, and a cognitive dimension where taken-for-granted beliefs, perspectives, and mental models facilitate and shape action (Nonaka, 1991).

However, all interaction requires people to be able to communicate. All communication and collaboration in turn rest on a foundation of information, which the interaction partners have in common and which they are aware that they share, i.e., on common ground (Kraut et al., 2002; Olson & Olson, 2000). In some situations, there is already much common ground prior to interaction because people are members of the same group or work environment, belong to the same national culture, have witnessed or experienced the same events, etc. At the same time, and

partly due to the dynamic nature of everyday life, people always have to establish common ground during the particular interaction, by attempting to understand each others' current situations and gauging which views are shared, and what the other mis/understands about the information that one tries to convey. However, according to the principle of 'least collaborative effort', people will try to create grounding for their interaction with as little effort as possible; and people will, therefore, also often prefer to interact in person rather than through written media (Kraut et al., 2002).

2.2 Transferring knowledge from onshore to offshore personnel

In this chapter, we focus on knowledge transfer, and more specifically the knowledge transfer that takes place in situations, (1) where people interact with each other, in person or through various types of media and (2) where some people already possess knowledge that others need. We do not address whether new knowledge has to be or is created in connection with knowledge transfer activities. This delimitation has been chosen to stay in line with the way the case company understands and formulates the knowledge problem in outsourcing. Here knowledge needs are expressed in terms of knowledge already existing in Danske Bank to be re-used by Indian associates taking over new tasks. This focus on knowledge re-use is in line with the framework provided by Markus (2001).

Based on a synthesis of previous work in the knowledge management area, Markus (2001) proposes a theory that delineates four situations in which knowledge possesed and explicated by some are transferred to and (re)used by others. Two of these theoretical situations represent the knowledge transfer situations we see in the outsourcing arrangement under study very well. Following Markus (2001), we describe the two situations below.

- **Expertise-seeking novices** are people who are in need of more knowledge to be able to perform their work – because they are new to the work; because they have to perform it with increased productivity; or because they have encountered a problem with which they have no prior experience. The novices do not possess the knowledge they need themselves and therefore they have to get it from experts or through codified expertise. Markus (2001) refers to this as classic knowledge transfer, and as distinct from the knowledge sharing that takes place among colleagues, due to the fact that it supports people who differ substantially from the knowledge producers with regard to knowledge

and background. The more dissimilar the novices and those who possess the knowledge are, the more difficult it is for the novices to know the jargon, which questions to ask, which symptoms to report, or which expert or expertise to look for. Moreover, once acquired it can still be difficult to know how to apply the knowledge appropriately. Thus, novices require information to be presented to them in a very accessible (i.e. in a de-contextualized) way and they need help in determing when and how to apply knowledge (i.e. with re-contextualization). Further, they may not be aware that they "need" knowledge and that adequate knowledge exists for their use, so general training is important. In this scenario, human and IT intermediaries who can ensure that knowledge is packaged, i.e. structured, formatted, sanitized and indexed, and disseminated are very important.

- **Shared work producers** are people who work together as colleagues on a team. The team members have much common ground, share a lot of knowledge during the work process, and produce and document knowledge that they use among themselves. The need for knowledge transfer arises, for example, when new people arrive in the group; here, the produced and documented knowledge can be used to recall reasons for decisions about what was done, how, and why, as well as about what still needs doing and what can be improved. The recommendations in the literature for succesful knowledge transfer to new team members include providing support for locating knowledge, striving to document rationales for decisions (despite the effort it takes), maintaining context in records, and keeping the records private to the group, as this means that the records can contain "raw", unpolished notes and details, thereby decreasing the cost of capturing the information in writing.

2.3 Summary

Our view is that knowledge enables action and interaction. In particular, we see individual knowledge as central in getting professional work done and shared knowledge (i.e. common ground) as a necessary starting point for communication and collaboration.

Based on this understanding of knowledge, we are primarily interested in identifying the challenges of knowledge transfer and proposing a systematic, IT tool supported approach for dealing with knowledge transfer to *expertise-seeking novices*. There are two main reasons for this. First, the outsourcing arrangement that constitutes our empirical foundation involves people who are dissimilar with regard

to the knowledge and background they have, and second, in this setup the Indian associates often need access to the knowledge of the Danish employees to be able to perform their job.

In addition, the empirical case study that we draw on is characterized by much client–vendor teamwork on IT development projects and system management areas. Aspects relating to the *shared work producers* situation will therefore also inform our empirical analysis and conceptual design.

3 Research approach

Our focal point is the knowledge transfer that takes place at the operational level in outsourcing. A longitudinal case study (Yin, 1994) with this emphasis has been conducted in collaboration with Danske Bank as an integral part of the SourceIT research project's activities with the company. An engaged research approach has been applied to avoid the production of research that is too abstract or irrelevant for practical problem solving, i.e., to avoid the research–practice divide (Van de Ven, 2007). The research team consisted of people from both academia and practice, more specifically two academics from Roskilde University and one practitioner from the case company, who was working as a liaison officer in India for a period of time and subsequently has taken on the management role for a team of 25 Indian associates. The research team has worked closely together to develop an empirically grounded and shared understanding of the knowledge transfer challenges in outsourcing and how they might be overcome.

Our research activities have been structured into four phases. In the first phase, the two academics spent three weeks in India in March 2009 to study the operational aspects of the outsourcing arrangement. This led to a more focused study of how to understand and support knowledge transfer, involving the practitioner from summer 2009 onwards. The practitioner was at this point in time on a short term posting (6 months) in India and was, among other things, charged with the task of improving the case company's way of conducting knowledge transfer. In the second phase, the aim was to understand the challenges of knowledge transfer in outsourcing, in general and as they pertain to the case. Over the course of a two month time period, a literature study of the knowledge management and outsourcing literature was conducted and the results here of, delineated in overview tables and text, were jointly discussed and compared with the case company's experiences. The discussions were documented in a project log, containing our

emerging understandings of the challenges of knowledge transfer as well as ideas for how to overcome them. In the third phase, the results from phase two (i.e. the documents and shared understanding) informed the first conceptual design of a multi-step knowledge transfer model. In the fourth phase, the knowledge transfer model gradually, and based on feedback and additional empirical insight, evolved

Phases	*Activities*	*Who and when*
1. Building common ground	• Field study at the ODC in India: 18 interviews and observation (see Madsen and Bødker, 2010 for more detail)	• The two academics, three weeks, Mar 2009
	• A short-term posting at the ODC in India	• The practitioner, six months, Mar–Oct 2009
2. Understanding the challenges of KT	• Literature study: Knowledge management; KT in outsourcing	• The research team, two months, Jul–Aug 2009
	• Joint conversations about the results of the literature study and their "fit" with and manifestation in practice; documented in a project log	
3. Conceptualizing a multi-step model to KT	• Informed by the results from phase two, a multi-step model for overcoming the challenges of KT was developed	• The research team, two months, Sept–Oct 2009
4. Receiving feedback and refining the approach	• Workshop: Presentation of KT model to the SourceIT project participants	• The research team and the academics and practitioners in the SourceIT research project, Nov 2009
	• Workshop: Presentation of a systematic five-step, tool supported approach to the SourceIT project participants	• The research team and the academics and practitioners in the SourceIT research project, May 2010
	• Presentation of the KT approach to another company with a dissimilar outsourcing arrangement to ensure the approach's broader usefulness	• The research team and three employees involved in outsourcing, Jun 2010
	• Two interviews with LOs to follow-up on challenges and experiences with KT	• The research team and two LOs working with knowledge transfer, Jun and Aug 2010 respectively
	• Writing the book chapter and receiving feedback on the approach as presented in the chapter	• The research team and the academics and practitioners in the SourceIT research project, Jan–Mar 2011

Table 1: *Research phases and activities*

into the conceptual design of a systematic five-step, IT tool supported approach to knowledge transfer. Table 1 provides an overview of the four phases and our research activities.

Below, we report our empirical findings about the challenges of knowledge transfer in outsourcing; the overall design of the approach and IT tool; as well as reflections about the approach and its usefulness. These are the product of a number of iterations between data collection at various empirical sites, analysis of empirical data, comparison of literature and practice, and presentations for the people involved in the activities studied, people with managerial positions in Danske Bank, as well as for the other companies and academic researchers in the SourceIT research project.

Currently, the research is at the stage where we have received positive evaluations of the approach at the conceptual level. For example, the case company has recently developed and implemented a tool supported approach to knowledge transfer that is very similar to the one presented below. The next step is to continuously gain experience with and evaluate the implemented approach and thus further develop the approach and the tool based on learning points from the practical experiences with the utilization in the case company.

4 Case study

In this section, we first present Danske Bank's outsourcing arrangement in more detail. Then we describe the knowledge transfer challenges that the case company has experienced. Lastly, we summarize the results in the form of a list of ways in which a systematic approach to knowledge transfer should help the manager responsible for devising and executing a knowledge transfer plan.

4.1 The outsourcing arrangement

Danske Bank has substantial operational experience with a dedicated offshore development centre (ODC) in India which has been in place since 2005. The ODC is a facility owned by an Indian vendor, but dedicated to Danske Bank and the Indian associates work on the same technical platform as the Danish employees by connecting to virtual machines located in Denmark. Moreover, the ODC is

located in four adjacent buildings that bear the Danish company name and where only the employees who are working for Danske Bank have access.

The chosen strategy is such that currently approximately 500 Indians employed by the Indian vendor are 'hired' from the Indian company into the ODC. These Indian associates are considered a pool of resources to be allocated to IT development projects and/or system management areas, just like other IT employees in Danske Bank. Consequently, the contract with the Indian vendor concerns the timely delivery of skilled personnel and billable hours rather than IT products or services. This outsourcing arrangement has been chosen to ensure access to a scalable workforce that can be adapted to meet the requirements of the bank's IT organization. With regard to the latter aspect, Danske Bank has deliberately chosen to establish a collaboration with a vendor that has the ability to attract and recruit newly educated candidates from the best universities as well as more experienced staff. In other words, a large, well-reputed vendor has been chosen to benefit from their ability to cater to the Indian labour market's focus on quick career moves and enhancement of the curriclum vitae.

To ensure a well-functioning client–vendor relationship, five Danes are posted in India to oversee the daily operations. The four liaison officers and a manager are all experienced Danish employees with a long term posting in India. Their tasks are to conduct screening interviews with all candidates from the Indian company, control and follow-up on the contract with the Indian company, for example, with regard to the monthly billable hours, and to facilitate process improvement as well as other initiatives that strenghten the cooperation between Danske Bank and the outsourcing partner and increase efficiency and productivity. Furthermore, the Danes posted in India play an important role in facilitating and boundary spanning across the locations by helping people at both locations gain an understanding of differences in facilities, work culture, communication norms etc. and in aligning expectations among the stakeholders.

Of the 500 Indian associates, approximately 75% are allocated to system management tasks, while the remaining 25% work on development projects. Moreover, many Indian resources are allocated to tasks onshore, i.e., in Denmark; at any given time up to 20% of the billable hours concern onshore ODC resources. A typical onshore stay lasts from two to four months. An important characteristic of the chosen outsourcing strategy is that many activities are jointly performed by Danish employees and Indian associates, regardless of whether the tasks concern system management, IT development, or whether people are co-located or collaborate virtually. In other words, a *cooperative outsourcing* strategy has been implemented (Dibbern et al., 2004). In this outsourcing arrangement, knowledge

transfer is very important, and also challenging as the establishment of common ground is crucial for efficient collaboration between the Danish employees and the Indian associates.

Knowledge transfer in the case company's outsourcing arrangement is essentially twofold. First,it is the obligation of the vendor to hire staff with the appropriate technical skills and subsequently train them in the case company's organization, processes, and tools as well as to provide general cultural training about Denmark and work culture in Denmark. In this chapter, we do not focus on this initial type of knowledge transfer. Rather, we are occupied with the knowledge transfer that needs to take place when Indian associates join a team, whether this is a system management or a project team, to provide newcomers with the necessary level of specific knowledge to be able to function in the team they are assigned to. The manager of the team is responsible for this knowledge transfer.

4.2 The challenges of knowledge transfer

Danske Bank has experienced three major types of knowledge transfer challenges of which one is about different knowledge types and varying needs, one is related to physical distance, and one concerns incentives and priorities.

4.2.1Knowledge types and needs

All people know more than they are consciously aware of (Polanyi, 1962). In other words, people possess much tacit knowledge and therefore take many things for granted, also when transferring knowledge. Second, people have different backgrounds and levels of expertise, and thus, different knowledge (transfer) needs when assigned to similar tasks.

A simple, yet illustrative example of the challenge of tacit knowledge in the case company concerns the Danish mortgage system. Most Danish employees know that a mortgage in Denmark is a loan with the currency of up to thirty years whether it is a fixed rate mortgage or another kind of mortgage. So, in Denmark, the maximum currency is regarded somewhat as a constant that may very well be left out in a knowledge transfer session. However, in India there is no such thing as a formalized maximum currency and most mortgages have a currency of ten to twenty years; and in a few cases, the currency may be more than twenty years and in a few cases less than ten. Consequently, if the Danish maximum currency is left out of the knowledge transfer there is indeed a risk that the Indian associates will

work on the assumption that the mortgage system in Denmark is equivalent to the Indian system. A consequence of this is that the Indian associates write code that does not meet the expectations, let alone business needs, and Danish legal regulations. There are of course an endless number of similar examples of what is so common for the Danish employees that they forget that it may not be just as common for the Indian knowledge recipients, and vice versa.

Another issue that employees of Danske Bank often face is the question of how much the Indians know prior to knowledge transfer. The Indians have different backgrounds and levels of expertise. This inhibits a clear-cut definition of what type of knowledge to transfer and how as the needs vary from person to person.

However, the two abovementioned challenges related to tacit knowledge and different knowledge needs are not the only knowledge transfer challenges in an outsourcing context. The two other main categories are discussed below even though they – strictly speaking – are not about knowledge transfer. Instead, they address why knowledge sharing is more difficult across large geographical distance than if people are working in the same location.

4.2.2 Physical distance

Knowledge sharing is substantially more difficult among co-workers who are not co-located than among those who are (Olson & Olson, 2000). Experience in the case company supports this, as it clearly shows that both knowledge sharing as well as knowledge transfer are best done when the Indian resources are invited for an onshore stay of two to four months. It seems that knowledge sharing happens more or less automatically when people are in close physical proximity (Kraut et al., 2002); people simply go to each others' desks and ask for help as the need arises. This fluent pattern of interaction – aided by rich cues about peoples' availability for answering questions and evidence of what the person asking the question (mis)understands (Kraut et al., 2002; Olson & Olson, 2000) – is also exercised by onshore Indian associates. Thus, co-location of Danish employees and Indian associates means that knowledge transfer needs can be handled with low effort through "a quick chat", i.e., in a way in which it does not feel like knowledge transfer.

However, there are many occasions in which an initial onshore stay is not possible for a variety of reasons. In these cases, the employees tend to stick to emails as the primary means of communication. Primarily because this form of communication is less prone to interrupt the recipient and because it feels less intrusive and uncomfortable to send an email than to call a person that you do not know well.

From the viewpoint of the Danish employees, knowledge sharing hereby becomes a very time-consuming affair (please note that an investigation has not been conducted and we therefore only relate to the notion that it is *perceived* as time-consuming, not whether this is actually the case or not). Furthermore, the Indian associates on many occasions express that they feel they are burdening the Danish employees when asking (too many) questions. At the same time, a significant number of the Danish employees are not entirely comfortable with other types of communication technologies, and the available video conferencing rooms, the possibilites for shared desktops, etc. are rarely used.

4.2.3 Incentives and Priorities

Successful knowledge sharing over distance requires that the employees have an incentive to engage in this activity (Gregory et al., 2009; Markus, 2001; Olson & Olson, 2000); either because they need to give and seek information to progress with their own work, as increased levels of collaboration and knowledge sharing is prioritized and gets recognized by management, or because they are extrinsically motivated, i.e., by expected organizational rewards and reciprocal benefits, or intrinsically motivated to do so, i.e., by knowledge self efficacy and enjoyment in helping others (Lin, 2007).

However, in the busy environment of the case company, knowledge sharing between employees in Denmark and associates in India is often not prioritized. Employees in the case company are inclined to focus their effort on what is immediately beneficial for their own work and on what gets noticed by their local managers, namely the daily tasks and knowledge sharing among colleagues at the same location.

Getting knowledge sharing high on the list of priorities among the Danish employees is further complicated by the fact that, especially in the beginning of a collaboration on an IT project or in a system management area, there are clear knowledge asymmetries. Thus, in the beginning the Danish employees have knowledge that the Indian associates need. However, there is not necessarily any immediate benefits for the Danish employees in sharing their knowledge. In addition, it is difficult to measure, or just get a feeling of, the value of time spent on answering emails and engaging in other knowledge transfer activities. The Danish employees' motivation to do so, thus, can be quite low. Yet, in line with Heeks et al.'s (2001) findings about global software outsourcing, the experience in the case company is that when the Danish employees and the Indian associates have physically met and got to know each other, email exchanges work much better.

The reason is presumably because knowledge about each other as persons makes it easier for the interaction partners to know what kind of information to include in the emails (Kraut et al., 2002; Olson & Olson, 2000) and because people are more willing to help someone they have met, know, and like (Clark & Mills, 1993; Haytko, 2004).

4.3 Summary

In addition to the basic introduction program carried out by the vendor, the case company currently uses two main mechanisms for knowledge transfer, namely onshore stays and email exchanges. Knowledge transfer that occurs as a natural part of onshore stays, i.e., faciliated by co-presence and spontaneous and informal communication of the Indian associates, is reported to work well and to be experienced as relatively effortless by the Danish employees. But otherwise, the general perception among the Danish employees is that helping Indian associates gain knowledge is a time-consuming affair that takes time away from their own work. A major reason for this perception is that helping the co-workers located in

Type of challenge	*KT challenge*	*A systematic approach to KT should help the manager:*
Knowledge types and needs	Tacit knowledge. Knowledge needs vary from person to person.	Identify and include (tacit) knowledge that would otherwise be forgotten. Identify the real needs of the knowledge recipient(s).
Physical distance	The Danish employees consider knowledge transfer time-consuming due to the number of questions asked via email. The Indians associates also feel that they are burdening the Danish employees with (too many) questions.	Identify the knowledge needs that have to be met to reduce the number of questions from the Indian to the Danish employees. Identify a variety of relevant knowledge transfer mechanisms (incl. mechanisms that encourage knowledge transfer and sharing between Danish and Indian employees through means other than email).
Incentives and Priorities	The Danish employees focus their efforts on progressing with their daily work in accordance with management priorities.	Plan for and make the effort and effect of knowledge transfer transparent. With planning and transparency, knowledge transfer becomes "real work", that can be sanctioned and prioritized by (top)management .

Table 2: *Experienced challenges with knowledge transfer*

India is primarily taking place via email and that these emails have to be answered while the Danish IT employees are occupied with many other tasks and meeting the deadlines set by their managers and clients on these tasks. Table 2 provides a summary of challenges experienced.

We suggest that a way to overcome these challenges is by introducing a systematic approach to knowledge transfer. A systematic approach initiated by the project/system manager can help in several ways, for example, by turning the continuous email-based 'knowledge sharing' among non-co-located Danish and Indians employees into "real work" with allocated hours that can be reported; identifying the real knowledge needs of the Indian associates, including their need for contextual information that is taken for granted by the Danish employees, so as to reduce the number of subsequent questions; and ensuring that a variety of knowledge transfer mechanisms are used both during formal knowledge transfer sessions and afterwards. Moreover, a benefit of a systematic approach to knowledge transfer is that the thoughts that are put into the first knowledge transfer plan in an area can be reused and refined later.

5 A five-step approach to knowledge transfer

The point of departure for this section are the empirically identified challenges of knowledge transfer mentioned above (summarized in Table 2) and the notion that IT can and should play an important role in ensuring that knowledge transfer takes place (Markus, 2001). Based on this, we suggest a systematic, IT tool supported approach to knowledge transfer. The aim of the approach is to help the Danish managers plan and carry out knowledge transfer to Indian associates who are newcomers to a particular IT project or system management area.

The IT tool is more specifically thought of as a spreadsheet solution. The Danish employees in the case company are very familiar with this type of software functionality and they use it for many tasks. Moreover, several of Danske Bank's existing outsourcing assessment and decision-tools, e.g., for making tactical decisions about which IT projects and system management areas to outsource, have been implemented as spreadsheet applications (Jørgensen et al. 2011 in Chapter 11).

The suggested approach consists of five steps. (1) The manager identifies the knowledge gaps that are most important to address. (2) The manager then selects appropriate knowledge transfer mechanisms. (3) The manager establishes a detailed knowledge transfer plan. (4) The knowledge transfer plan is carried out. (5)

Step	*Action*	*Tool support*
1	**Identify knowledge gaps** • Identify the desired knowledge level. • Assess the Indian associates' current knowledge level. • Analyze the gaps between the desired and the current level, and select the most critical ones as focus areas for knowledge transfer.	• A range of predetermined categories and questions help the manager consider what type of knowledge is particularly important for the given project/system management area. • For each question, each Indian associate's current knowledge level is scored on a scale. • The result is presented as a gap between the desired and the current level of knowledge for each question as well as for each category. The biggest deviations are highlighted. • The focus areas for knowledge transfer are actively chosen and automatically moved to a new sheet that will eventually become the knowledge transfer plan.
2	**Identify knowledge transfer mechanisms** • For each of the selected focus areas, knowledge transfer mechanisms are considered and chosen.	• In the knowledge transfer plan, the knowledge transfer mechanism(s) for each focus area has to be chosen. For inspiration, a list of knowledge transfer mechanisms is provided.
3	**Establish the knowledge transfer plan** • A detailed knowledge transfer plan is made containing information about: o Focus areas o Transfer mechanisms o Responsible persons o Participants o Estimates (time and/or resources) o Requirements (space, equipment, etc.)	• When the knowledge transfer mechanisms have been chosen, the other fields for knowledge transfer planning are activated. • For each knowledge transfer mechanism, it is outlined: who is responsible, who participates, estimated time for preparation, estimated time for execution, room and/or technology requirements, deadline etc.
4	**Execute the knowledge transfer plan** • Intermediates carry out the knowledge transfer. A knowledge intermediate may be either a knowledgeable person from the Danish organization or an experienced team member from the offshore centre.	• The knowledge transfer plan is carried out without support from the KT tool.
5	**Evaluate the effect of the knowledge transfer** • Collect, store, and use data about the effect of the knowledge transfer.	• No specific method for data collection is prescribed, but data about effects can be stored and spreadsheet functionality used for analysis.

Table 3: *Overview over the knowledge transfer approach*

Lastly, the effect of the knowledge transfer is evaluated. Table 3 provides an overview of the five steps, and the suggested actions and tool support for each step.

In the following sections, we describe each of the five steps in the knowledge transfer approach in more detail.

5.1 Step 1: Identify knowledge gaps

In this step, a gap analysis lays the foundation for the subsequent knowledge transfer planning and execution. Thus, the Danish manager first decides what the desired or required level of knowledge is. Subsequently, the manager obtains information about the Indian associates' actual level of knowledge, e.g., by engaging in a dialogue with the Danish LOs, the Indian managers, and the associates themselves, as well as via the Indian associates' CVs. On this basis, an assessment of the gap between the desired and the current knowledge level is made. The outcome of the analysis is a decision about which gaps are the most severe and which therefore should be selected as the most important areas for knowledge transfer. As a part of arriving at a decision about which knowledge gaps to address, this first step should also help the manager become alert to tacit knowledge dimensions as well as the Indian associates' different knowledge transfer needs.

The IT tool supports the gap analysis in the following way. A number of predetermined categories and well thought out questions within each category help the manager consider what type of knowledge is particularly important for the given project/system management area. Thus, for each question, the manager sets the desired level of knowledge by using a predefined scale. Then, for each question, each Indian associate's current knowledge level is scored using the same scale. The result is presented as a gap between the desired and the current level of knowledge for each question (e.g., in numbers) as well as for each category (e.g., in a diagram). The biggest deviations are highlighted so that the manager gets an overview of where the major gaps are by quickly viewing the results for each associate. Based on this analysis of the knowledge gaps, the manager actively chooses the areas for knowledge transfer, and the selected focus areas are automatically moved to a new sheet that will eventually become the knowledge transfer plan.

As indicated above the predetermined categories, questions, and scales incorporated into the tool play an important role in ensuring that both explicit and tacit knowledge needs are addressed in the gap analysis.

For Danske Bank, we identified the following general categories: *business domain*, *IT*, *process*, *task*, *organization*. For each category, a number of questions were delineated. Here, due to space limitations, we demonstrate the approach by presenting one question for each category. The presented examples have been chosen to illustrate how the tool can help the manager consider aspects that might otherwise be forgotten, or taken for granted:

- *Business domain*: "The Indian associate is familiar with the rules and legislations of importance for the particular IT project/system management area."
- *IT*: "The Indian associate is familiar with the IT project/system management area's IT infrastructure and the dependencies between components."
- *Process*: "The Indian associate is familiar with the rules of conduct (e.g. with regard to sickness, vacation, whom to contact in case of various events, etc.) and norms of collaboration (e.g. with regard to deadlines) that pertain to the particular IT project/system management area."
- *Task*: "The Indian associate is informed about the purpose that the particular IT project/system management area serves for its users as well as about the vision and strategy for its future progress."
- *Organization*: "The Indian associate is familiar with the way the particular IT project/system management area is organized."

Also, the scale that is used to set the score for each question has been designed to capture the explicit/theoretical knowledge vs. tacit/practical knowledge dimensions (Pries-Heje, 2004). Thus, for each question the manager has to consider if the theme: (1) is non-applicable; (2) is one that the Indian associate does not need/does not have knowledge about; or one the Indian associate should/does have knowledge about at the required level (3) from where they have heard about it (i.e. explicit/theoretical knowledge), (4) from where they have prior experience with it (i.e. tacit/practical knowledge), or (5) is one where they are experts.

5.2 Step 2: Identify knowledge transfer mechanisms

Step 2 concerns the identification and selection of knowledge transfer mechanims that can appropriately address the focus areas identified in the previous step. As such, the knowledge transfer planning has commenced. However, the identification of relevant knowledge transfer mechanims is included in the approach, and in the tool, as a separate step to ensure that it is given due consideration. Thus,

at this stage the tool supports the project/system manager in realizing that there are many knowledge transfer mechanisms and that several mechanisms might be able to adress the same knowledge transfer need.

A literature study (see e.g., Beck et al., 2008; Carmel & Agarwal, 2002; Willcocks & Feeny, 2006) as well as discussions with practitioners has led to the idenfication of the following (nonexhaustive) list of mechanisms:

- Class room training
- Reading documents
- Formalized QA-sessions
- Creating documentation (of previously undocumented IT systems or work flows, or translating documentation in Danish)
- Onshore stay
- Single point of contact
- Learning-by-doing (real task) / learning-by-experimention (training task)
- Planned activities that focus on building common ground with regard to social norms, rules of conduct, communication, and coordination (e.g. a kick off seminar including both work and social activities)
- Mentoring and buddy arrangements (emphasis on knowledge sharing and transfer about social context)
- Apprenticeship (senior–junior work relationship)

In knowledge management terms 'due consideration' with regard to the identification and selection of transfer mechanisms also refers to reflections about whether contextualized knowledge is needed to address the knowledge gap as each mechanism to varying degrees support different aspects of decontextualization and recontextualization, respectively. The choice of mechanisms also indicates if effort is required to prepare for knowledge transfer by careful packaging of knowledge; so as to avoid the "easy" solutions, for example, to invite Indian associates to ask questions "whenever you are in doubt", or giving a hastily put together presentation at a virtual meeting.

5.3 Step 3: Establish a detailed knowledge transfer plan

After the completion of Step 2, a detailed knowledge transfer plan is made. For each selected knowledge area and transfer mechanism, a responsible Danish employee is assigned, the Indian participants are named, and time estimates for preparation

and execution, as well as room and technology requirements are outlined. The tool supports the planning activity by providing the fields that ensure that the project/system manager considers the most important aspects, including some that are easily overlooked in a busy business domain, such as preparation time. The resulting knowledge transfer plan allows for an overview of the effort, i.e., the resource draw, that the knowledge transfer demands. This overview might cause the manager to want to investigate implications of choosing different transfer mechanisms. In this way, the tool supports the creation of different knowledge transfer scenarios, thereby helping the manager strike a balance between what is realistic with regard to the Danish employees' use of time and satisfactory with regard to expected effect on the Indian associates' knowledge needs.

5.4 Step 4: Execute the knowledge transfer plan

In this step, the knowledge transfer plan is carried out in practice, without support from the knowledge transfer tool. However, in connection with each knowledge transfer mechanism, evaluation data, in the form of the participants' subjective satisfaction and perceived value, can be collected and stored in the spreadsheet. Evaluation data of this type is useful for the Danish employees who are responsible for the knowledge transfer initiatives as it allows them to continuously improve the knowledge transfer activities that are conducted in a specific area.

5.5 Step 5: Evaluate the effect of the knowledge transfer

The description of the challenges that Danske Bank experienced (see Section 4.2) indicates that it is important for the project/system managers to follow-up on the effect of the knowledge transfer initiatives on two measures: productivity and the number of purely question–answer oriented emails, i.e., emails that can be classified as pure knowledge transfer rather than collaboration/coordination oriented.

The case company already has a performance evaluation programme in which information about the Indian associates' perceived level of productivity is systematically collected on a quarterly basis. These data can be imported into the spreadsheet, for example, to evaluate the impact on the perceived level of productivity; if the impact is immediate (positive impact) and then decreasing over time (suggesting the need for periodic intervention); or if it has resulted in a sus-

tained increase, etc. Also with regard to emails, data can be collected and stored, either by asking the relevant Danish employees to count or estimate the number of QA-emails they receive before and after a knowledge transfer mechanism has been deployed. Together, data about productivity and the number of emails provide – some, but of course not complete – insight into the effect of the knowledge transfer initiatives. In a complex empirical reality, it is very difficult to isolate the effect of one initiative, and as such it is also very difficult to say exactly which knowledge transfer mechanisms work the best and when. However, the data can complement the Danish employees intuitive understandings of what works and what does not.

6 Conclusion

Based on a longitudinal case study of an outsourcing arrangement between an Indian IT vendor and a Danish financial company, we identify three main types of knowledge transfer challenges, as seen from the client's side. The challenges relate to *knowledge types and needs* and more specifically to challenges with tacit knowledge and identification of knowledge transfer needs; *physical distance* and choice of knowledge transfer mechanisms; and the Danish managers' and employees' *incentives and priorities* for taking the time to engage in knowledge transfer. The challenges indicate that a pro-active and management initiated approach to knowledge transfer could be useful.

We suggest a systematic approach conceptualized as five separate steps. (1) The manager identifies the knowledge gaps that are the most important to address. (2) Then, the manager selects appropriate knowledge transfer mechanisms. (3) The manager makes a detailed knowledge transfer plan. (4) The knowledge transfer plan is carried out. (5) Lastly, the effect of the knowledge transfer is evaluated.

The approach has been presented to Danske Bank employees and SourceIT project participants on several occasions to obtain feedback, i.e., to conduct proof-of-concept. In general, the feedback has been positive. Moreover, positive evidence for the usefulness of the concept is that the case company recently has developed and implemented a tool supported approach to knowledge transfer that is very similar to the one presented here.

Alongside the actual knowledge transfer plan and the quality and execution thereof, an important contribution of the suggested approach is that it creates

awareness about and gives transparancy and priority to the activities of knowledge transfer. Thus, by providing tool support and devising explicit plans, knowledge transfer receives attention as an activity in its own right and as something that takes time to plan, prepare, and conduct. In this way, knowledge transfer is put visibly on the agenda.

However, two contradictory concerns were also expressed with regard to the approach's incorporation of tool support. The dangers of over-relying on a "mechanistic" IT tool and its functionality to make decisions versus providing too few concrete recommendations. We have dealt with the first concern by emphasizing that at this initial stage the tool should primarily be designed to facilitate decision making, e.g., by letting the categories and scales of the tool serve as reminders about important topics requiring human judgement. Over time, the focus of the tool may be shifted towards providing recommendations, i.e., towards incorporating decisions instead of merely facilitating a thought and planning process. However, it will require a substantial amount of empirical data or theoretical grounding to substantiate such recommendations, e.g., about which knowledge transfer mechanisms should be applied for addressing a particular type of knowledge gap. Currently, both empirical data and theory that establish the relationship between the knowledge need, the most appropriate knowledge transfer mechanism(s), and the effect on productivity are lacking. More research is needed to identify this relationship.

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Designing virtual team building with a focus on social capital

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Abstract. An interview study of virtual teams in Danske Bank revealed seven problem areas. To cope with the problems, we used a design science research approach to design a conceptual framework for team building in virtual and distributed project teams. The conceptual framework combines a six-phase team building model with the notion and elements of social capital. Thus, in each phase of team building you build up all six elements of social capital. The complete six-by-six framework was diffused in Danske Bank in January 2011. This chapter gives an account of the framework content and the very early results of the evaluation.

Keywords: Virtual teams, team building, social capital

1 Introduction

In the future work can be done anywhere across the world, as globalization is here now (cf. Friedman, 2006). This means that work is being done by anyone who does it better, cheaper or faster. It also means that a company will have many projects characterized by rapidly assembled project teams, geographically dispersed, but with highly specialized professionals who perform specific projects. Individual project teams will gather (virtual) during varying periods of time depending on the type of work, and will be dissolved as soon as project task is done. For the individual, placed somewhere in the world, work and career will be about participating in a series of individual "projects", comprising progress and achievements.

Thus, virtual teams and virtual projects will be very common in the future, where a virtual team in our understanding is a team separated by geography, time zones and/or culture, but never the less has to work together as a team.

In this chapter, we look at a concrete process improvement effort in Danske Bank. Project work in Danske Bank is characterized by many virtual teams consisting of people from both Bangalore in India and Denmark, and these teams need to improve their collaboration. This was realized by Danske Bank in the beginning of 2010 and our process improvement effort was initiated in the summer of 2010.

The remainder of the chapter is organized as follows. First, in Section 2, we carefully explain our research method; design science research. Then in the last part of Section 2 we give a short account of existing knowledge in relation to virtual teams and management as well as the problem at hand. In Section 3, we lay out all the details of an interview study conducted in Danske Bank. Then follows Section 4 in which we give the details of our design of a conceptual framework, solving the problem faced in Danske Bank. In Section 5, we give an account of the diffusion and successful adoption of our six-by-six conceptual framework (= the design); the chapter ends with a conclusion.

2 Research method

In this section, we carefully explain our design science research approach, the business needs we are addressing, and applicable knowledge for the problem at hand.

Benbasat & Zmud (1999) argue that much IS research today is irrelevant and recommend research that are more relevant, but without fundamentally challenging the existing academic value system. We believe that design science research offers the practical relevance and utility requested because it emphasizes that a design should address a need or a problem and at the same time should "stand on the shoulders" of existing research within the problem area. Probably the first journal paper on design science research on information systems was published in 1992 by Walls et al. (1992). They argue that design is both a product and a process. Thus, a design theory must on one side handle the design product and on the other side it should handle the design process. In 1995, another influential paper on design science research by March and Smith (1995) was published. One of their key points is that in design science, one can build and evaluate four things:

1. Constructs that are concepts that characterize a phenomenon; an entity-relationship model, for instance, could be a construct.
2. Models that describe tasks, situations, or artefacts. An example would be an entity-relationship model of a concrete company ABC.
3. Methods that help to carry out activities towards a goal, i.e., how to design an entity-relationship model.
4. Instantiations that are "physical implementations intended to perform certain tasks" as, for example, the physical implementation of an entity-relationship model in company ABC.

The conceptual framework we ended up developing is both a *Model* and a *Method* and we are using it in at least seven areas; making it seven *Instantiations*.

Continuing from the work of March and Smith (1995), Hevner et al. (2004) presented a design science research framework that enhances the Walls et al. (1992). An overview of the framework is shown in figure 1. At the core are such elements as build and justify. Arrows back and forth symbolizes the iterative nature of design science research. To the left are business needs stemming from people, organization or technology. To the right are our common knowledge base consisting of foundations, methodologies and technology. At the bottom are two arrows showing the main outcomes of design science research; applications in a concrete setting and additions to the general knowledge base.

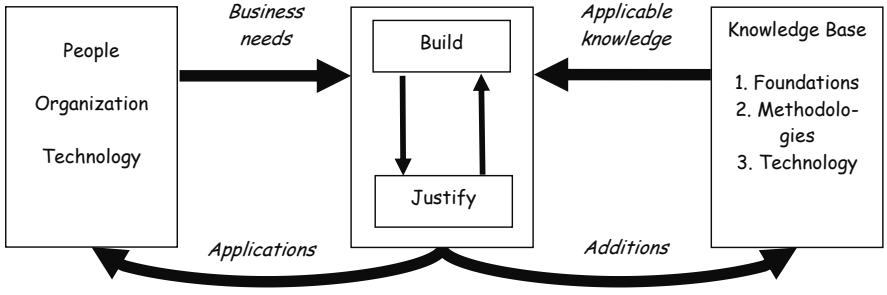

Figure 1: *Components of a design theory according to Hevner et al. (2004).*

2.1 Research initiation and the business need

The research reported in this chapter was initiated in the summer of 2010 when Linda Olsen, the First Vice President for Danske Bank's outsourcing setup called Development Center India (DCI), stated that they needed an improvement; they needed better virtual management.

The set-up between DCI and Danske Bank in Denmark is built on the outsourcing strategy called staff augmentation. In short, this strategy means that more and more projects will have people from different sites – such as Bangalore, India and Ejby, Brabrand and Lyngby, Denmark – working together in the same project team. The main advantage of the staff augmentation approach is that it may leverage existing resources in Denmark as well as utilize outsourced services and contract workers in Bangalore. In the concrete Danske Bank (at time of writing – April 2011) has close to 500 people from ITC Infotech working in Bangalore as part of project teams with both Danish and Indian team members. Most shared project teams do not create totally new IT systems but are responsible for updates and maintenance of existing systems, that is, system management projects.

In August 2010, we interviewed the first Vice President Linda Olsen to obtain a better understanding of the business need for better virtual management. She told us that Danske Bank has two types of projects. One type is new development projects where something new is developed often as an add-on to existing applications or sometimes from scratch. The other type of projects is system management projects where development consists of smaller changes, additions, and defect corrections. The virtual projects (across Denmark–India) were mainly of the latter system management type. She also told us that in her opinion there was enough technology available to the virtual project teams. Danske Bank had implemented telepresence rooms at all main sites including Bangalore. They had eMeeting software and Chat at all workstations in Denmark and India. And they had several Video meeting facilities in Bangalore and at the Danish sites. Thus, Linda Olsen emphasized that the need for better virtual management was in her view a *management* problem.

To address this management problem, an interview study was planned and conducted to obtain a deeper and more thorough understanding of the problem.

2.2 Applicable knowledge from the Knowledge Base

Before you can design anything in design science research you need to "stand on the shoulders" of all the others who have looked into a similar problem; the upper right arrow called "Applicable knowledge" in Figure 1. Quite many researchers have looked at virtual (project) management. 'Much depends on experiential learning and sheer hard work' says Lacity et al (2008, p. p. 32), and they continue to say that '… outsourcing is not about giving up management but managing in a different way.'

What should this "different way" then be? Well, our literature review of the knowledge base revealed a very interesting paper, (Bhat, Gupta, & Murthy, 2006), exactly building on case studies from an Indian IT-services firm where they identified five key strategic factors essential for success using a root–cause analysis:

1. Shared goal
2. Shared culture
3. Shared process
4. Shared responsibility
5. Trust

These five key factors are a major part of what in the literature is called *social capital*. That is, a concept referring to connections within and between people. The concept has been used to study societies, differences between developing and developed countries, and recently to study project teams as we were interested in them. Another thing that led us in the direction of social capital was one of the conclusions from Lacity et al. (2008, p. p. 30): 'Our research found that one of the best ways to transfer knowledge is to invest in social capital. Social capital is simply the idea that knowledge and resources are exchanged, work gets done, and value is created through social relationships.'

We found a very interesting study by Evans and Carson (2005), linking the performance of distributed and heterogeneous teams (equal to virtual teams as we call it in this chapter) to three core processes (communication, social integration, and coordination), and social capital as a moderating structural dimension meaning that when social capital is low then distributed teams will be negatively related to group processes and positively related when social capital is high. We have showed the model in Figure 2.

The concept of social capital is relatively new and is an attempt to bring together a number of concepts such as informal organization, trust, culture, social support,

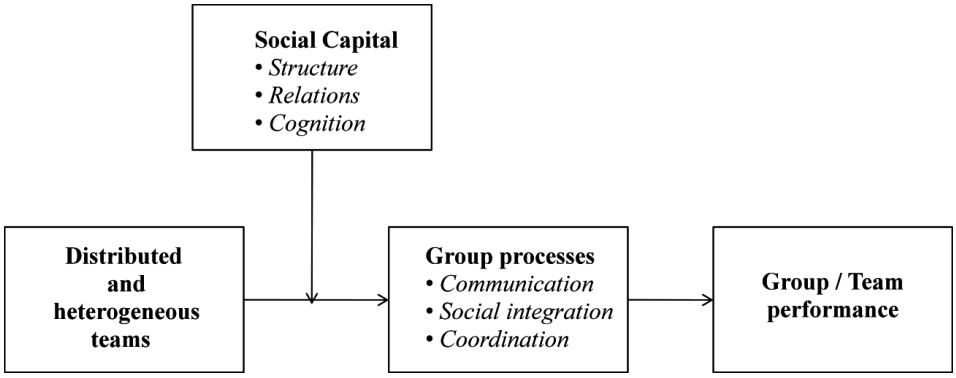

Figure 2: *Relationship between group processes, social capital and performance (Evans & Carson, 2005).*

social exchange, social resources, rational contracts, social networks, and inter-firm networks (Adler & Kwon, 2002). As a construct, social capital can be defined as '*the goodwill available to individuals or groups. Its source lies in the structure and content of the actor's social relations. Its effects flow from the information, influence, and solidarity it makes available to the actor*' (Adler & Kwon, 2002, pp., p.23). Social capital has three dimensions, namely a structural dimension, a relational dimension, and a cognitive dimension (Adler & Kwon, 2002; Evans & Carson, 2005).

Adler and Kwon (2002) suggest that if opportunity, motivation, or ability is missing, it will undermine the generation of social capital. Thus, when analysing social capital potential it is necessary to establish to what extent these three factors are present. First "opportunity", here the question is, whether a network that allows for social capital transactions is present; simply applying the idea that ties create an opportunity to act together. Both the quality of the ties (frequency, intensity, multiplicity) and the number and redundancy of internal as well as external ties matter. Especially two aspects of structural configuration has been researched; closure of the network structure; *strong ties* (Coleman, 1988) and sparse network with few redundant ties; *weak ties* (Burt, 1987). Second "motivation" is necessary. Different motivations have been suggested such as trust and associability, socialization and shared destiny (Leana & Buren, 1999), enforced trust (Portes, 1998), career advancement (Graaf & Flap, 1988), or reduction of transaction costs (Baker, 1990). Finally, the cognitive dimension focuses on ability – the competencies and resources at the nodes of the network. Thus, if social capital includes the resources that any actor could potentially mobilize via their social relations then the ability of each tie is important (Adler & Kwon, 2002).

2.3 Interview study

Armed with a request for help on virtual (project) management and a preliminary understanding of the problem as related to social capital we travelled to India for 3 weeks in November 2010. The purpose of the trip was to obtain a better understanding of the problems related to actual virtual project management in Danske Bank's Development Center India, where 480 people from the Indian company ITC Infotech work in the Development Center.

Based on the applicable knowledge, we formulated an interview guide as shown in Figure 3.

1.	Your background, Education / Experience
2.	The project? Scope? / Organization? / Roles?
3.	Denmark – India? People on-site in Denmark? / You? / Use of LOs?
4.	Communication: Structure: What? / Daily? / Regularly? / Challenges? / Hindrances & obstacles?
5.	Team building: How do you build a team?
6.	Networking: Here? / Across to DK? / Community here at ITC? Bangalore?
7.	Project Management.
8.	Coordination and Control Formal control and follow-up?
9.	Common vision and mental model? / Informal?
10.	Coordination Mechanisms?
11.	Examples
12.	Surprises? / Miscommunication / Misalignment / Special or what is different about working here in general?

Figure 3: *The interview guide used in the interview study in November 2010*

To pilot test the interview guide, we conducted some interviews in the fall of 2010 with a project manager (using a pseudonym called the BRAVO project). Some changes and improvements were made from that pilot testing before the interview guide ended up looking as shown in Figure 3.

To obtain a broad understanding of the problem domain, we asked for access to interview three people with different roles in projects that differed in size, type, and scope.

The projects we ended up interviewing were:

Bravo: Medium-size system management project; used Scrum as their development methodology with one scrum team in Denmark and another in Bangalore. Project manager, task manager, business developer, tester + two developers interviewed

Charlie. Smaller system management project; task manager and developer interviewed.

Golf: Larger 3-year development project with main parts developed in India. Three people interviewed: task manager and two developers of which one was newly arrived at DCI (4 months)

Tango: Larger system management project. 3 people interviewed: task manager and two developers of which one had recently arrived.

Besides interviewing the Indians in DCI in Bangalore, we also interviewed five Danish liaison officers and the first Vice President. For that, we used the same interview guide.

All interviews were recorded and careful and detailed minutes were jotted down. Furthermore, we observed development using technology such as video meetings and telephone conferences. We also tried the telepresence room for a 2 hour meeting. For all these observation studies, we made careful notes as well.

2.4 From Interpretive Coding and Analysis to Design

The methodology we adopted was a contextualized, interpretive one, using the technique of case study research (Pettigrew, 1990; Walsham, 2006). Our research can be characterized as being interpretive in that we attempted to understand the virtual project management phenomena and the problems therein through the meanings that people assigned to the issues we brought up in the interviews. Thus our access to reality is through social constructions, such as language, consciousness, and shared meanings (Myers & Avison, 2002).

Data analysis also followed the interpretive tradition, using hermeneutics (Myers, 2009). Interviews minutes and observation documents were coded and analyzed. First, we found a number of potential problem categories. Then a subsequent, more careful qualitative data analysis (Miles & Huberman, 1994) uncovered a number of underlying problem themes. In this uncovering, we followed a process inspired by Goetz and LeCompte (1981). First, we scanned and coded the data and documents. This identified several categories of explanations for virtual management problems as well as attributes of both complex and interwoven relationships between problems. Second, we compared data and categories to uncover all relevant elements of the data. Third, our findings were then presented and discussed in a workshop in November 2010 with all the Danish liaison

officers in Bangalore and on 5 January 2011 with the whole Indian Management Group in DCI. Finally, in the fourth step, we arrived our conclusion in the form of a design of a conceptual framework for virtual project management.

3 Interview study findings

In general, we noted that there was a preponderance of engineers at DCI (compared with Denmark), and we noted that most employees have 4-year bachelor degrees rather than master degrees; although figures show that 35% had a master degree. We also noted that many of the interviewees had a background of having worked in another Indian company and thereby had experience from another outsourcing arrangement than the one at DCI. For example, a number of our interviewees had stayed in the U.S. or the U.K. before coming to work at DCI.

Problem #1 – Social ties take time

The first problem area identified is about social ties. The interviewees' experience is that in general it takes time to build social ties, social ties develops over time, in virtual projects it takes more time, and that it is considerably harder to forge social ties with someone you have not met face-to-face. In relation to this problem area, we also noticed that the Indians had very few professional and technical specialist networks. In Denmark, for example, developers often attend "on-the-way-.home" meetings and seminars in Dansk IT (The Danish Computer Society), Dansk Projektledelse (The Danish Association for Project Managers) or Tecpoint (Danish Association for companies in the Technical area). We did not find that in India. However, it is done internally in ITC Infotech and DCI by having a Quality month, tech month, etc.

Problem #2 – Not enough trust

The second problem area is trust. Again the interviewees' experience is that it takes time to build trust and it takes longer to get confidence at a distance. We (the researchers) found that problem #1 and #2 are related in that social ties and trust are mutually reinforcing.

Problem #3 – Lack of shared vision and language

The third problem area is about shared vision and shared language for better work. Based on the interviews, we found there is very limited use of a common vision or roadmap in the projects. This may be rooted in the fact that we mainly studied system management projects. Another part of this third problem area is lack of shared language and concepts. Here, some of the problems are related to national languages (in contrast to professional vocabulary). Thus if the majority of the project team had a shared language other than English, they may have a tendency to use this language in meetings and written correspondence which exclude those who had not mastered that language. In most projects, however, English is successfully implemented as the common language. Here different accents and sparse language skills occasionally result in miscommunication and discomfort in communicating.

Problem #4 – Cultural distance

Problem area 4 is issues related to cultural differences. Examples given in the interviews include differences in how self-propelled team members are expected to be, when uncertain, do you ask first or investigate/check yourself first, differences if you follow methods loyally or work out-of-process, differences in how you perceive performance measurements, differences related to management style, especially acceptance of formal and hierarchical power and the value of seniority.

All our interviewees agree that Danes take many things for granted, that it is important in India to obtain recognition after having finished a task, and that measurement is more acceptable in India. One solution that has been tried with some success is explicit training in cultural differences. Another successful initiative is a metrics program in India that DCI has built. Several metrics programmes have been tried without success in Denmark over the last 10 years – making it clear that the metrics and measurements are difficult in Denmark.

Cultural differences especially come to the surface in relation to management style. In Denmark, it is okay to have a rotating manager (as in Scrum). In India, a team prefers to be configured with a formal leader to work. Seniority is surprisingly important in India, say the Danes illustrating the distance between the two cultures. And Danes have found that DCI offshore teams do not work as well if everyone is at same level; you need the hierarchy in India. It is, however, not just seniority that counts. DCI have existed in Bangalore for 4 years and it is clear from our interviews that seniority in Danish Bank counts more than seniority in general (e.g. from other companies than DCI).

Problem #5 – Communication Issues

Problem area 5 is about communication issues. Much communication takes place on a daily basis and most of it works quite well. E-meetings work well and video meetings are used to a great extent. Chat is open and used very frequently for questions. Nevertheless, cost considerations to some extend limit the diffusion of new and potentially valuable technology. Communication works very well in some teams and not so well in other teams. Those who do it well will have invested a lot of time in it, e.g., meetings every day, chat etc.

Some communication issues are again culturally dependent. For example, we were told that Indians have a tendency to answer more on intention and social structure – not as things really are (related to yes/no-issue). Related to this it seems that Danes and Indians are not good at 'reading' each other. And this problem may become more severe when you have only virtual communication.

Problem #6 – Lack of reciprocity

Problem area 6 is about reciprocity. According to Merriam-Webster's Learner's Dictionary, reciprocity can be understood as having/giving the same rights to all or an agreement among different parties to do something similar for each other. In teamwork, neither rights nor exchange of favours may be stated explicitly but nevertheless a fair balance is expected.

Team members may do things for others with an expectation that the favour will be returned in some way in the future. In the interviews, different examples were given where the interviewees felt a lack of reciprocity: always having meetings in unpleasant timeslots, having individuals take your time asking questions without "paying you back" in different ways, newcomers feeling that they do not get the same opportunities as those with seniority.

Problem #7 – Not sufficient team identification across sites

Problem area 7 is about insufficient team identification. The interviewees experienced difficulties in identifying themselves with the team or realizing the true team spirit especially if there is only one or very few team members in one location and a larger number of team members at another location.

Two solutions make it easier for one to identify oneself with a team. One is co-location of the team members at a site. This happened, for example, in project Bravo. Another important vehicle that we have seen for creating team identification is a video meeting with all team members present.

4 Designing a conceptual framework for developing social capital in virtual projects

Performance of teams varies significantly. Barry Boehm (1981) in the book "Software Engineering Economics" found a factor of 1–4 between the best and the worst team – which on paper were equal. And DeMarco og Lister (1999) in the book "Peopleware" found a factor of 1–5. And 400–500% difference is worth an effort.

Our overall impression from the interview study was that to make virtual teams succeed you need to spend much more *time for* and *emphasis on* it.

Our preliminary focus on social capital was confirmed by the interviews meaning that the dimensions of social capital seem to play an important role. Thus, the conceptual framework we designed focus on the project managers' ability to facilitate the creation of social capital throughout all phases of a project.

We believe that the interviews and the literature (knowledge base) give strong grounding for a proposition saying.

> *You need to build social capital in all its aspects through all phases of building a virtual team to ensure successful virtual project management*

In the following section, we explain the conceptual framework we designed in detail. First, the theoretical basis for the two dimensions in the framework is explained in Section 4.1 "Phases in the virtual team process" and Section 4.2 "Elements in Social capital". These two dimensions result in a six-by-six matrix, which is described in details in Section 4.3.

4.1 Phases in the virtual team process

Pries-Heje & Commisso (2010) carried out a literature study on teams. They found four primary things of interest: (1) The Task; (2) Team Roles; (3) Team Working, and (4) The Process. The *task* to be undertaken by the team has an influence. For example, the more complex the task the more there is a need for a balanced team where all the *team roles* are enacted. Number three – *team working* – is mainly about two things that we also found. It is about the importance of trust (problem #2 above). Trust is really a prerequisite for an effective team. If you do not have trust in each other, you cannot work well together. You will show your 'facade' instead of your real self, and facades have never done a good job. And the second thing

of importance in relation to team working is to have a common vision within the team (problem #3 above).

Finally, the *process* that the team goes through is very important. We have the 'old' forming–norming–storming–performing model as a main proponent of the team process. In TSP (Humphrey, 2006), we also have the emphasis on a good team start-up in the form of a distinct launch activity. Commisso and Pries-Heje (2011, forthcoming) have developed a model for building team with six phases as described in Figure 4.

4.2 Elements of Social Capital

According to Evants and Carson (2005), social capital has three key elements; a structural element, a relational element, and a cognitive element,. The *structural* element of social capital is the network of ties and relationships possessed by group members and reflect the degree to which groups of individuals openly communicate. The *relational* element concerns the nature and quality of the relationship ties and refers to the trust that exists among a group. Research findings suggest that network ties that are not strengthened by mutual obligations, trusting relationships,

Constitute	Team and project constituted. Do we have the knowledge and competence needed; Team gathers; We ARE a team; Who am I?
Clarify	Who are the others, clarify group dynamics; how to communicate; how to decide; rules of conduct; social contract
Commit	Aim and goals, priorities, roles, context, and vision
Carry Out	Working – preferably effectively; continued group dynamics; ongoing communication and coordination
Check	How are we? Do we need to go back and repeat – build more social capital; mid way crisis?
Conclude	We have come to the end; what did we learn

Figure 4: *The Six-C model for team building (Commisso & Pries-Heje, 2011, forthcoming).*

and common language easily break down (Burt, 2002). The relational element can be decomposed into: identification, trust, and reciprocity. The *cognitive* element can be described as the shared language and shared narratives that together form a shared system of meaning. The cognitive dimension of social capital highlights the importance of shared representations, interpretations, and systems of meaning among parties, and it can be split into to sub-elements: shared vision and language and concepts. Hence using Evants and Carson's (2005) notion of social capital it can be understood to have six elements:

1. Structure
2. Relation
    a. Identification
    b. Trust
    c. Reciprocity
3. Cognition
    a. Shared vision
    b. Language and concepts

4.3 Designing a conceptual framework for developing social capital in virtual projects

In our design science research, we are now at a point where we have a very good and thorough understanding of the need and the problems as well as the existing knowledge base. After some iteration, we ended up with a design combining the Six-C model – as presented above – with six aspects of social capital, allowing the necessary building of enough social capital in all phases of a team.

In summary, the design looked like the one shown in figure 5.

In relation to our interview study, it is clear that our conceptual framework covers the problems that we identified:

- Problem #1 – Social ties take time. This is addressed by having a conceptual framework where you go through all the phases of team building, thereby allowing the time it takes to build social ties
- Problem #2 – Not enough trust. This is addressed by the strong emphasis on trust building; the third row in Figure 4.

- Problem #3 – Lack of shared vision and language. This is addressed by row 5 and 6 in our conceptual framework.
- Problem #4 – Cultural distance. Addressed partly in the fields saying "Hofstede".
- Problem #5 – Communication issues. As can be seen from Figure 2, better communication is a result of the heightened level of social capital, that is, all six rows in all phases in the conceptual framework. Furthermore, we have a row 7 "Others" that specifically addresses Communication.
- Problem #6 – Lack of reciprocity. This is addressed by row 4 on reciprocity in our conceptual framework.
- Problem #7 – Not sufficient team identification across sites. This is addressed by row 2 identification in our conceptual framework.

The overall idea in our design follows from the proposition: to be successful, you need to build all elements of social capital in all phases of a team. To populate the six-by-six matrix, we have chosen techniques that can be used in a team to build a specific part of social capital. In general, the techniques included come from a number of different sources. The main source was the book "Best Practices for Facilitation" (Sibbet, 2002). The second most important source was Duarte and Snyder (2006). Norm Kerth's book on "Project Retrospectives" (Kerth, 2001) was the main source for the Check and Conclude phases. Furthermore, we were inspired by agile techniques especially Scrum (Sutherland & Schwaber, 2010). The remainder of the techniques were taken from Commisso & Pries-Heje (2011, forthcoming). The choice of techniques was not incidental. We carefully discussed each of the 36 fields in the 6-by-6 model. We considered several techniques and we selected techniques that were especially well suited for both being done virtually (for example in a video or e-meeting) and creating social capital. Research method wise this was our Build and Justify iteration (middle part of Figure 1).

Space does not permit going through all 36 felts in the matrix, but a few examples are provided here.

Under Clarify and Relation/Identification there is a techniques called *Imagine Success*. What you do here is that:

- Everyone in the team thinks for himself or herself about the last project they participated in and was implemented successfully.
- You capture the feeling of success and transfer it to an idea of how a successful completion of this project is experienced.

	Constitute	**Clarify**	**Commit**	**Carry Out**	**Check**	**Conclude**
Structure / Social ties	Shield	Human behind What techniques?	Events	Celebrate Create social time	"Light" Retrospective *	Retrospective *
Relation/ Identification	Group portrait	Imagine success Confidence	Short feedback loop	Create team pride – talk about success	Process observation * "Light"	Retrospective *
Relation/ Trust	*Historic trust*	Team game rules	Explore barriers Define roles	Performance and knowledge.-based trust	Process observation * "Light"	Retrospective *
Relation/ Reciprocity	*Mindset for virtual work*	*Mindset for virtual work*	*Mindset for virtual work*	Identification trust	Process observation * "Light"	Retrospective *
Cognition / Shared vision	Knowledge map *	Hofstede *	Front page SPOT Big Steps Game Plan	Use common vision	"Light" Retrospective *	Retrospective *
Cognition / Language & concepts	Knowledge map *	Team building activities Hofstede *	1. Meeting Development Model Articulation protocol Common process & architecture		"Light" Retrospective *	Retrospective *
Others			Comm. need Stakeholder matrix		Fishbone	

Figure 5: *The conceptual framework we designed consists of a six-by-six matrix combining six parts of team building with six dimension of social capital. The '*' after the name of some techniques means that the techniques are repeated in other fields.*

- Tell the team what was it that helped you succeed in your projects and how your success is experienced.
- On a common screen or large piece of paper (seen on video) write: "The look of success" and around it write / draw what is everybody's individual perception of success

Under Clarify and Cognition (both shared vision and language and concepts) it says 'Hofstede' (cf. Hofstede, 2001). That is the name of a famous research in national cultures. We use it as a technique giving this advice:

- When high 'individualism' (as in DK and partly India), use team building to let individuals speak about themselves first and then talk about the cooperation after.
- Small 'uncertainty avoidance' (like DK), talk generally about how the team should work and give details later.
- Large 'uncertainty avoidance' (like India), use team building to precisely and in detail specify how you want to work together.
- If small 'power distance' (as in DK), use team building to let the individual talk about his background in relation to the team, and use competition-oriented activities where everyone can win.
- When large 'power distance' (as India), use team building to let individuals tell about themselves in relation to others and do not use activities that could upset the balance of power and hierarchy.

Under Commit and Cognition/Shared language and concepts, we urge the teams to use the Danske Bank development model with the following arguments about the advantages:

- Everyone has the same terminology in projects
- It becomes easier to register and understand data and experiences from earlier projects. The method can become a common framework for communication, i.e., of successes
- With well defined phases and documentation for each phase, management is much easier
- New employees without experience get a well defined platform to start out from

Under Carry out and Relation/identification, there is a technique called Create team pride – talk about success. This includes:

- As a (project) manager, you are responsible for telling about team success.
- Plan to facilitate an early success.
- Celebrate it.
- Build momentum.
- Team pride and team identification.
- Make the opponents think; maybe the project actually has the potential to become a success

5 Diffusion and adoption in Danske Bank

We presented the conceptual framework for management in Danske Bank in the last week of November. We clearly linked it to the problems we identified in our interview study as presented in this chapter. The response was very positive. Danske Bank was confident that focusing on building social capital had potential to help them improve their virtual (project) management.

It was then decided that we should teach it to task managers, process people, and general managers within DCI. That took place in week 1 of 2011. The aim of the five-day course we gave was that after the course the participants should be able to:

- Independently facilitate the start up of and the ongoing work in a virtual project team; that is, a team distributed across Denmark and India and have never been together in one physical location
- Choose appropriate techniques for six phases of teamwork to use in and facilitate the building of enough social capital within the team; enough to ensure that the team can work virtually

The evaluation by the participants emphasized the following more general comments:

- Introduced the topics that some consider very vague in a clear and perceivable manner.
- Though the techniques that were discussed were familiar, put together as a

package it was new and it encouraged us to think about what was being done.
- Sensitive subject but handles it very well with good examples/tools
- Practical tools given to us will really help in day-to-day management.
- Building social capital is the real value addition (by our conceptual framework).

We realized at the end of this course that it was necessary to give a similar course in Denmark. The resulting course took place on 2 February 2011. Here again the evaluation was quite positive and the participants were committed to using the conceptual framework.

The conceptual framework is now being used in seven project areas – mainly the so-called system management areas. All areas have made concrete plans for how to build social capital for their team. And they have each made a cost–benefit analysis specifically for their own project, showing that the benefits of building and ensuring enough social capital are much higher than the costs.

6 Conclusion

Hevner et al. (2004) expressed their view on what constitutes good design science research in the form of seven guidelines that are useful in understanding, executing, and evaluating design science and design research.

Design Science Research Guidelines (Hevner, et al., 2004)

1 Must produce a viable artefact.
2 Produces technology-based solutions to relevant business problems.
3 Evaluation that demonstrates utility, quality, and efficacy.
4 Research contribution of the design artefact, foundations, or methodologies.
5 Rigor in construction and evaluation method.
6 A problem-situated means–ends search for an effective artefact.
7 Communication to both technical and managerial audiences.

Ad. 1: We have produced a viable artefact in the form of the six-by-six conceptual framework.

Ad. 2: We started out with a relevant business problem, namely to improve virtual management in Danske Bank. We detailed it on the basis of an interview study into seven specific problems. To address these problems we build a technology-based – or rather techniques-based – solution.

Ad. 3: The first successful evaluation took place in November 2010 when the management of Danske Bank decided to apply the six-by-six conceptual framework. The second successful evaluation took place when the task managers in the course decided to apply the six-by-six concept in their own projects. The efficacy of the conceptual framework was only tried ex-ante (Pries-Heje, Venable, & Baskerville, 2008) in the form of a cost–benefit analysis. An ex-post evaluation can take place after the projects using the conceptual framework have ended or after at least 6 months use.

Ad. 4: The research contribution is the six-by-six conceptual framework. In the March and Smith (1995) notation, it is a Model (with techniques in 36 fields) and a Method (of using the techniques through phases of team building). The seven project areas that have committed to using our design are then seven instantiations.

Ad. 5: As can be seen from this chapter, we have been very careful and rigorous in every step of our research. We have followed and included all the steps from Hevner et al. (2004); thus making it rigorous designs science research.

Ad. 6: We started out with a problem given by Danske Bank and our whole undertaking was a means–ends search for an effective artefact to deal with specific aspects of the virtual management problem.

Ad. 7: We have communicated it to both managerial and technical audiences in Danske Bank. We are now in this chapter communicating our results to technical and managerial readers outside.

Thus, we believe the design created in the form of the six-by-six model artefact is a valuable contribution and a good example of design science research.

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Experiences with effects specifications

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Abstract. We describe the effects-specification process from a project that was conducted during the fall 2010 and spring of 2011 in this chapter. The project configured and implemented an electronic patient record system at a maternity ward at a hospital located in a European region. The process comprised workshops with effects specification with management and end-users and an agile development process including prototypes configured from the effects specifications. We describe the project and the effects-specification process through which effects were related to the system design and instruments for measuring effects were designed. The project is analyzed and lessons learned are discussed.

Keywords: partnership sourcing; effects-driven IT development, effects specification, effect means–end hierarchy, management effect workshop, end-user effect workshop, electronic health record.

1 Introduction

This chapter describes an information technology (IT) vendor's experiences with effects specifications used in a partnership-sourcing relationship with a client, a large hospital complex located in a European region (the Hospital for short). The IT vendor, CSC Scandihealth A/S (or CSC for short), has for years engaged in long-term relations with clients in the healthcare area using a partnership-sourcing approach. A partnership between the vendor and the client is especially relevant when the technical development and organizational implementation of large IT

systems extend over considerable periods of time and when the systems continually need to be re-configured to fit changing and emerging client needs. This is possible when the system is not developed from scratch but based on a highly configurable standard system.

The overall strategy of the Hospital is to use CSC's configurable standard system CSC Clinical Suite™ (CCS) as the Hospital's overall electronic health record (EHR) solution. CCS will be implemented in a step-by-step manner, and the Hospital should gradually be able to undertake a still larger part of the configuration and implementation. CSC has offered the Hospital an effects-driven IT development approach to support their partnership (see Chapter 8 by Hertzum and Simonsen, 2011). Effects-driven IT development changes the focus from one of detailed specifications of IT functionality to a focus on measurable effects that can document the needed utility value of the EHR. The idea is to base the partnership sourcing on agreed goals, specified in terms of the effects to be achieved by using the EHR at the Hospital. The effects specification documents and mediates the client's needs for change during the process of configuring and implementing the EHR. The partnership is organized as an experimental, user-driven, and effect-driven process: experimental when the domain to be supported is complex and the IT solution has to be configured and evaluated through an agile and iterative process; user-driven when it is important that the involved clinicians contribute to the development with their detailed insights into the clinical work; and effects-driven to specify, and subsequently measure, if and how the desired effects are attained. The effects-driven IT developments approach is used as a project management instrument to guide and facilitate the partnership between CSC and the Hospital.

In this chapter, we describe one of the initial effects-driven projects conducted by CSC and the Hospital. We focus on the effects-specification process and the associated project activities in which CSC and the Hospital meet and discuss key milestones during the project. Our empirical data have been collected using an action–research approach (Avison et al., 1999; Simonsen, 2009). During the project, one of the authors was employed at CSC and participated in the project as a CSC consultant. His experiences as well as the project documentation have been analyzed by the authors. It should be noted that this chapter is based on CSC's perspective of the project and process.

In the following section, we first present the general effects-specification process offered by CSC to the Hospital. Second, we outline the context of the project and the maternity ward involved in the effects specifications. Third, we describe the project process with a focus on the effects specifications and how these specifications guided the process. We conclude by discussing the lessons learned.

2 Effects specifications

CSC Scandihealth A/S has since 2005 employed effects-driven IT development to support partnership sourcing with some of its clients in the healthcare sector. Effects-driven IT development supports the development process during the specification and evaluation of a design. When engaged with a client, the effects set forth by the management define the scope of the project and, thereby, guide the process with the client's end-users. The end-users are engaged in workshops throughout the process and the effects identified serve as documentation of the design. In parallel, CSC transforms the specified effects into mock-ups or prototypes, which demonstrate the system functionality, intended to support the client in achieving the effects. During the pilot use – or later – the effects from using the solution are assessed systematically by means of event logs and questionnaires.

CSC organizes partnership sourcing as an agile effects-driven development process as depicted in Figure 1. Activities with the client are organized as a collaboration between management and clinical users from the client and configurators from CSC. The configurators have competencies in the clinical domain and are responsible for documenting the effects and for developing the mock-ups and prototypes. Technically, the prototypes are developed in CCS, which is a highly configurable framework tool based on the Oracle Healthcare Transaction Base™ (HTB). CCS can be configured by XML-based templates for overviews, clinical notes, results, standard plans, work situations, and the structure of the patients' medical record. This makes it possible to configure a complete medical record in accordance with the clinicians' requirements and, at the same time, remain open to changes in the configuration as new requirements emerge. The configurators collaborate with the CSC developers responsible for the CCS, especially regard-

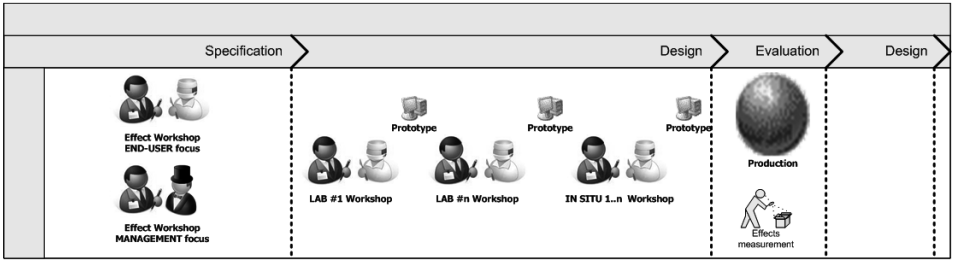

***Figure 1**. CSC's effects-driven IT development process for projects that involve the configuration of systems supporting clinical pathways in the healthcare sector.*

ing integration to other systems or if the effects specification requires changes in the next release of CCS.

During specification, the effects are used to identify management and end-user requirements related to the client's overall goals and to the daily work performed to fulfill the mission. The effects workshop with management and end-users results in an effects specification that forms the starting point for the development of prototypes.

The effects specify how the solution must be evaluated to determine whether the design supports the needs of the management and the end-users. The prototypes are iteratively evaluated through a series of workshops with users from the client. CSC distinguishes between laboratory workshops and in-situ workshops. Early prototypes are evaluated through laboratory workshops where users are confronted with the prototype in a 'laboratory' setting, that is, in a meeting room where the prototype is demonstrated and process models of the work supported by the prototype are drawn on an ad hoc basis to explain and discuss the prototype. The prototype is evaluated against the effects specification. The workshop identifies the requirements for implementing the new and revised functionality in the next version of the prototype, for elaborating the effects specification, and for discussing how the effects should be measured. As the prototype gets more mature, the laboratory workshops are replaced with in-situ workshops. In in-situ workshops the prototype is evaluated by end-users who should have up-to-date, first-hand experience of working with the clinical pathways that the prototype is to support. The workshop can take place in a meeting room or in the clinic where the system will be implemented. The prototype contains either relevant test data or actual patient data from the clinic, and the users evaluate the prototype by simulating or performing actual work using the system. In addition to revised functional requirements, the in-situ workshops might also involve an evaluation of the instruments designed to measure the effects of using the implemented system.

Effect specifications are descriptions of the effects that the customer and the users would like to obtain when they start using the envisioned IT-system. CSC uses a generic template for effects specifications. This template has five parts: *Effect* (the effect to be obtained in a specified situation), *agent* (the user of the system in this situation), *practice* (a description of the clinical activity and intervention involved in the situation), *outcome* (the result of the activity), and *evaluation* (a description of how to assess the extent to which the effect has been achieved). The template indicates that an effect is the anticipated outcome generated by the user in a specific situation and when performing a given activity using the system.

The effects to be obtained from using the system can be assessed from mul-

tiple perspectives and at multiple levels of abstraction. Therefore, the effects are specified in a five-level hierarchy, as described in Figure 2 (see also Chapter 8, Figure 8, by Hertzum and Simonsen, 2011). This hierarchy shows that effects are related to each other, as one effect can serve as a means to achieve another more abstract effect. Effects describe ends or means depending on whether they are seen as explanations of *how* effects contribute or *why* they contribute. Arranging effects into a means–ends hierarchy is inspired by cognitive work analysis (Rasmussen et al., 1994; Vicente, 1999) and the participatory design method known as the MUST method (Bødker et al., 2004).

The properties represented in the effects means–ends hierarchy are purposes and reasons at the top (high level of abstraction), general processes in the middle, and more specific information processes and the physical configuration of the IT system at the bottom. While IT has a direct influence on the lowest two levels, descriptions of IT functionality are typically absent at the three top levels.

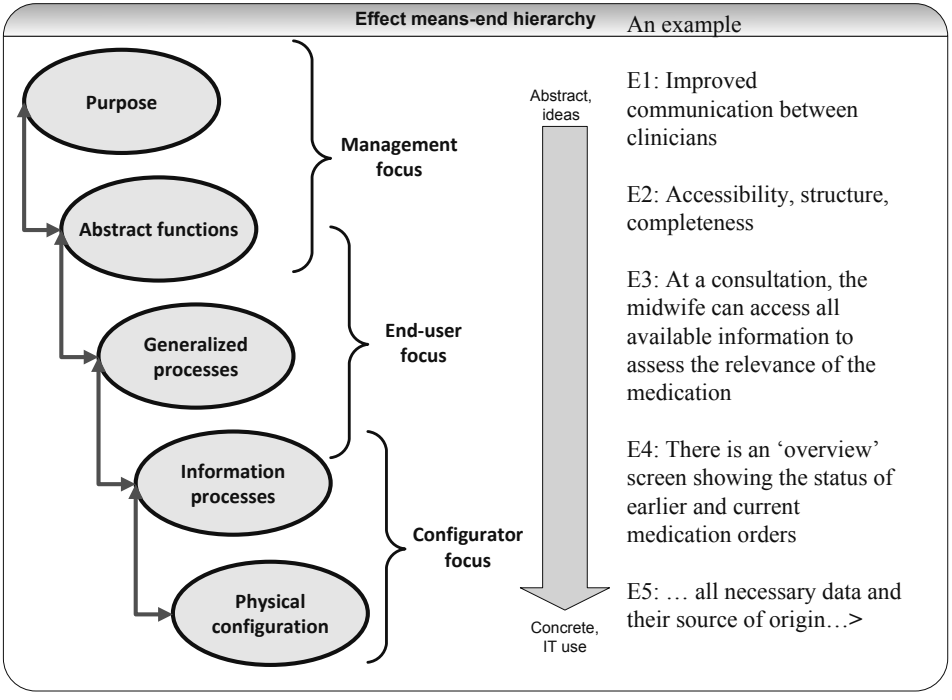

***Figure2**. Effects specification in five levels, ranging from strategic, through tactical, to operational effects.*

Each level is described in the following section (Rasmussen et al., 1994):

1. *Purpose*: This is the highest level of abstraction and represents the goals and purposes in relation to the organizational environment and the goal pursued through the lower levels. It is typically identified as policies, service goals etc. regarding quality and efficiency at the enterprise level of the client organization.
2. *Abstract functions*: This level addresses the prioritization and allocation of resources to the various generalized processes and activities on the level below. This second level describes the client's response, or strategy, to the environmental demands from level one and often relates to efficiency or the quality of service.
3. *Generalized processes*: This level represents business processes in terms of recurrent input–output processes and overall activities which are general and well-known in the work domain. It is not a detailed specification of an activity but might be compared to the "black box" metaphor because sub-processes or sub-activities are not specified at this level.
4. *Information processes*: This level represents information-processing tasks that define the generalized processes, including the human activities as well as the use of equipment. Typically, these tasks precede or succeed a clinical intervention. Example: One of the tasks during the preparations for a consultation involves looking at the overview of past consultations to determine whether there are any topics or events of relevance to the upcoming consultation. At this level, it is possible to map activities to the forms and views in the prototype.
5. *Physical configuration*: This is the lowest level of abstraction and consists of tools or objects which are the sources of information for a given tasks. At this level, detailed descriptions of user interfaces are given as screen mock-ups or interactive prototypes.

Figure 2 also shows the focus of the actors and stakeholders. Typically, the client's management is involved in specifying effects at levels one and two. These overall effects present a starting point for the end-users who specify the effects they want to obtain in their clinical practice, that is, in relation to general processes of managing and executing clinical pathways. The configurators then interpret the effects at level three and translate them into use patterns and system requirements at levels four and five.

An effects means–end hierarchy outlining client–vendor context, effects specification examples, and typical stakeholders is presented in the appendix to this chapter.

3 Project context

Prior to the project, a consultancy company made an overall business case for the Hospital. This business case concluded that the Hospital should implement an EHR for all clinical processes where the main parts of the patient records were still paper-based. Implementing a complete EHR system was intended to improve the quality of patient treatment along with ensuring more effective use of the available clinical resources. CSC was chosen as the vendor of the EHR system.

The partnership between CSC and the Hospital began with the implementation of CCS as a common portal, a view-station, giving access to data from all existing systems at the Hospital, including patient administrative systems, medication systems, laboratory results systems, and so forth. While CSC was responsible for the technical integration with the existing systems, the Hospital and CSC collaborated in developing the view-station. Views in CCS that present data from various existing systems are configured by means of the so-called satellites. A satellite is a generic component for data selection and presentation; that is, a screen display consists of a number of satellites each retrieving it own information from the database and presenting it in its part of the screen display. As more screens were configured, a library of satellites was developed and staff from the Hospital was trained in using this library to configure new screens. This way, the EHR was implemented first as a view-station introducing clinicians to the new system by viewing data from existing systems in the EHR. Simultaneously, the Hospital built competencies in configuring screen displays. A long-term ambition for the Hospital is to be able to configure new parts of the EHR themselves and to maintain and re-configure existing parts of the EHR to respond to changes in the clinical process or when new requirements emerge.

When the EHR had been implemented as a view-station at several of the Hospital's wards, the plan was to start using CCS for configuring screens for data entry. This is also referred to as the clinical-process part of the EHR and it supports clinical decision making and the clinical staff's on-going documentation of the information on the medical patient. This clinical documentation was still mainly paper-based at the Hospital. The Hospital chose its three maternity wards for its first clinical-process project. The maternity wards were chosen because the midwifes constitute an independent group of relatively few clinicians and because pregnant women are a delimited group of patients.

4 The maternity ward

During a woman's pregnancy, she will be in touch with different healthcare related organizations, mainly her general practitioner (primary healthcare sector) and the maternity ward (secondary healthcare sector), which consists of a pregnancy outpatient clinic (the midwife's clinic) and an inpatient maternity ward. The woman will visit the pregnancy outpatient clinic during her pregnancy for various inspections (e.g., ultrasound scanning) and for information meetings. When the actual delivery of the child is to take place, the woman will be hospitalized at the inpatient maternity ward.

The overall clinical process during a pregnancy is recorded in four different types of patient records:

- At the general practitioner's clinic, the visits by the pregnant woman are recorded in the patient record maintained by the general practitioner. This record includes all visits to the general practitioner (not only those related to the pregnancy).
- The visits at the midwife's clinic are recorded in the so-called Midwife Record. This record comprises all control visits and measurements and includes data about such things as family, dispositions (heritable, allergies, etc.), foetal position, results from various blood samples and ultrasound scannings, signs of possible complications, and so forth.
- During her pregnancy, the woman regularly visits both her general practitioner and the pregnancy outpatient clinic. For this reason, an additional Pregnancy Record is maintained. This record is a paper pamphlet kept by the woman herself and it works as a coordination mechanism (Schmidt and Simone, 1996) between the general practitioner and the midwife's clinic. The record includes personal details and history together with BMI, blood pressure, and other information pertinent to diagnostic and treatment decisions. The woman brings the Pregnancy Record with her for all the appointments during her pregnancy.
- When the woman is hospitalized at the maternity ward a new record is initiated: the Partogram Record. This record is used in managing the labour process and includes the continuous registration of data such as cervical dilatation, uterine contractions, foetal heart rate, descent of the head, state of membranes, blood pressure, pulse rate, drugs, and fluids.

The project was to focus on the clinical pathway related to the Partogram Record, that is, the process that begins from the time the woman is hospitalized at the

maternity ward and until the child has been born and the woman is discharged. Later, the Hospital decided to extend the project with the Midwife Record, that is, to include the process from the general practitioner's initial referral and the woman's first visit at the pregnancy outpatient clinic (a scanning offered 11 weeks into the pregnancy) and until she is hospitalized at the maternity ward (including regular visits in weeks 11, 13, 19, 21, and 35).

5 The project

The initial aim of the project was to specify and develop an electronic Partogram Record for the Hospital's three maternity wards. The project was organized with participants from the Hospital as well as from CSC:

- Three midwifes – one from each maternity ward – took part in the project group as representatives for the clinicians. It was three very experienced midwifes who were also heads of department for each maternity ward; in addition, one of them was chief midwife for the Hospital.
- Three persons from the Hospital's IT department participated in the project group. They constituted the project manager and two staffs who were to be trained to work as configurators. All three of these persons had participated in the prior projects implementing the view-stations.
- CSC participated with an experienced configurator responsible for the technical configuration and a process consultant specialized in effects specifications.

The project was planned as an agile process inspired by CSC's effects-driven IT development process outlined in Figure 1. The Hospital was responsible for the project while CSC was to configure the electronic Partogram Record, provide process support, and document the project.

In the following sections, we describe the effects specification of the electronic Partogram Record. To provide a coherent description we include the workshops held to specify effects and associated system design at all five levels represented in figure 2. Effects at levels 1 and 2 were specified at a management workshop, effects at level 3 were specified at end-user workshops, and a system design corresponding to levels 4 and 5 was made by CSC's configurator and process consultant, who also designed the instruments for effects measurement. Figure 3 gives an

overview of the project. The actual project process included other activities and events beyond those related to the effects specification.

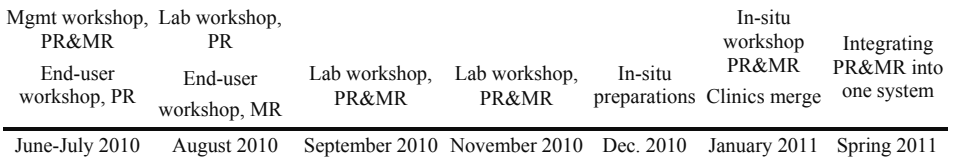

***Figure 3**. Project timeline (PR – Partogram Record, MR – Midwife Record)*

In the beginning, the project focused on the clinical pathway related to the Partogram Record. However, after a couple of months the project scope was extended to include also the Midwife Record. The Hospital's decision to extend the scope was made after the end-user workshop and laboratory workshop for the Partogram Record. Especially, the discussions related to the effects of obtaining an overview of the work situation elucidated that information from the Midwife Record (covering the pregnancy up until the woman is hospitalized at the maternity ward to deliver the child) was important to a high-quality overview of the patient during the active management of the labour process. The laboratory workshop illuminated the need for re-entering data from the paper-based Midwife Record. Thus, to meet the effects prioritized at the management workshop, integration with the Midwife Record was needed to provide high-quality support for overviews in the Partogram Record. In January 2011, the in-situ workshop of both the Partogram Record and the Midwife Record including an initial evaluation of the questionnaires designed to measure the effects was conducted. Then, the system was in principle ready to be implemented.

In parallel with the project, the Hospital was considering a major reorganization, and around the turn of the year 2010–2011, it was decided that the pregnancy outpatient clinics will be merged with the inpatient maternity wards and that all secondary healthcare services related to pregnancy will be consolidated. As an immediate implication for the project, the Partogram Record and the Midwife Record were to be integrated into one system. This organizational merger of the clinics and the corresponding integration of the two EHRs were well in line with the project discussions related to effects specifications, for example, level 1 effects specifying the purpose of giving better means of communication and collaboration, ensure continuity, increase information and communication between midwifes, as well as level 3 effects related

to overview (including coordination of responsibility and tasks during a handover).

The integration of the two systems and the organizational merger of the clinics took place during spring 2011. At the time of this writing, the implementation of the operational system and the effects measurements have been planned for May and June 2011.

5.1 Management workshop: effects specification at levels 1 and 2

The first workshop was a management workshop (see Figure 1). The aim of this workshop was to specify effects at levels 1 and 2 (see Figure 2) and thereby produce an effects specification concerning the overall purpose and abstract functions of the electronic Partogram Record. Later, when the project was extended to include also the Midwife Record, the effects at this high level turned out to fully include an electronic Midwife Record. The workshop was held with the chief midwife, the Hospital's project manager, and the process consultant from CSC. This initial workshop also served as an introduction to the overall project process and the effects specification. CSC's process consultant played a major role during this workshop.

The consultant started by presenting statements from the Hospital's overall business case determining the high-level effects to be pursued, including:

- Electronic records must always be available, coherent, and complete.
- Data must be structured in ways so that it is easy to understand and easy to reuse.
- Patient trajectories and record content must be standardized.
- Patient treatment must be correctly recorded for further reporting to national directories and for the settlement of activity-based accounting.

During the workshop, the business case was related to the electronic Partogram Record and the Hospital's strategy for implementing complete EHR solutions. According to the chief midwife, the main question to pursue was treatment quality, rather than resource load, to achieve better clinical practice and higher satisfaction from clinicians and patients. Thus, it was decided to prioritize quality related effects rather than efficiency. The level 1 effects reflecting the purpose of the electronic Partogram Record were defined as follows:

- To give better means of communication among midwifes and of collaboration between midwifes and physicians.

- To ensure the continuity of medical record-keeping for the individual midwife.
- To increase the information and communication between midwifes regarding the status and progress of the patients.

Level 2 effects mirrored the above described effects from the business case with one additional effect:

- The record is always available at the point where the clinical work is carried out.

5.2 End-user workshop: effects specification at level 3

Following the management workshop an end-user workshop was held (see Figure 1). The aim of this workshop was to elaborate the effects into level 3 effects about the general processes performed by midwifes at the maternity wards. This workshop was held with all project participants: the three midwifes, the Hospital's project manager and two staffs, and the configurator and process consultant from CSC. The workshop served as an introduction to the overall project process for those who had not participated in the first workshop, and CSC's process consultant again played a key role during the workshop.

At the workshop, the participants discussed and outlined the process of an uncomplicated delivery and the work situations involving the midwifes during this general process. This resulted in the identification of the following six generic work situations to be supported by the electronic Partogram Record:

- Overview (coordination of responsibility and tasks during a handover)
- Anamnesis recording (data gathering related to clinical interview)
- Clinical recording (data gathering related to clinical observation)
- Child investigation (data gathering related to clinical observation)
- Post partum recapitulation (administrative planning after delivery)
- Reporting (administrative incident reporting)

For each of the six work situations, the workshop participants specified the desired effects and discussed how to assess achievement of the effect. The effects were specified according to CSC's template for effect specifications. As an example, the 'Overview' situation was specified as follows:

Effect for the work situation 'Overview' (coordination of responsibility and tasks during a handover)

- *Effect*: The new midwife who is responsible has an overview that makes her capable of acting correctly and be informed about the observations and interventions relevant for the patient in the nearest future.
- *Agent*: The new midwife taking over a patient during the handover.
- *Practice*: As part of the handover of tasks and responsibilities, the midwife gets information by looking up information available about the on-going delivery.
- *Outcome*: The midwife does not need to look for supplementary information and she can go on to the next patient of the handover or end the handover.
- *Evaluation*: After the information has been handed over (and possibly after the midwife has seen the woman) an evaluation can ascertain whether parts of the 'picture' are missing. Is there a need for clarifying questions that might have been answered by the overview? Does the midwife feel ready to continue her work? How much time does the midwife need to read and/or search for information? Does the midwife get visual support regarding data that require intervention?

5.3 System design: effects specification at levels 4 and 5

Based on the specification of level 3 effects a first prototype, corresponding to the effects at level 4 (information process) and level 5 (physical layout of system), was designed. This was done jointly by CSC's configurator and process consultant and by the Hospital's two CCS staff.

At level 4, the different screens were identified and related to the work processes specified at level 3. The screens were defined as either *forms*, which are used for recording and for looking up individual data fields, or *views*, which are used for bringing data together and presenting an overview (by means of satellites). In total, 15 screens were identified for the electronic Partogram Record. In addition, a table was made naming the 15 screens (but not specified and further divided into fields or satellites), their CCS type, and their relation to the level 3 situations, that is, which work situations and effects the different screens are designed to support.

Level 5 consists of the different versions of the configured CCS prototype. For example, the 15 screens in the first prototype included four screens (three views and one form) that were designed to support the 'Overview' situation described above. These screens included views showing the data registered when the woman has been hospitalized, the clinicians who have been allocated to the woman since

her hospitalization, the interventions and clinical notes recorded, and an overview of the continual recording of labour-process data – some of which were visualized in graphical satellites (see Figure 4).

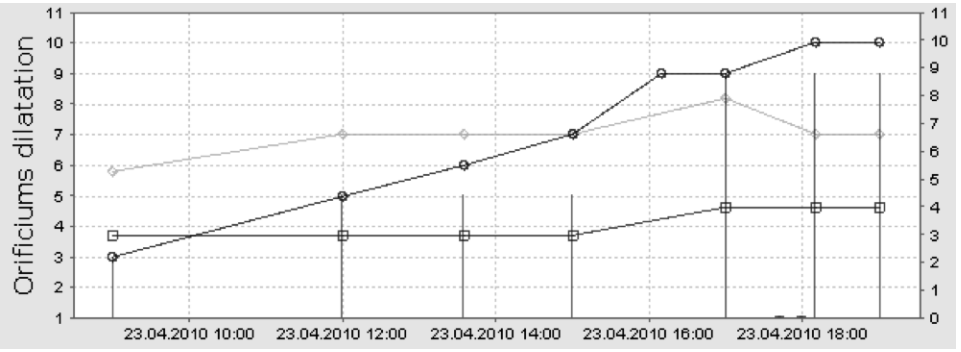

***Figure 4**. Satellite visualizing the labour process regarding the number and level of uterine contractions, salt drain infused, and analgesia.*

5.4 Effect measurement instruments

As one of the activities of the effects-specification process the instruments for measuring effects were devised and later evaluated as part of an in-situ workshop held in January 2011, where the prototype was tested using real patient data. At this workshop, six additional clinicians participated: five midwifes and one social and health care assistant.

Two types of instruments were designed based on (1) event logs and (2) questionnaires.

Event logs basically record when a key is pressed to initiate an event in the system, for example, when a user presses a key to open a specific screen, enter a value into a field, or commit changes to a record. Event logs are made automatically by the system. All events are recorded with a timestamp and a user-id. For example, if a user enters a new value into a field in the electronic Partogram Record, a record of the event is made specifying the date and exact time of the event along with information about which screen the user was using, which field on the screen was changed, the value entered into the field, the old value of the field, and the id of the user. Event logs can be analyzed by data mining techniques (Fayyad and

Uthurusamy, 2002) to investigate how the system is used (see Bøving and Simonsen, 2004). Statistics made from event logs can, for example, show the average degree of completion of a given part of the Partogram Record, the time spent completing a certain task using the system, which screens are used for a specified task, whether the users use screens other than those designed for a specific task, and the number of times the users hit the cancel button.

The *questionnaires* are designed to measure how the clinicians perceive using the system. Questions about three different kinds of effects were included in the questionnaires:

- Quality-related effects were included in the questionnaires by adopting parts of the Technology Acceptance Model (TAM) (Davis, 1989), using questions directed at perceived usefulness and perceived ease-of-use.
- The clinician's mental workload when using the system for a specific task is measured by means of the Task Load Index (TLX) (Hart and Staveland, 1988), using questions rating mental demand, physical demand, temporal demand, performance, effort, and frustration.
- Effects relating to overview and situation-specific issues were assessed by custom-made questions. This included questions such as 'your assessment of the status of the pregnancy for this patient', answered on a rating scale from 'clear' to 'unclear'.

To assess the 'Overview' situation, a combination of all three types of questions was designed for the midwifes to fill out after completing their hand-over. At the in-situ workshop, the questionnaire was used as part of the prototype test. Seven midwifes completed a total of 11 questionnaires after having tested the prototype.

Some of the TAM-inspired questions from the questionnaires were: 'By using this overview [a screen presenting an overview of the patient] – I can quickly get knowledge of the patient; – improve the quality of the clinical work I will subsequently do; – my clinical work becomes easier because I know enough about the patient; – I increase the efficiency of my clinical work; – I increase my productivity because I minimize the non-productive time; – I become able to complete my preparation faster; – I improve the performance of my clinical work; – I experience the system as usable when preparing my clinical work'. The evaluation of the prototype and the results from the preliminary effect measurement indicated that the system was almost ready to be pilot implemented at one or more of the maternity wards and the questionnaire worked well as part of the measurement instrument.

6 Conclusion: Lessons learned

The Maternity Ward project is the fourth effects-driven IT development project undertaken by CSC since 2005 (see Chapter 8 by Hertzum and Simonsen, 2011), and the processes and tools developed to manage and perform these projects are gradually becoming more mature.

CSC's standard process for effects-driven projects is depicted in Figure 1; tools to specify effects include the effects means–ends hierarchy in Figure 2 and the template specifying level-three effects in five parts: effect, agent, practice, outcome, and evaluation. As a general lesson, these generic processes and tools are perceived by CSC as operational instruments for managing an agile effect-driven process. Effects specifications are described in the client's own 'language' and form a usable means to mediate communication between different actors in partnership sourcing. Lessons from earlier projects led to the division of the effect-specification workshop into a management workshop, focusing on high-level effects (levels 1 and 2), and an end-user workshop, focusing on the effects related to the clinical processes performed by the end-users (level 3 effects). The primary focus of management, end-users, and configurators (on levels 1 and 2, level 3, and levels 4 and 5, respectively) has been observed in this project as well as in earlier projects.

Effects specifications at levels 1 through 3 appears to be adequate as a basis for the design of prototypes provided that the configurator has a clinical background and prior experience in configuring healthcare systems using CCS. This includes an ability to model the processes supported by the system and knowledge of the clinical information and data needed. A prototype was designed for the first laboratory workshop based solely on the effects specifications and the discussions from the two management and end-user workshops. CSC is, however, considering to use non-interactive mock-ups (Ehn and Kyng, 1991) as a replacement for the early versions of the prototypes. This is intended to shorten the iterations and thereby allow for more workshops to be planned without compromising the progress of the project. The first prototype was based on the configurator's interpretation of the effects specification. An evaluation of this interpretation might very well be conducted using mock-ups such as simple screen drawings that are much easier and quicker to make. This can provide for a fast mutual reinterpretation and eventual revision of the effects specification. Using mock-ups might also enable the client to participate more closely in the design since no technical competence is needed in configuring CCS.

Effects specifications have in earlier projects appeared to require few revisions once they have initially been specified, and they thus constitute a reference point in the management of the subsequent workshops and prototype revisions (see Chap-

ter 8 by Hertzum and Simonsen, 2011). This characteristic was verified in this project. The high-level effects (levels 1 and 2), specified at the management workshop, remained unchanged during the project. Even the decision to extend the project with the Midwife Record, in addition to the Partogram Record, and to merge the two clinics did not lead to changes or supplements to the effects at levels 1 and 2. Possible reasons for this stability include that they represent a high level of abstraction and thereby unaffected by most changes in work processes. The project aimed at improving the quality in the midwifes' work, while the clinical work as such was retained. The merger of the clinics had administrative and managerial consequences but entailed no changes to the practical management and organization of the clinical pathways. The effects specifications also reflected the management's loyalty to the Hospital's strategy for EHR solutions as the effects were tightly aligned with the effects specified in the Hospital's overall business case. Finally, it suggests that the effects were perceived as worth pursuing by management, which included experienced midwifes from the maternity wards and the outpatient clinics.

Extending the project with the Midwife Record also had only minor consequences for the effects at levels 3 and 4. The six work situations specified for the general processes at level 3 for the Partogram Record could be re-used in the Midwife Record without modifications. Two additional generic work situations and associated effects were specified at level 3, while two views and two forms were added to the specification at level 4. At level 5, the re-design comprised that a single system had to be configured for both pathways and that a number of data-entry fields in the Partogram Record had to be changed to show data recorded by the new screens for the Midwife Record.

Though the effects specifications were stable throughout the project, the in-situ workshop held in January 2011 resulted in a number of detailed comments and requests for changes. One lesson to be drawn from this is the importance of early involvement of experienced end-users with actual insight into current work practices. This is a general lesson, also referred to as the principle of first-hand experience of the work practice (Bødker et al., 2004). The three midwifes in the project group were very experienced and they were heads of department for the maternity wards. Having this management position also meant that they were mainly involved in midwife tasks when the ordinary midwifes required specialized assistance, that is, actually assisted a woman in giving birth. The in-situ workshop was attended by five additional midwifes with no managerial positions. These 'ordinary' midwifes noted that some information was not represented in the records. In the Partogram Record it was, for example, noted that the midwifes must record whenever they request for anaesthesia – a relatively new practice that the three

managing midwifes had overlooked. The absence of end-users with actual first-hand experience during the end-user workshop and the laboratory workshops might suggest some incompleteness and imprecision in the effects specification. An approach to having such knowledge included in the project could be to present the mock-ups or prototypes to a larger audience earlier in the process, as it is intended with the in-situ workshops.

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Effect means–end hierarchy	Client context, clinical work	Vendor context, IT product	Effects specification (examples from a CSC Scandihealth project with a client)	Dynamics and stakeholder representatives
Purpose	Political objectives, programs, regulations, accreditation	Product strategy	**Client**: Contribute to increased patient motivation **CSC Scandihealth**: Products supporting the clients business strategy	Politicians, Corporate CSC Senior Management, client and CSC Scandihealth **Effects are stable**
Abstract functions	Quality requirements for clinical work, service goals for clinicians, workplace assessment	Product suite; EHR, Paraclinical system, Patient Adm. System (PAS) laboratory inf.system (LIS)	**Client**: Better overview of patient trajectory within 3 categories: Managing the patients' state of health during evaluations (quality of life, well-being) Efficient recording by customizing documentation to work tasks (easy and efficient documentation) Homogeneous evaluation of patients (joint best practice) **CSC Scandihealth**: Priorities of functionality in accordance with other client requirements	Senior Management, client and CSC Scandihealth Middle manager, client Business architect, CSC Scandihealth **Effects are stable**
Generalized processes	Areas of clinical specialization, Nursing or treatment	Specific IT systems CCS, LABKA, VITAE, OPUS	**Client**: Consultation – coordination of responsibility/tasks during consultation. Therapist and patient can account for the distribution of responsibility. **CSC Scandihealth**: Providing a module supporting consultation and coordination between therapist and patient	Clinicians/end-users CSC Scandihealth process consultants **Effects are stable**
Information processes	Treatment regimes, patient trajectories, interventions, nursing plans	Modules, templates, booking-schemas, test-profiles.	**Client**: Patient's responsibility regarding goals and actions can be described by the patient giving a clear indication of the patients' own responsibility. **CSC Scandihealth**: To configure forms and views handling the recorded distribution of responsibility between the patient and the therapist.	Clinicians/end-users CSC Scandihealth process consultants, configurators, and developers. **Effects are dynamic**
Physical configuration	Specific elements within an intervention can be identified and described.	Screens, forms, views, satellites, controls, fields	**Client**: Schemas, templates. **CSC Scandihealth**: Prototype – IT supporting the intervention: A division of the screen/form when recording responsibility or a screen/view displaying the distribution of responsibility between healthcare provider/therapist and patient	Clinicians/end-users CSC Scandihealth configurators and developers. **Effects are dynamic and technically implemented**

***Appendix**. Effects means–end hierarchy outlining client–vendor context, effects specification examples, and typical stakeholders.*

Effects-driven IT development: Status 2004–2011

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Abstract. Information technology (IT) is a means to an end, yet many IT projects assign primacy to technical development and attend comparatively less to the organizational change effort that is required to attain a good fit between organization and IT system. This entails a risk of not capturing the benefits of the deployed system. Effects-driven IT development aims to counter this risk by providing an instrument for managing IT projects through a sustained focus on the effects desired from the use of the IT system. A sustained focus on effects entails that the specification, realization, and assessment of effects become central systems-development activities. In this chapter, we describe the six empirical projects we have conducted in our work on effects-driven IT development during the period 2004–2011 and we discuss the experiences gained so far. The empirical projects indicate that the desired effects can be specified and measured, though we have mixed experiences with ensuring that effects are measured. An effects hierarchy has been devised and appears suitable for working with effects at different levels of abstraction. A key challenge with which we still have insufficient experience concerns how a partnership with close relations between a customer and a vendor can be established. Finally, we have yet to address whether and how to incorporate an effects-driven approach in the contractual regulation of IT projects.

Keywords: effects-driven IT development, partnership sourcing, pilot implementation, evaluation.

1 Introduction

Many information technology (IT) projects do not produce the effects the customer aims to achieve. From the customer's point of view, such projects are full or partial failures, but the vendor may nevertheless have fulfilled the contract by delivering the specified system functionality. Effects-driven IT development – our attempt at addressing this situation – supplements functional specifications of systems with (a) specifications of the effects the customer wants to achieve and (b) measurements of whether these effects are in fact achieved during the pilot use of the system. The rationale for making measurements of specified effects a part of IT projects is to establish and maintain a focus on the ends for which the system is a mean and to make organizational implementation an integral part of IT projects. We contend that a sustained focus on desired effects will make it easier for customer representatives to take part in IT projects and that vendors will be able to extend the scope of their business with elements of the management of organizational-change processes.

Effects-driven IT development is an instrument for the management of iterative, participatory, and experimental projects concerning the technical development and organizational implementation of large, complex systems. Due to the size and importance of such projects, effects-driven IT development aims to establish a strategic partnership characterized by trust, mutual learning, and collaboration between customer and vendor. Effects-driven IT development focuses on (a) effects rather than products and processes, (b) measurements rather than expectations and estimates, and (c) effects specification rather than functional specification. Starting from these characteristics the customer and vendor develop IT systems with measured effects on the customer's work. Effects measurement is an important tool in the mutual adjustments between the customer and the vendor about how far they have progressed.

We believe effects-driven IT development is generally applicable to large IT projects but particularly to complex and business critical projects. In our empirical work, we have so far focused on the development and implementation of electronic patient record (EPR) systems in the Danish healthcare sector. Two reasons for this focus are that the development and deployment of EPR modules is, at present, a prominent example of large and complex IT projects and that the complexity has both technical and organizational elements. In addition, there is a large need for achieving – and documenting – actual benefit of the substantial EPR investments. This need is exacerbated by bad experiences from previous projects based on a

linear development model with insufficient focus on organizational implementation.

Our work on effects-driven IT development started in 2004 and was until 2007 part of the HealthcareIT project. Since 2008, we have continued the work in the context of the SourceIT project. In this chapter, we describe our experiences with effects-driven IT development during the period 2004–2011 and we discuss the status of our research questions. We start by describing effects-driven IT development and then give an overview of the six empirical projects through which we have developed and applied effects-driven IT development. Following the overview of the empirical projects, we discuss our experiences, assess the status of our research questions, and point toward focal areas for our future work on effects-driven IT development.

2 Effects-driven IT development

The cost–benefit relation in many IT projects is unclear, and IT systems often do not lead to appreciable benefits. Two related characteristics of IT projects appear to contribute to this unsatisfactory state of affairs. First, the relationship between the customer and the vendor is in most IT projects regulated through a specification of the functionality of the system. This means that an understanding of the users' needs is transformed to a specification of system functionality, which then defines the system. It is, however, well-known that functional specifications may not fully match users' actual needs. This mismatch becomes particularly evident in situations where the vendor argues that the basis for determining whether the contract has been fulfilled is whether the system meets the specification, whereas the customer's experience of the system concerns whether it meets the users' needs. The effects the customer seeks to achieve are in focus during the early stages of an IT project but thereafter they are often replaced by functional specifications though such specifications have known shortcomings.

Second, IT projects tend to focus on technical development while the importance and complexity of organizational implementation are often underestimated. However, the customer does not attain the desired effects until both technical development and organizational implementation succeed. Many IT projects end before the customer has achieved the effect that was the rationale for introducing the system and, thereby, also before there is evidence that it is possible to achieve this effect with the new system.

Effects-driven IT development (Hertzum & Simonsen, 2004, 2010b, 2011; Simonsen & Hertzum, 2005, 2008, 2010) aims to counter the shortcomings of functional specifications through a sustained focus on the effects the customer seeks to achieve by adopting and using a system. The overall idea of effects-driven IT development is to specify the purpose of the system in terms of effects that are both measurable and meaningful to the customer and to systematically assess whether these effects are achieved when a pilot version of the system has later been developed and subjected to realistic use (see Figure 1). Effects are in many ways similar to key performance indicators (KPIs) and to the notion of benefits in benefits management. A sustained focus on effects emphasizes that the functionality of a system is a means to an end, but it also entails that effects must be specified as well as measured within the timeframe of the IT project. Thereby, effects-driven IT development blurs the distinction between technical development and organizational implementation in favour of a focus on the complete process from business case through development and deployment to the achievement of effects. This implies that effects measurements are formative in the sense that they are an instrument in a typically iterative process where the results of the individual measurements provide important guidance to subsequent activities. In contrast, summative evaluations aim to measure the end result of a process. While summative evaluations are well-known from, for example, research studies of IT systems, formative use of effects measurements as an instrument in the development of IT systems is specific to effects-driven IT development and a few other approaches to information systems development.

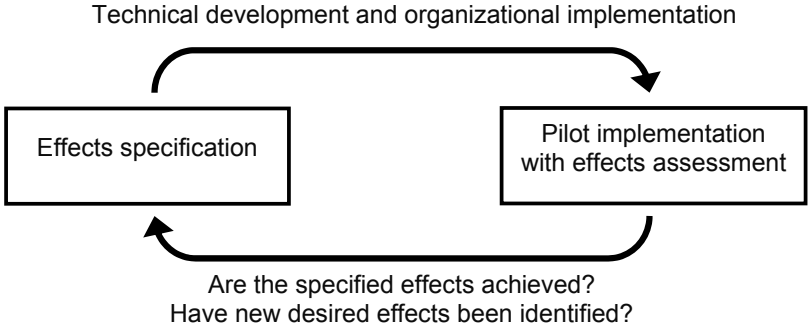

Figure 1. *Effect-driven IT development entails a sustained focus on effects.*

Concrete examples of effects include that a physician can complete her or his medical ward round without being escorted by a nurse. This makes the physician's medical ward round more efficient and the nurse can focus on caring for the patients. Another example can be a reduction in the clinicians' mental workload during the daily, cross-disciplinary team conference. A lower workload reduces the risk of errors in the clinicians' treatment of the patients. The effects desired from a system often form a hierarchy where high-level effects specify why effects at lower levels are desirable, while effects at lower levels specify how higher-level effects can be achieved. The primary focus of effects-driven IT development is typically on the direct effects on the users' work. The main reason for this is that these effects can be specified most accurately, whereas high-level political and strategic effects tend to be more indirect and thereby more difficult to relate to an IT system in a concrete and measurable manner. A supplementary reason is that the success of a system is critically dependent on the users' attitude toward the system and thereby on the extent to which the users agree to the pursued effects and can relate them to their work and needs.

Our work on effects-driven IT development has addressed five research questions, which we consider central to working systematically with effects as an instrument for managing information systems development. Our five research questions are:

1. *How can desired effects be specified and specified effects measured?* Effects are likely to be more stable than functional requirements because effects are at a higher level of abstraction and are fewer in number than functional requirements. If a focus on effects is to provide a framework for experimenting with different designs it must, however, be possible to identify, formulate, and prioritize effects as well as to find ways of measuring them. We propose that this is done in collaboration with the users following a participatory-design approach.
2. *How can pilot implementations create the conditions for measuring the effects of using a system?* To use effects actively as an instrument for managing IT projects, the system must be subjected to periods of real-world use, and these periods must be within the timeframe of the IT project. We envisage that such pilot implementations can be conducted for systems that are based on configurable platforms and by making creative use of simulation of system modules.
3. *How can effects that are specific to the users' work processes be related to overarching strategic and political effects?* An understanding of the relationship between different effects is essential to understanding and arguing for why a set of effects is desirable and how the effects can be achieved. Such an understanding

requires clarity about how overarching effects are implemented at lower levels and about the effects that are directly related to the users' work.

4. *How can the partnership that is necessary for effects-driven IT development be established between the customer and the vendor?* Effects-driven IT development involves a blurring of the distinction between technical development and organizational implementation. The customer's adoption and use of the system influence the vendor's success and the vendor will, therefore, demand influence on how the customer approaches organizational implementation. Such partnerships require trust between the customer and the vendor, for example, developed through a long-lasting, strategic collaboration.
5. *How can an effects-driven approach be incorporated in the contractual regulation of IT projects and what are the consequences of doing it?* A sustained focus on effects in the management of IT projects ultimately presupposes that the effects are not subordinate to other management instruments. The existing contract types appear to be biased toward functional specifications and a linear development process. The development of a fully or partially effects-driven type of contract will be an important strengthening of effects-driven IT development.

Effects-driven IT development builds on participatory design (PD) and user-centred design (UCD). In these research traditions, the focus is on methods and techniques for mutual learning between, on the one hand, the domain specialist (the customer) and, on the other hand, the IT and organizational-change specialist (the vendor).

3 Projects

A concrete consequence of our roots in PD and UCD is that our work with effects-driven IT development takes place in close, empirical collaboration with customers and vendors.

3.1 Clinical Process

The first project we conducted in the research program was Clinical Process (DVD documentary, 2006; Hertzum & Simonsen, 2008; Pedersen et al., 2006; Simonsen & Hertzum, 2008). This project focused on how the development and

implementation of an integrated EPR solution can be organized as an experimental, participatory, and effects-driven process. The EPR solution was to support all documentation so that the clinical work could proceed without any paper records.

The research goals of the project were:

- To conduct a large-scale experiment with effects-driven IT development
- To investigate whether and how effects of IT use can be defined and measured
- To analyze the customer's and vendor's experience and accept of such effects measures
- To assess whether the EPR solution gave the clinicians the desired effects, especially with respect to better overview and coordination

The project was an action–research project and was conducted in 2005–2006 in collaboration with the EPR Unit of Roskilde Amt and CSC Scandihealth.

The EPR Unit wanted to acquire knowledge about the clinical value of a clinical-process module and about the magnitude of the effort required to introduce such a module. The EPR Unit was very aware that success with a clinical-process module required that the clinicians experienced an immediate benefit from using it. The strategy was to conduct pilot implementations to learn about the effects of the EPR module before it was "rolled out".

CSC Scandihealth wanted to evaluate the configuration process associated with their new EPR platform, CSC Clinical Suite, and to evaluate its usability in a real-life clinical situation. Their purpose was to test the system's performance, scalability, and its flexibility concerning integrations with other systems. CSC Scandihealth had an interest in documenting the usability and usefulness of the system toward Region Sjælland and other potential customers, such as Region Nordjylland, which at the time was initiating the tender and bid process for a large EPR project.

The Clinical Process project was conducted at the Stroke Unit of the Neurological Ward of a medium-size hospital (Figure 2). Five full-day workshops were conducted with clinicians from the Stroke Unit, during which their suggestions for effects from the system were specified and prioritized. The top-priority effects were improved overview of the patients combined with support for coordination. Similarly, the specification of clinical content focused on the situations involving intense coordination: the nursing handovers, the team conferences, and the medical ward rounds. During the five workshops, the EPR system was designed through up to three iterations of mock-ups and prototypes.

The configuration of the EPR system in Clinical Suite comprised 243 screens, including overviews, standard treatment plans, laboratory results, and notes, which could run on portable as well as stationary computers, on large-screen displays during nursing handovers and team conferences, and on PDAs for the registration of, among other things, stroke in progression (SIP) scores. Interfaces were developed to existing systems (e.g., GS, Labka, OPUS Medicin), and five years of patient data were migrated to the system.

Project start up	Workshops with effects specification, specification of trajectories, design of EPR		Effects measurements (paper records)		Effects measurements (EPR)		Project evaluation
		Configuration	Integration and test	Training and test	Pilot use	Analysis	
August 2005			November 2005		Week 50		February 2006

***Figure 2**. Timeline for Clinical Process.*

After a training and test phase, the system was used during Week 50. During this week the paper records were replaced by the EPR system, which ran 24 hours a day and covered all patients at the Stroke Unit. As a safety precaution 'shadows', in terms of staff from CSC Scandihealth and the EPR Unit, were continually present to support the clinicians in case of uncertainty about how to use the system. A 'back office' was also established and staffed round the clock. The back office monitored the use of the system and simulated transactions between the Stroke Unit and other hospital wards: Requests entered into the system by the clinicians were printed by the back office, sent manually, and when the reply arrived it was typed into the system. This way the clinicians at the Stroke Unit experienced the system as though it was implemented across the entire hospital.

Measurements were made before the use of the EPR system and during the use of the EPR system. These effects measurements comprised 15 nursing handovers, 11 team conferences, and 8 medical ward rounds. The effects measurements were subsequently analyzed, and the project as a whole was evaluated and discussed at a full-day workshop in February 2006. The clinicians, the EPR Unit, and CSC Scandihealth expressed satisfaction with the experimental, participatory, and effects-driven process, and the EPR system led – in spite of the brief period of use – to several measurable, positive effects.

3.2 Clinical Monitoring

The Clinical Monitoring (KLIMO) project (Granlien, 2010; Granlien, Pries-Heje, & Baskerville, 2009) investigated the possibilities of introducing a clinical-monitoring system promoting the Danish Healthcare Quality Programme, developed by the Danish Institute for Quality and Accreditation in Healthcare. Effects-driven IT development was to be used in the development and evaluation of a system that could replace a number of paper forms (for the registration of, e.g., growth curves, respiration, SIP, and diabetes). The system should support real-time registration using a standardized terminology (SNOMED CT) and should present the registered data in overviews along with data from other systems (e.g., PAS and OPUS Medicin).

The research goals of the project were:

- To conduct a series of small, focused experiments with effects-driven IT development
- To define and measure effects of IT use over a longer period of time, including a focus on direct effects on patient outcomes
- To assess whether the system contributed to achieving the desired effects
- To investigate the implications of effects-driven IT development in relation to the organizational implementation of the system

The project was an action–research project, and it was conducted in 2006–2007 in collaboration with CSC Scandihealth and Region Sjælland (Figure 3).

		Six workshops with effects specification and system configuration			
Project start up	Configuration	Test and configuration	Preparations for pilot implementation	Training and pilot use	Project evaluation
August 2006	September 2006		November 2006	January 2007	February 2007

Figure 3. *Timeline for the KLIMO project.*

Region Sjælland wanted better knowledge about the possible benefits of – and requirements for – a large, future investment in a clinical-monitoring EPR module. In addition, they wanted to identify the derived consequences of introducing such a system with respect to, among other things, revised work procedures, possibilities for changes in the division of labour, changes in the time spent on clinical monitoring, the needs for training, and the resources and competences

needed for continual re-configuration, maintenance, and operation of the system.

CSC Scandihealth wanted a reference installation for quality assessments based on the Danish Healthcare Quality Programme in order to demonstrate their system's configurability, integrability, scalability, and that it could be made part of a solution for clinical monitoring.

The project was established in August 2006, and during fall that year six full-day workshops were conducted to specify the desired effects and the system design. A total of six forms were designed in collaboration with clinicians from the departments that participated in the project: neurology, cardiology, paediatric and respiratory medicine. The system was configured and tested, and the participating departments made preparations for the pilot implementation in parallel with the workshops. The pilot implementation was initiated in January 2007 with some delay and a reduction in system scope and the project was evaluated in February 2007.

KLIMO demonstrated that clinicians find it easy to formulate, specify, and prioritize effects. The project also contributed in terms of experiences regarding the practical and organizational challenges involved in conducting pilot implementations. Due to resource scarcity, the pilot implementation became shorter and more narrowly scoped than planned and the project was discontinued after the evaluation in February 2007.

3.3 Healthcare Centre Workspace System

The Healthcare Centre Workspace System (HCWS) project (Barlach & Simonsen, 2008, 2011) concerned effects-driven IT development at the newly established municipal healthcare centres. The focus of the project was to specify and develop/configure selected patient trajectories based entirely on effects specifications. The system should support the planning, clinical consultation, and continual follow-up of the patient trajectories for diabetes, chronic obstructive pulmonary disease, obesity, smoking cessation, and certain forms of cancer.

The research goals of the project were:

- To devise a model in which effects at different levels are related (from effects close to the clinical work to overarching strategic and political effects)
- To investigate whether effects specification can be used as an alternative to use cases

- To investigate the transferability of effects measurements, including whether effects measured at one healthcare centre are representative of measures from other centres
- To design effects measurements that require a minimum of resources from the clinicians, for example, by basing the measurements on log data

This action–research project was conducted in 2007–2008 in collaboration with CSC Scandihealth and three newly established healthcare centres (Figure 4).

Project start up	Workshops with effects specification and system configuration	Design of effects measures		Strike among Danish healthcare staff	Pilot implementation discontinued
		Integration and test	Pilot implementation		
August 2007	October 2007		February 2008	April–June 2008	August 2008

Figure 4. *Timeline for the HCWS project.*

The healthcare centres were especially interested in being able to evaluate the effect of the system and relate this effect to high-level clinical and strategic/political goals concerning, for example, patient empowerment and motivation. The patient trajectories should be developed and IT supported on the basis of the principles of guided self-determination.

CSC Scandihealth wanted to develop effects-driven IT development further and to train their configurators in conducting system specifications based on effects-driven IT development. Technically, the system would become part of OPUS Healthcare Portal. The project would later be followed by projects at other healthcare centres to assess the transferability of the specified and measured effects.

Six workshops were conducted with representatives from management and healthcare-centre clinicians. The initial workshops focused on the effects the healthcare centres wanted to pursue. The effects were specified in a means–ends hierarchy with five levels (environment, strategy, process, work domain, and IT system). On the basis of these specifications, prototypes were iteratively developed and discussed at subsequent workshops.

A plan was made for measuring effects concerning aspects of the quality, efficiency, and satisfaction that resulted from using the system. This plan consisted of online questionnaires integrated in the system and of automatically recorded log data about the use of the system. The questionnaires were based on the techn-

ology acceptance model (TAM), the task load index (TLX), and the health care empowerment questionnaire (HCEQ).

The pilot implementation of the system was initiated in February 2008. Due to technical problems the pilot implementation had to be aborted and when the technical problems had been resolved the healthcare staff in Denmark went on strike. The strike and the summer holidays following immediately after it delayed the project considerably and it was therefore decided that the effects measurements would be cancelled.

The project produced useful results with respect to effects specification and the design of effects measurements. In addition, we got valuable experiences about organizing the collaboration between the customer and the vendor, about requirements for the technical development platform, and about how to plan and carry out pilot implementations.

3.4 Electronic Medication Record

The electronic medication record (EMR) project (Granlien, Hertzum, & Gudmundsen, 2008; Granlien, 2010; Granlien & Hertzum, 2009; Hertzum & Granlien, 2007) was part of a larger project aiming to consolidate the medication module of OPUS in Region Sjælland. The focus of the EMR project was to identify target areas for achieving effective use of the EMR in the medication process and to evaluate a number of interventions with respect to their contribution to achieving a safe medication process in which the EMR is used efficiently. The purpose of the EMR is to support the clinicians in giving the right medication to the right patient at the right time.

The research goals of the project were:

- To uncover the extent to which the departments at the hospitals in the region used the facilities provided by the EMR and followed the procedures associated with the system
- To identify any barriers to the use of the EMR in accordance with its purpose and as prescribed in the procedures for the medication process
- To work in a effects-driven way with the organizational implementation of the EMR by iteratively conducting interventions and measuring their effect
- To design effects measurements that do not tax the clinicians in their daily work, by using record audits to measure the effect of the interventions

The project was conducted in 2007–2008 in collaboration with Region Sjælland (Figure 5). The vendor of the EMR was CSC Scandihealth but they did not participate in the project, which consisted of three phases:

First, a questionnaire survey about the use of the EMR was conducted at all clinical wards at the hospitals in the region. The region was especially interested in this survey because they had the impression that many wards used the EMR partially, and because the EMR might consequently have an untapped potential. The region saw the survey as the first step in increasing the benefit of their investment in the EMR.

Second, interviews were conducted at two wards that had progressed far in their adoption of the EMR. The interviews aimed to uncover how these wards had handled barriers in the use of the EMR and served, partly, as an elaboration of the survey and, partly, as a preparation for the intervention study.

Third, an intervention study was conducted at one ward to increase and improve its use of the EMR. The region's interest in the intervention study was to gain experience with taking an effects-driven approach to organizational implementation and to improve the utility value of the EMR at the selected ward. These experiences would subsequently be used at other wards.

The intervention study involved four interventions with a common focus on delegated medication orders, which enabled the nurses to order certain types of medication in order to reach the goal of recording all medication in the EMR, rather than, for example, in the nursing Kardex. The interventions and the effect they aimed to bring about were identified at a workshop with clinicians from the ward. The effects of the interventions were assessed at six record audits: two before the interventions, two during the interventions, and two after the interventions. In addition, the use of the EMR was observed before and during the interventions to get an impression of how the interventions were received by the clinicians.

Questionnaire survey		Workshops, effects, and effects measures		Intervention period			
	Interviews	Audit 1	Audit 2	Audit 3	Audit 4	Audit 5	Audit 6
August 2007		February 2008		April–May 2008			September 2008

Figure 5. *Timeline for the EMR project.*

We found large differences in the extent to which the wards used the EMR, but the general picture was that several system facilities and mandated work procedures

were used consistently by a minority of wards. The interventions led to the desired decrease in the amount of medication information not recorded in the EMR, but the last record audit three months after the end of the interventions indicated that the effect of the interventions might not be lasting.

3.5 Maternity Ward

The Maternity Ward project (Simonsen, Hertzum, & Barlach, 2011) is the fourth effects-driven IT development project undertaken by CSC Scandihealth since 2005, and the processes and tools developed to manage and conduct these projects are gradually becoming more mature. Effects-driven IT development is used as an instrument for guiding and facilitating the partnership between CSC Scandihealth and a large hospital complex located in a European region (the Hospital for short). The Hospital's overall strategy is to use CSC Clinical Suite (CCS) as the platform for all parts of its Electronic Health Record (EHR). The EHR is developed and implemented in a step-by-step manner and the Maternity Ward project is the first project that includes the clinical-process part of the EHR. The project focuses on how effects are specified and how a relationship can be established between the customer and the vendor.

The research goals of the project are:

- To evaluate a hierarchical model for effects specification including effects at strategic, tactical, and operational levels (see Figure 8, in Section 4)
- To evaluate CSC Scandihealth's process for effects-driven IT development when it is used for configuring systems that are intended to support clinical pathways
- To try out effects measurements that require a minimum of resources from the customer and the vendor
- To explore how effects measurements can be incorporated in the contractual regulation of subsequent projects

The project has been running during the period 2010–2011 (Figure 6) and comprises two related clinical pathways and EHRs: the Midwife Record, which covers the pregnant woman's outpatient treatment during her pregnancy, and the Partogram Record, which covers the pregnancy from the time the woman is hospitalized and until the child is born. Except for a few workshops early in the project the two records have been developed jointly.

Management workshop	Lab workshop (PR)				Pilot use	
End-user workshop (PR)	End-user workshop (MR)	Lab workshop	Lab workshop	In-situ workshop	Effects assessment	Project evaluation
June-July 2010	August 2010	September 2010	November 2010	January 2011	Spring 2011	Fall 2011

***Figure 6**. Timeline for the Maternity Ward project (MR – Midwife Record, PR – Partogram Record).*

The project follows CSC Scandihealth's process for effects-driven IT development. This process consists of a series of workshops with the customer. First, effects were specified in separate workshops with management and end-users. These effects specifications formed the starting point for iteratively developing prototypes and evaluating them at workshops with clinicians. Early prototypes were evaluated in laboratory workshops; that is, in a setting away from the users' real work. In a laboratory workshop the prototype is demonstrated using a projector and supported by process models of the clinical pathway drawn ad hoc on a whiteboard. The prototype is evaluated against the effects specification. As the prototype gets more mature, the laboratory workshops are replaced by in-situ workshops. In in-situ workshops the prototype contains either realistic test data or actual patient data from the clinic, and the users evaluate the prototype by simulating or conducting actual tasks using the prototype. The outcome of each workshop is requests for revisions of the prototype and of the measures for assessing the achievement of effects during a pilot implementation of the system.

Effects achievement will be assessed on the basis of data from event logs generated automatically by CCS and from online questionnaires triggered at predefined points in the clinicians' use of the EHR. The final evaluation of the project will include an analysis of the legal implications of using effect assessments as part of an addendum to future contracts.

CSC Scandihealth sees the process for effects-driven IT development and the hierarchical model for effects specification as operational management instruments for guiding an agile development process. The project has, however, reinforced that the users who participate in the effects-specification workshops and laboratory workshops need to have concrete insight into the customer's current work practices. Effect specifications appear to be a useful mediation tool in the communication between the different actors in the vendor's partnership with the Hospital. The high-level effects specified at the management workshop were tightly aligned with the effects formulated in the Hospital's overall business case and they have

remained unchanged throughout the project. After the effects had been specified it was decided to integrate the Midwife Record and the Partogram Record. This happened as part of an organizational merger of two types of clinic and it occasioned no changes or supplements to the high-level effects and only minor changes to lower-level effects.

3.6 Clinical Overview

The Clinical Overview (CLOVE) project (Hertzum & Simonsen, 2010a; Rasmussen, Fleron, Hertzum, & Simonsen, 2010) concerns the design, technical development, organizational implementation, and evaluation of IT systems for supporting clinicians at emergency departments (EDs) in maintaining the overview they need in their work. The project addresses clinical overview at two levels. At the ward level, overview is about keeping track of the progress of the treatment of all patients at the ED, about the clinical resources available, and about their allocation at any given time to the ever-changing number of patients. At the patient level, overview is about obtaining and maintaining knowledge regarding the individual patient's condition and about integrating patient information from a host of sources.

The research goals of the project are:

- To arrive at an understanding of the notion of clinical overview in terms of how clinicians describe their overview and in terms of the effects associated with having an overview
- To investigate the extent to which a system consisting of electronic ED whiteboards can be transferred from one ED to another with only minor changes to its configuration
- To evaluate the effects of electronic ED whiteboards on different aspects of the communication, coordination, and work in EDs
- To gain experience with automated collection of data for assessing effects, including logging of computer use and of clinicians' whereabouts

The project has been running during the period 2009–2012 in collaboration with Region Sjælland and the Norwegian IT vendor Imatis (Figure 7). All four EDs in Region Sjælland take part in the CLOVE project; two of them are involved in design as well as evaluation activities, the other two in only evaluation activities. The project has three phases, each lasting about a year:

First, a pilot version of the electronic ED whiteboards was designed and devel-

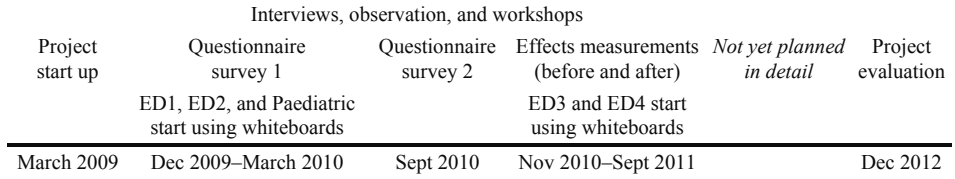

Figure 7. *Timeline for the CLOVE project.*

oped by Imatis in collaboration with ED1 and ED2. The pilot version was taken into use at the two EDs and was gradually evolved while in use. This process provided rich feedback to the ongoing development activities and to the change process associated with the organizational implementation of the whiteboards. Research activities during this phase involved a field study of the implementation process and a survey of the clinicians' expectations toward and experiences with the whiteboards.

Second, the electronic ED whiteboards resulting from the first phase were taken into use at ED3 and ED4. Before they started to use the whiteboards, the configuration of the whiteboards was tailored to the individual ED, and the two EDs adjusted – based on input from ED1 and ED2 – their work processes to take advantage of the whiteboards. We measured selected effects of the use of the conventional dry-erase whiteboards prior to the introduction of the electronic whiteboards and will repeat the measurements for the electronic whiteboards after they have been used for 3–4 months.

Third, the focus of the project will change from ward-level to patient-level overview. The patient-level overview will be accessible through the whiteboards so the two levels are interrelated, technically and clinically. Initial activities regarding design, development, and real-use evaluation will again be performed in collaboration with ED1 and ED2.

We have found that at the time they started to use the electronic whiteboards, the clinicians at ED1 and ED2 responded similarly to key survey questions and appeared to base their expectations toward the whiteboards largely on whether they expected the whiteboards to yield improvements for the patients. After they had used the electronic whiteboards for eight to nine months the clinicians perceive an improvement in the extent to which they have the overview they need in their work, compared to when they were using dry-erase whiteboards, but they have not yet experienced improvements for the patients. These largely positive results for ED1 and ED2 are the result of an implementation process that has attended

carefully to balancing tradition and transcendence by allowing the whiteboards and the associated work practices to evolve gradually. At ED3 and ED4 the process is different because they have not been involved in the design process. We are currently investigating how this might affect the reception and adoption of the whiteboards and the extent to which the effects are attained.

In 2010, the scope of the CLOVE project was extended to also include the pre-hospital phase before patients arrive at the ED. This part of the project is a collaboration with Region Syddanmark and comprises field studies of pre-hospital work and evaluations of pilot systems installed in ambulances. We focus, in particular, on the effects concerning the collaboration and information exchange between pre-hospital staff and ED staff.

4 Results

Our work with effects-driven IT development until now has produced a number of interesting results. In the following section, we summarize the main results concerning our five research questions. The overall status is that we have many elements of answers to questions 1, 2, and 3, whereas a lot of further work is required to provide answers to questions 4 and 5.

Research question 1: How can desired effects be specified and specified effects measured? We have specified desired effects at workshops with clinicians and management representatives. The effects concern purposes of the clinical work – as opposed to IT functionality – and the clinicians can generally specify the effects they want from new IT systems quickly and precisely. In the HCWS project, all effects were specified at one four-hour workshop and there were subsequently few changes to the set of effects (Barlach & Simonsen, 2011). Effects may be directly related to the treatment and care of the patients. For example, the clinicians in the KLIMO project defined an effect related to a quicker regulation of diabetes patients admitted for stroke. This is a situation in which regulation is often needed but the involved clinicians are not specialists in diabetes. Other effects concern the clinicians' work, rather than patient outcomes (Hertzum & Simonsen, 2010b).

Effects specifications are instrumental to identifying the information and functions an IT system should provide. We have demonstrated how effects specifications can be a pivotal element of a development process by completely replacing use cases, and how effects specifications support the communication between dif-

ferent groups in the development and configuration process: management, clinical users, EPR-responsible staff, configurators, and developers (Barlach & Simonsen, 2008). A short amount of training appears to be sufficient for vendor configurators to plan and conduct effects specifications and subsequent system configuration (Barlach & Simonsen, 2011).

We have documented several positive effects of using an EPR by identifying, quantifying, and measuring planned effects of its use (Hertzum & Simonsen, 2008). Many effects can be measured with internationally recognized methods such as TAM and TLX. More specific effects can, for example, be measured with questionnaires devised specifically to gauge these effects, but it is our experience that the interpretation of such tailor-made questionnaires is more often contested. An alternative to questionnaires is record audits, which do not interrupt the clinicians in their work (Granlien & Hertzum, 2009). In the future, we will focus on methods that are internationally recognized and/or methods for which consensus about their interpretation can be achieved prior to the collection of data. Measurements must also require a minimum of resources from the participating clinicians. Here we are experimenting with, among other things, analyses of log data from the use of the systems and incorporation of short online questionnaires in the systems that are being evaluated.

Research question 2: How can pilot implementations create the conditions for measuring the effects of using a system?

Pilot implementations are an opportunity to conduct formative evaluations of effects and, thereby, inform the ongoing development and implementation of IT systems (see Figure 1). This makes it possible to measure the effects of using a system before it is fully implemented. The clinicians' experiences with the pilot system may also produce new ideas. In the Clinical Process project all design proposals from the clinicians were registered, and 38% of the proposals (183 of 482 proposals) were made during the five-day pilot implementation (Hertzum & Simonsen, 2008; Pedersen et al., 2006).

We have demonstrated how an EPR system can be designed and configured through an experimental, participatory, and effects-driven process and, then, pilot implemented at a hospital ward (Simonsen & Hertzum, 2006, 2008). A pilot implementation of an integrated EPR system at one ward must make use of creative methods to simulate full use of the final system. This can be achieved using, for example, Wizard-of-Oz techniques, which simulate online transactions with hospital wards that are not part of the pilot implementation (Hertzum & Simonsen, 2010b; Simonsen & Hertzum, 2008).

A pilot implementation evaluates a system under realistic conditions and, thereby, makes it possible to evaluate the specified effects and also to encounter unanticipated effects (positive as well as negative), which also follow from introducing new IT-based tools. We have seen unanticipated, positive effects that emerged spontaneously after only a brief exposure to the possibilities provided by an EPR system. These effects were identified using observational, ethnographic methods and show the necessity of supplementing measurement of planned effects with the observation of selected work situations. This supports the identification of unanticipated effects and the incorporation of the novel use of a system in clinicians' work practices and in further development and implementation efforts (Simonsen, 2009).

The use of pilot implementations in effects-driven IT development presupposes that the technology is sufficiently flexible to accommodate an iterative development process and that it is sufficiently mature to be evaluated under realistic conditions. The Clinical Process project demonstrated that the configurable technological platform used in that project was sufficiently mature to enable that EPR solutions can be iteratively configured and adapted to individual clinical specialties without sacrificing existing standards, integration with other systems, or system performance (Møller-Jensen, Pedersen, & Simonsen, 2006; Møller-Jensen, Simonsen, & Iversen, 2006).

Iterative development processes that involve pilot implementations are demanding in resources. It is important to be able to predict which parts of a system will require experimentation and which parts can be developed in a predominantly linear manner. We have worked with developing techniques for identifying, characterizing, and estimating both the stable parts of an EPR system (those that do not require experimental systems development) and the parts that must be configured iteratively and experimentally to attain the desired effects (Barlach & Simonsen, 2007). Our analyses suggest that it is only a minor part of a system that needs to go through multiple iterations and intensive evaluation, including the parts that are specific to a medical specialty and those that integrate information in new ways compared to the paper records. An example of system parts that often integrate information in new ways are overview displays (Hertzum & Simonsen, 2010a; Rasmussen et al., 2010). We expect that further research in this area can produce an estimation tool that will allow customer and vendor to identify the parts of a system with which they need to experiment.

Pilot implementations are difficult to conduct successfully, and they are often discontinued before the system has been in pilot use for a longer period of time. This has, for example, happened in two of our projects. The challenges include

that the learning objective of pilot implementations has difficulty "competing" with the demands of the day-to-day production. The customer may, for example, assign primacy to patient treatment and safety, and the vendor to the development and support of the existing product suite. The difficulties of pilot implementation and how they can be countered have not been systematically investigated; there is a need for further research in this area.

Research question 3: How can effects that are specific to the users' work processes be related to overarching strategic and political effects?

The benefit resulting from a large investment in an IT system can be assessed from multiple perspectives and at multiple levels of abstraction. We use a model that represents effects in a hierarchy ranging from overall strategic/political effects over effects directly addressing the clinicians' work to effects concerning the specific design of the system (Barlach & Simonsen, 2008; Granlien, 2009; Simonsen et al., 2011). The model is inspired by Cognitive Systems Engineering, Cognitive Work Analysis, and our previous research on methods for systems analysis (the MUST method). The model specifies five hierarchical levels of effect: environmental, strategic, procedural, work-domain, and IT-system effects (see Figure 8).

Our experiences with the model indicate that management representatives tend to focus on its two upper levels, whereas clinicians typically focus on its three lower

Effects hierarchy	National Indicator Project (NIP)	Standard treatment plans
Environment (political demands, national standards, legislation etc.)	National indicators improve the quality of treatment	Coherent patient trajectories, knowledge sharing
Strategy (response to environment, abstract function)	High quality in NIP recordings	Standard treatment plans
Process (recurrent, familiar, input-output relationships)	Well-documented patient trajectories	Well-documented patient trajectories
Work domain (information-processing task with need for IT support)	Situations in which NIP data are produced	Acute admission of stroke patients
IT system (functions, information, categories, standards, user interface etc.)	Functionality capturing NIP data at their source	Template with checklist for junior physicians

Figure 8. *Examples of hierarchically specified effects.*

levels, which presuppose detailed knowledge of the concrete clinical work. Effects specification at the four upper levels has produced rather stable effects, which have not changed much in the course of a project (Barlach & Simonsen, 2011). At the same time effects specifications appear to provide a usable starting point for the development and configuration of IT systems (Barlach & Simonsen, 2008) as well as for working systematically with their organizational implementation (Granlien & Hertzum, 2009). It appears promising to implement a system organizationally over a period of time while its functionality is gradually extended on the basis of local experiences with the system (Hertzum & Simonsen, 2010a; Rasmussen et al., 2010).

Lately, we have been investigating how to integrate the effects hierarchy into effects specifications and how to support its use with tools (Granlien, 2009; Simonsen et al., 2011). In our further research, we will focus on identifying and handling inconsistencies between effects and on managing large sets of effects. This is related to another area that warrants further attention, namely, the selection of the user and management representatives who take part in the effects-specification activities.

Research question 4: How can the partnership that is necessary for effects-driven IT development be established between the customer and the vendor?

Effect-driven IT development involves technical development and organizational implementation co-determining each other and forming one integrated process. This necessitates an innovative relationship between the customer and the vendor. Our experience is that it tends to be tacitly assumed that the vendor is responsible for developing and delivering the system, while the customer is responsible for its organizational implementation. This conventional division of responsibility is associated with considerable inertia.

An effects-driven approach blurs the distinction between development and implementation of IT systems by, instead, making their development a more continual and integrated part of the development of the organization (Granlien, 2007). This calls for reconsidering issues such as which parts of the IT solution the vendor must develop and maintain on a continual basis and which parts of the system can best be developed and maintained by the customer, who possesses the domain expertise and the most extensive knowledge of local circumstances. We will seek answers to these issues in future work.

The need for pilot implementations and for working systematically with organizational implementation is emphasized by the not uncommon experience that desired effects fail to show, even after a system has been in use for an extended

period of time (Granlien et al., 2008). We have identified a number of barriers that hamper consistent use of EPR systems in accordance with mandated procedures, for example, the clinicians experience the presence of barriers but are unable to describe the concrete nature of these barriers (Granlien et al., 2008). This makes it difficult to target efforts to address the barriers. We have gained some preliminary experience with integrating the identification of barriers in processes primarily aimed at the specification of effects (Granlien, 2009), but it is an area we need to address in more detail in future work.

In the EMR project, we have iteratively improved the organizational implementation of a system by first specifying a desired effect and subsequently conducting multiple rounds of interventions and effects measurements (Granlien & Hertzum, 2009). The EMR project showed that positive results can be obtained by working with organizational implementation only, but it would have been advantageous to work also with the technical development of the system. Technical changes to the EMR were, however, not possible within a timeframe that could be combined with monthly effects measurements. This stresses the need for a close collaboration between the customer and the vendor, in which both parties agree to prioritize quick, iterative evaluations and adjustments to the system and the associated work procedures. The potential of a gradual implementation process with multiple iterations and adjustments to the system has been observed in the CLOVE project, in which the customer has undertaken most of the configuration of the system (Rasmussen et al., 2010). Such configuration is laborious and must be tightly coupled with the organizational adaptations accompanying the system. By undertaking the configuration the customer has converted some development costs into internal person hours and ensured that the configuration has been performed by people with local knowledge. The vendor has been relieved of a laborious task and has instead been able to focus on developing generic and configurable functionality and to respond quickly to reported errors and inconveniences. Without close collaboration between the customer and the vendor there is considerable risk that the implementation process would grind to a halt and the desired effects are attained only partially or not at all (Granlien et al., 2008; Granlien et al., 2009).

Research question 5: How can an effects-driven approach be incorporated in the contractual regulation of IT projects and what are the consequences of doing it?

For effects-driven IT development to become widely used an effects-driven mindset must probably be incorporated in the contractual regulation of IT projects so as to achieve an optimal partnership between the customer and the vendor. Until now we have not had opportunity to work very concretely with this research question.

The plan for our further research is to start out with projects in which the system is developed in an effects-driven manner and, in parallel, write a draft of an effects-driven extension to the conventional contract. The drafts will be evaluated by being used as shadow contracts for the projects; that is, without legal implications. When a suitable contract extension has been devised it will be evaluated in a subsequent proof-of-concept project, in which the contract extension is part of the legal foundation of the project. A precondition for the initiation of the proof-of-concept phase is that satisfactory results have been achieved with respect to the results of the effects measurements and the experiences with the customer–vendor partnership. In addition, there must be a mutual belief that once organizationally implemented the IT system will generate the effects specified in the contract. Until we become involved in projects that satisfy these conditions, we aim to elaborate the ways in which effects specification and assessment can be used as an instrument in projects regulated by conventional contrasts.

5 Conclusion

Effects-driven IT development is an instrument for the management of iterative, participatory, and experimental IT projects. This chapter has described the status of effects-driven IT development based on our experiences from six empirical projects, conducted during the period 2004–2011. The six projects – Clinical Process, KLIMO, HCWS, EMR, Maternity Ward, and CLOVE – are all in the healthcare domain, but we contend that effects-driven IT development is also applicable in other large and complex IT projects.

All the empirical projects indicate that desired effects can be specified. In three projects specified effects have also been measured; two of the other projects ended before measurements were made. Our mixed experiences with ensuring that measurements are made point toward a number of challenges in relation to pilot implementations. These challenges are important and somewhat surprising given the widespread practical use of pilot implementations. This suggests that the challenges involved in pilot implementations are poorly understood. To work with effects at different levels of abstraction – for example, effects specific to the users' work processes and overarching strategic effects – an effects hierarchy has been introduced. Our experiences with this effects hierarchy are promising. In contrast, the six projects have only provided us with tentative experiences concerning how a partnership between a customer and a vendor can be established. Further work

on this issue requires empirical projects of considerable duration. Finally, none of the conducted projects have addressed how an effects-driven approach can be incorporated in the contractual regulation of IT projects.

Effects-driven IT development seeks to establish a sustained focus on achieving and documenting the utility value of IT systems. The means for achieving this end is the specification and assessment of effects. Apart from the assessment of whether desired effects are achieved an important result of working systematically with effects is that it provides opportunities for identifying additional desirable effects and incorporating them in the subsequent work on a system.

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Innovation in partnership sourcing from a vendor's perspective

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Abstract. This chapter describes three generic categories of assets for technological innovation: 1) process innovative assets, 2) product innovative application assets, and 3) aesthetic design assets (Christensen, 1995). These different types of innovation are used as a framework for discussing effects-driven innovation at the IT vendor CSC Scandihealth A/S. CSC Scandihealth's business strategy regarding effects-driven innovation is described and related to a partner sourcing model with a client, a hospital in the North Region of Denmark. The chapter analyses how innovation can be organized and the different stakeholders, contexts, and perspectives undertaken by the vendor and the client while engaging in partnership sourcing supported by effects-driven innovation. The experiences and challenges are discussed on the basis of a number of projects with the vendor's clients.

Keywords: innovation, partnership sourcing, effects specification, effects-driven IT development, system development, healthcare.

1 Introduction

In this chapter, we elaborate on the concept of innovation and discuss it as part of partnership sourcing by means of effects-driven IT development. Partnership sourcing is described from the perspective of the vendor, CSC Scandihealth, CSC in short. CSC Scandihealth is owned by the CSC Corporation, a global leader in providing technology enabled business solutions and services. The overall focus

of this chapter is on sustaining change and innovation as it is often found in large organizations (Christensen and Overdorf, 2000).

According to Christensen (1995), it is a general assumption in many industries that the ability to produce innovation is based on Research and Development (R&D) as a production process. Christensen (1995) further points out that the relevant assets are often understood in a narrow sense as an R&D department and an activity concerned with the development process by the use of application and design. Another misunderstanding of the R&D concept is that it is mainly synonymous with scientifically based research. We need to understand innovation as a collection of different assets, which together enable the organization to commercially exploit innovation.

Throughout this book, we address innovation within the systems-development process as a means for improving an organization's product or business-process innovation. The general focus is on sustained innovation providing "products and services that are better than their predecessors on quality attributes that are already appreciated by mainstream customers," which leads to evolutionary rather than revolutionary change (see Chapter 1 by Hertzum and Jørgensen, 2011). In this chapter, we further distinguish between three different assets for technological innovation, as identified by (Christensen, 1995):

- Process innovation.
- Product innovative application.
- Aesthetic design.

A process innovation asset could, for example, mean a person who is good at making new ideas emerge during the process of holding a workshop. An example of product innovative application could be the identification of new markets for applying a specific product. Finally, there are those assets that enable innovation in the aesthetic design of a product, e.g., the construction of a user-interface so that they appear smooth and do not interfere with unnecessary information.

Together, these three assets provide a more accurate representation of technically innovative assets than the R&D concept (Christensen, 1995). We use this framework to describe how CSC Scandihealth experiments with effects-driven IT development as a means for innovation. This enables us to, among others, to clarify how CSC primarily recognizes human resources as assets of technical innovation.

In Section 2 that follows, we elaborate the innovation concept a bit further by discussing different ways in which innovation is organized. In Section 3, we describe how innovation is organized within CSC Scandihealth. CSC pursues part-

nership sourcing by means of effects-driven development. The generic process for this, used by CSC, is given in Section 4 while CSC's motivation for participating in the effects-driven development research program is presented in Section 5. Section 6 argues how partnership sourcing and effects-driven development support CSC's product strategy. Section 7 presents CSC's experiences and challenges and the chapter finally concludes in Section 8.

2 Organizing innovation

Innovation requires the activation and coupling of different assets in the organization, and this cannot be expected to happen solely through the traditional employee roles within the organization (Christensen, 1995). In other words, you cannot, e.g., settle with designating a person for a role such as 'responsible for innovation'; it is rather the coordinated effort of all the employees who contribute to the different categories (process innovation, product innovative application and aesthetic design) that brings about the technical innovation in the organization.

When an organization pursues technical innovation, four types of trajectories for innovation can be identified: science-based, scale-intensive, the specialized vendor and vendor-dominated pattern (Christensen, 1995):

- The science-based trajectory is usually associated with a strong internal R&D resource performing innovation activities towards the industry's commercial objectives and is typically found in chemical and electronic industries. The clients focus is on price and differentiation of the product.
- The scale-intensive trajectory is characterized by strong internal process engineering skills. The client focus is primarily on price and experience base/novelty value. For example, you will find this type of company within the food industry.
- The specialized vendor trajectory involves predominant domestic product application resources and is often in close cooperation with clients who are performance oriented, i.e., functional requirements are more important than volume and price. Application opportunities are limited by technology and this trajectory is usually adopted by companies that manufacture machinery and instruments or by IT vendors.
- The vendor-dominated pattern of technological change is characterized by the clients' need being dominated by cost and driven by marketing assets. This is usually seen in firms in traditional industries, like production of garments.

These four types of trajectories for innovation are analytical in nature, and in the real world, the boundaries between them are often not very clear. On the other hand, companies tend to divide into clear functional organization subdivisions such as management, finance, production, etc. This functional organization comprises the context of innovation and it also, to a certain extent, defines the motivation for a company's innovation. The functional organization and the trajectories for innovation form the starting point for a company in identifying and pursuing the commercial potential for innovation.

It is a prerequisite to have access to the relevant innovative assets to be able to produce innovation (Christensen, 1995). On the other hand, companies rarely ground their innovation purely on the basis of new research also referred to as revolutionary change in Chapter 1 by Hertzum and Jørgensen, 2011. This means that industrial research is most often described by the ability to combine process development and new uses of technology by integrating scientific and technological competencies (Christensen, 1995) – described as evolutionary change in Chapter 1 by Hertzum and Jørgensen, 2011. In some cases, pure scientific research might be organized in projects aimed at creating a new competing product for the company, as for example, in the pharmaceutical industry when developing a new drug (Christensen, 1995).

The process innovative assets might interact with scientific research as innovation is often pursued through highly systematical approaches using scientific – or scientifically inspired – methods. Process innovative assets draws on cross organizational management and cross organization resources and it can seldom operate independent of the company, for example, alone within one specialized R&D department (Christensen, 1995).

The specialized vendor trajectory draws on the skills and resources that are prerequisites for product-innovative development activities. This is not only the case in physical product development, but also in development of software or information systems. The process here is mainly characterized by technological options used in a series of phases including identification, evaluation, selection, and subsequent different disciplines of deployment. The innovative process is not solely the result of a scientific activity, but it also involves the use of experience and firm-specific knowledge and it can draw on established operating and production processes in the company (Christensen, 1995). Hence, a company cannot just 'decide' to be innovative: the company must consider how the product development should be organized, what processes are appropriate, what methods should be used and, in particular, be aware of which employees in the company possess the different innovative skills needed.

To discuss the experience with innovation in CSC, we introduce a final analytical distinction of the concept of innovation by distinguishing between technical and functional application of innovation (Christensen, 1995).

- The technical application of innovation is seen as the task of reducing the technical uncertainty without increasing development costs or reducing production capacity. In a software developing company such as CSC this could be obtained by aiming at more efficiency in the work performed, and, as a simple example, be measured by the number of lines of code produced for a given quality using a given number of working hours.
- Functional application of innovation is the task of reducing functional uncertainty, often during the interaction with the clients' management and end-users. It concerns knowledge development in relation to design and implementation especially based on end-user requirements and preferences (Christensen, 1995). For CSC, this could include process and organizational development towards higher quality of the work performed, the services provided, and the products delivered. One way of measuring the commercial value, could be to measure the effect of a product on basis of the work performed by the client's end-users.

Common to both technical and functional applications of innovation is that this could be related to the work in the general sense, or more specifically on work involved in system development or clinical care with a specific client.

Before looking into CSC's innovation, we may ask how innovation actually appears in the real world. Empirical studies report that successful innovation is common in cases of functional uncertainty combined with close collaboration with end-users, having strong professional interests and competencies in relation to the product being the target of development (Christensen, 1995). Christensen also notes that large organizations often accumulate innovative assets in inappropriate ways. This is a consequence of the division and specialization of work with the implications for the development of subcultures among departments. Further, the three innovation types (process innovation, product innovative application and aesthetic design) do not exist on equal terms. Aesthetic design, for example, is often considered to be a marketing asset more than a real innovation active (Christensen, 1995). This can lead to a source of conflict within the organization because the desire or demand for an aesthetic design comes from the marginalized innovation assets. Innovation comprises both product and process where the two types can be more or less intertwined. Historically, automobile factories in the United States invented the assembly line idea, which is highly product oriented.

Japanese companies have been highlighted for their ability to focus on the process as an important contribution to innovation. Japanese automobile factories invented LEAN (Womack and Jones, 1996), taking the assembly line a step further to, for example, include the workers attitude towards what creates value.

3 Innovation at CSC Scandihealth

The most obvious way to describe CSC Scandihealth is by the specialized vendor trajectory because of the frequency of client involvement and the performance focus on functional requirements in the products supporting the workflow in the healthcare domain. From a client perspective, this means that the product value is appreciated in relation to the use of the product by end-users (clinicians) doing their work. It is precisely this value that CSC wants to make more visible as we shall see stated later in CSC's product strategy.

CSC's product strategy resembles the specialized vendor trajectory and the innovative application of IT-based products. Technology stacks from vendors such as Microsoft and Oracle, etc., drives the process internally. The term 'stack' refers to the understanding of a series of different technologies arranged on top of each other forming a stack based on, typically, database management systems at the bottom, functional programming languages and frameworks in the middle and ending in technologies supporting user interfaces at the top of the stack.

The need for new products is driven by the clients' requirements, and the possibilities for innovation are determined by the technology's potentials and limitations as a technology stack forming a development platform. New products are developed to replace old, not always with new functionality, but often because clients want these new technologies indirectly. One example is the transformation of systems from mainframe to client-server technologies because there was a desire among clients to in-source hosting. This resulted in a technology shift and during the systems development process it was often both a question of what can be done on this platform, as well as a matter of what requirements the end-users needed.

CSC Scandihealth is specialized in offering IT-based solutions to the healthcare domain, a domain which is complex and highly specialized. At CSC, the primary innovation assets are the employees, who have built a corporate culture and product portfolio through almost 30 years, using their imagination and diverse knowledge of both the technical and the domain specific clinical issues.

The three types of innovation assets (process innovation, product innovative

application, and aesthetic design) are present to a more or less visible extent. There is no department responsible for innovation or R&D. Persons with special skills are designated as use-ability experts. These skilled persons constitute aesthetic innovations assets and they are often allocated to projects on a consultation basis during design, or, for example, while evaluating prototypes. Concepts such as easy-to-learn and easy-to-use have in CSC become synonymous with the product as user-friendly and are a prerequisite to obtain actual widespread use of the systems by the clinical end-users. In CSC, this type of innovation assets are especially distinct among usability experts responsible for usability tasks and occupied with developing and evaluating usability in relation to a very local interpretation of the term. In other words, it is a more narrow conception of usability than a general and broader understanding of usability encompassing the entire innovation process.

Product innovative application is also distributed and visible in a similar fashion, not within any specific department but in relation to employees designated business architects. They are employed in a similar way and as the aesthetic design assets they are consulted throughout the process of development and when there are issues involving management, sales, and marketing.

The challenge for the development organization is a trade-off between the conditions a particular technology stack offers and the innovative product application assets' ability to seize opportunities and steer clear of the limitations within the design requirements defined by the client. This means that the ability to implement process innovation assets becomes crucial because it is necessary to uncover the needs of users and relate those needs to the technical framework. This was Christensen's (1995) point with user involvement of end-users having a strong professional skill profile being a prerequisite for a successful product development.

Process innovation is not as visible or institutionalized in a employee role as the two previous mentioned roles relating to aesthetic design and product innovative application. Process innovation is present implicitly in the form of project managers, or as a grassroots movement among the developers and configurators. For example, several production units pursue an agile and flexible way of working rather than adopting procedural and documentation-heavy approaches from the other business areas within CSC Scandihealth and CSC Corporation. There has been an adoption of elements from different sources of process improvement which have been integrated and adapted internally to local conditions. This results in process innovation involving elements of agile development methods such as the Dynamic Systems Development Method (DSDM) (Stapleton, 1997) and Scrum

(Schwaber and Beedle, 2002). This example of process innovation is only visible internally, but as the trajectory implies the clients, they too get involved in the development during specification, design, and evaluation.

The success of innovation in CSC's projects requires the involvement of the clients' doctors and nurses. Moreover, the sense of responsibility and professional commitment, especially from end-user representatives when they are involved with the projects, is highly significant and has been pointed out by Christensen (1995). Participation of these 'external' assets from the client's side is a prerequisite for successful innovation. The need for process innovation that includes external assets is therefore important when pursuing CSC's business interests and implementing the company's product strategy.

Employees who represent CSC's innovation assets need a process that binds internal and external innovation activities together and comprise both functional and technical application of innovation. As a process innovative asset, CSC uses effects-driven development to mediate innovative work between developers and configurators from CSC and end-users from the client representing a different focus on the application of innovation (technical and functional respectively).

4 Effects-driven IT development in CSC Scandihealth

Effects-driven IT development (EDIT) is a research program at Roskilde University, which has engaged CSC for several years (see Chapter 8 by Hertzum and Simonsen). Contributions from CSC to this research initiative are done by integrating different projects with the client in the research work.

The research concerns how the utility value or effects of using implemented IT-systems can be used as a driving force for system development. This means that the effects that motivate a client´s investment and use of the system in the daily clinical work also constitute the effects that become the driving force in the design of CSC's solutions. This implies a development and implementation of IT solutions organized with the close and thorough involvement of the clients' management and end-users. Effects-driven IT development at CSC can be characterized as an effects-driven, experimental, and participatory process:

- Effects-driven because it means specifying the effects to be achieved with IT solutions, and subsequently, after implementing an IT-system, measuring the

extent to which they are achieved. This approach enables CSC and the client to work systematically to ensure value in the client's investment.
- Experimental because the healthcare sector is too complex for the development process to predict the solutions that both need to respect the important details of the work and need to add a substantial value. This means the process of development and implementation must adapt to the work environment and organization as it also changes along with the implemented IT solution.
- Participatory because the healthcare professionals representing the end-users are the only ones that possess detailed knowledge of the daily clinical work which is necessary to understand the conditions by which the IT solutions must operate and to specify the relevant requirements for the solutions.

Effects-driven development is undertaken during three different stages in the development process; during specification, design, and evaluation (see Chapter 7 by Simonsen, Hertzum and Barlach for a detailed example).

The overall process, while engaged with a client, can be described as a series of workshops ending with the deployment of a solution designed in collaboration with the client, see Figure 1. First, the management´s effects requirements (effects workshop, management focus) set the scope for the project and serves as a guide for the workshop with the end-users (effect workshop, end-user focus). During specification, the effects are used to identify management and end-user requirements relating to both the overall goals for the organization and the daily work performed fulfilling the mission. (We refer to Chapter 7 by Simonsen, Hertzum, and Barlach demonstrating how effects are specified in a five-level hierarchy). Later in the process, the same effects specify how the solution must be evaluated to determine if the design supports the requirements specified by both the management and the end- users. The effects are used at the LAB workshops (users are confronted with mock-ups or early prototypes in a 'laboratory' setting) where the evaluation methods are first consolidated and later put to work in the IN SITU workshops (users evaluate mature prototypes by simulating or performing actual work using the system) where the measured results help to determine if the design need re-work or can be put into production.

The end-users are engaged in workshops through-out the design process, and the effects identified serve as documentation of the design and are translated by CSC into technical requirements for the IT system. This ensures the progress of the development, as the requirements are implemented in mock-ups or prototypes and building towards the solution being deployed in production. The design process can be repeated and evaluated in instances where the system is imple-

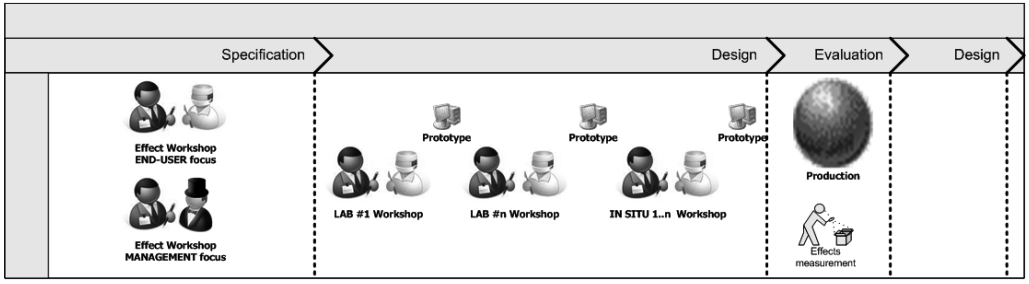

***Figure 1**. The specification, design, and evaluation process utilizing effects in various workshops.*

mented and taken into production. During evaluation, effects are measured and feed-back informing whether the desired effects have been achieved sufficiently is provided.

Employees from CSC and researchers from Roskilde University have collaboratively been participating in several projects to ensure that new experience and knowledge are developed and incorporated into projects organized as in Figure 1 (see Chapter 8 by Hertzum and Simonsen). CSC's contributions include devising generic tools and processes for developing products with the client, focusing on effects. The effects represent the central concept for the specification of requirements while also being associated with the measurement tools that are to document the impact in the clinical work domain.

Often, one or more overall desired effects are, in fact, the client's motivation to start a development project. Instead of asking the client to specify requirements for the end-product functionality (often using a technical vendor 'language' that is foreign to the client), effects-driven IT development focuses on:

- Effects – rather than functional requirements
- Measurements – above assumptions
- An effects-driven process – rather than a functionality-driven process

Some examples of effects from the perspective of the individual end-user, when introducing an IT system into their clinical social domain include:

- Significant reduction of the mental load in the registration and evaluation of data – resulting in greater client satisfaction.
- Less missing information that must be found from alternative sources to make decisions – resulting in the reduction of resource consumption.

- Fewer follow-up inspections due to better coordination and sharing of knowledge across disciplines – resulting in an overall better quality of core services.

Effects-driven IT development can be related to the three generic categories of assets for technological innovation. A mapping between the three innovation types and three effect categories is outlined in Table 1. The functional use of innovation can be related to the effects, which is a result of the use of the IT product that increases the quality of the clinical work. A similar mapping is indicated for the technical application of innovation with the efficiency in the work supported by the system and for the aesthetic innovation with the user's satisfaction when operating the system. The inherent expectation in CSC's strategy is reflected by a functional application of innovation which must result in a quality effect experienced by the involved end-users engaged in clinical work. The effects method support that the client needs is translated into innovative design, which is evaluated to document how the implemented solution results in the expected effect.

The mapping in Table 1 should not be taken as being too unambiguous. Effects are rarely precisely related to one and only one of the categories (quality, efficiency, or satisfaction); rather, an effect may be expressed in all three categories, but there should be a priority of the category that is the most desirable. If a client wants to implement a quality-related effect, one should expect the main contribution to come from the innovation assets mastering the functional application of innovation – and, hence, this should be prioritized. However, one cannot expect a quality effect to be realized only by concentrating on the functional use of innovation. Openness to relevant contributions from the other types of innovation and related effect categories should be maintained.

Innovation types in use	*Effect categories*
Functional use of innovation	Quality
Technical application of innovation	Efficiency
Aesthetic innovation	Satisfaction

***Table 1**: An example of innovation types mapped against effect categories.*

Christensen argued that innovation cannot be taken for granted just because the innovative assets are present in the company. Therefore, the EDIT project in CSC can be viewed as an example of establishing processes and organizing assets to create optimal conditions for innovation.

5 EDIT research in CSC

Why is it important for CSC Scandihealth to collaborate with the effects-driven IT development (EDIT) research program and to use effects in the development of their healthcare solutions in Denmark?

To answer this, we must first understand the market situation on healthcare IT in Denmark. This market is characterized by several major and smaller vendors who all vie for clients, i.e., decision makers from the regions provided with public healthcare. The rules for procurement and project execution are regulated by the European Union (EU), and they are centrally managed from the organization providing healthcare services, in this context, the Danish Regions. There are many expectations of what an investment in a healthcare IT project can generate of value and which needs and problems it can solve. The expectations are expressed both from the political side and by the many stakeholder groups of end-users (doctors, nurses, etc.) that are involved during the development and implementation process.

How can CSC contribute in this market and what is CSC's core competency?

CSC differs from the rest of the CSC Corporation by primarily offering products over projects. CSC has offered healthcare IT solutions since 1972 and has built up competencies in line with these developments. CSC has followed a technical path embracing new technologies and incorporating them into products as they evolve and become available. From an organizational perspective, this has been driven by changes in the client organization's tasks, which again is a result of political strategies and professional clinical knowledge that require new development or proliferation of the product portfolio. The employees at CSC comprise both staff with an IT technical background (computer science and computer scientists) and staff with a clinical background (doctors and nurses).

The strategy of the company shows that it is not enough to merely have a deep knowledge of the technologies and the healthcare domain, but that a competitive vendor also needs to master an increasing requirement for organizational change involved as part of the delivery. This is the result of an increasing complexity and demand for dynamics in the healthcare core services, which in turn induce

demands on efficiency and quality in the delivery of products supporting these services. IT is increasingly linked to the client's core production services, either indirectly as a reporting tool or directly through documentation, resolution, and quality assurance. This central role of IT contributes to the need for quality in the innovation process. For example, the quality of clinical work is directly reflected in the quality of the clinical documentation supported by IT systems. So there is a tight coupling between the value represented by the clinical work and the different factors, including IT support, which affects this value.

Today, the clinical provision of services means that technology becomes a prerequisite for the clinical work: IT is one of the key tools in the daily work of healthcare professionals. The consequence is that the IT product must match the unpredictability and differentiation encountered by the various end-user groups in the organization, all providing specialized and diverse services that change continually. In other words, it has become harder to specify exactly what the client wants and the time development takes place and the pace of change is shortened. This tendency is continually enforced by pressure on the work organization from the policy makers. This in turn drives the requirement for efficiency in the innovation process at CSC, as the cost of development cannot be increased although the complexity continues to grow. Furthermore, stakeholders in the project must be represented at many levels within the organization on both sides of the client–vendor relationship and demands for swift responses to changes are very much present from the client.

The factors that contribute to the value of the IT product and require contributions from CSC include usability, the ability to effectively make use of available functionality, and the ability to add sustained quality to the clinical work. This comprises all three types of innovation (process innovation, product innovative application, aesthetic design) and might be specified as effects that can support the development and demonstration of values in an IT solution.

As part of the collaboration with the EDIT research program, CSC financed an industrial PhD project. The PhD project is based on selected delivery projects at CSC that involve development of new IT, where the need for technical and functional application of innovation are linked to the product strategy of the company.

The immediate motivation for CSC and the clients involved in an effects-driven project is to give them a unique opportunity to demonstrate the usefulness of a new clinical IT system. Documentation of effects may subsequently be included as part of management agreements with the vendor and other stakeholders. This documentation of specific effects and overall utility value is innovative compared to current IT projects, which most often focus on technical deliveries and not on the overall usefulness. From a marketing perspective, there is a commercial potential

for the vendor in sales situations with similar clients, where the vendor is given the option to refer to the qualities of the product based on measured effects.

The overall motive for CSC in applying effects to drive the development process is to meet the requirement for innovation and have the effects obtained from the innovation evaluated by both parties (client and vendor). Appreciation of the product is central to the commercial outcome that CSC can expect as a result of a successful delivery. The effect approach embed Christensen's (1995) various types of assets profiles for innovation and organizes them by creating a medium and a process that make it possible to systematically develop innovative solutions with documented value.

6 CSC Scandihealth's product strategy

To meet the expectations of the clients, CSC has repeatedly articulated a strategy and approach regarding how CSC views progress and how CSC intends to live up to its role as an innovative vendor in relation to the healthcare domain.

The company's mission is to be ready to seize the challenge that lies in being involved in multiple processes and linking technology support closer to the clinical work. The vision involves a close relationship and establishing integrating technology platforms with individual clients as well as between different healthcare providers, as stated by CSC's CEO, Freddy Lykke:

> The vision we have is that the healthcare community is increasingly integrated into the various sections of society, coming closer and closer together, and our mission is that we [CSC] can help to make the linkage of the healthcare community (CSC, 2006).

Freddy Lykke elaborates how this vision can be implemented through a bottom-up approach:

> The bottom-up approach is basically another way of saying that it is the clinicians themselves that are to define how their work processes are to be supported, rather than we [CSC] come with a system where we have defined how we think the workflow should be at the various hospitals and their wards. We provide a system that allows the clinicians to dynamically define how the system should work in their specific situations (CSC, 2006).

There are several points in this statement: creativity or innovation comes from those who are involved in the everyday tasks that constitute the clinical work domain. This requires the involvement of many different professionals and knowledge domains. Another point is the acknowledgement of the value owed to the local clinical knowledge combined with humility towards the challenges that lie in getting closely involved with this as an IT vendor. CSC does not come with *the* solution, but provide a process and a technology stack constituting a highly configurable framework system constituting a platform supporting the development of solutions through a close collaboration with client representatives. To be able to handle the increased complexity and dynamics of the client in the development process, a very dynamic process that includes innovation related to technical application is required. At the same time, the client expects that the process is organized so that the quality of the functional use of innovation is both perceptible and sustained.

A client representative, chief physician, Carsten Elleman from Roskilde County Hospital, testified CSC's vision:

> What has been the argument against electronic healthcare records (EHR), is that they are too stiff, they are too heavy, and we cannot change them along the way when necessary. They [CSC] have demonstrated that they can adapt really, really fast. And that is nice to see (CSC, 2006).

Or to put it another way, the client is satisfied with the dynamic process offered by CSC as this means that the time from concept to testing will be short and less complicated and that changing requirements can be configured in the system very fast.

CSC's product strategy includes that CSC changes the overall perspective from "delivering a *product* to the client" to "delivering a *solution* to the client." The commercial motivation for this is seen as the acknowledgment of the great savings that can be expected by using a framework system that already contains a highly specialized domain knowledge built into them over many years. Many resources has been used to enrich this technology platform with the domain knowledge and reuse and/or reselling it – a direct motive in CSC's strategy. Moreover, it means that you can move the delivery of new products closer to the client which is demanded and appreciated (see quote above by Carsten Elleman).

CSC's strategy also includes, expanding their activities and responsibilities from primarily being concerned with technical systems to increasingly include a responsibility for the organizational implementation and utilization of IT systems. The

motivation for this is found in an acknowledgment at CSC that for a client, 30% of the overall costs for a large IT project are grounded in the technical IT system, while 70% of the costs are due to organizational implementation. Hitherto, CSC's strategy has been almost exclusively focused on the delivery of the IT system. Now CSC offers services and responsibility aiming at not only applying the technological innovations, but also supporting the functional use of the innovation and the quality of the work supported by the IT system. This challenges the traditional ways of evaluating the delivery within an IT project context (time, resources and specified content) and points to effect evaluations of how the problems and needs that motivated the client to start the IT project are being solved.

A long-term partnership sourcing arrangement includes the continuous development and maintenance of the delivered IT solutions – also after they have initially been implemented at the client site. It is necessary to organize the partnership and differentiate between what parts are optimally developed and maintained by the client, who possesses domain expertise and the good knowledge of local conditions and needs, and what parts are to be maintained by CSC. The effects-driven approach plays a central role in mediating and managing the partnership relation, and takes the collaboration between the client and vendor into account without prioritizing certain types of innovation. The key to this collaboration lies in the formative evaluation of effects that goes through the process as the parties must continually specify effects, negotiate conditions for the evaluation of effects, observe and measure how a specified effect requirement is met, and use the effects assessment as basis for continuing the project.

The demand for innovation and a process to support it externally is reflected in the above strategy 'statements' and sets the scene for collaborative innovation between CSC and its clients.

7 Experiences and challenges

There are both advantages and challenges for innovation through the effects-driven development (see also Chapter 8 by Hertzum and Simonsen, 2011). The task of EDIT is to provide process-oriented innovation in CSC and to ensure the development of a method that can accommodate all types of innovation. This is to be done without compromising CSC's commercial requirements.

CSC has through a series of EDIT projects developed and evaluated generic tools and processes, supporting the idea of using effects as a methodological

approach to systems development projects with Danish clients. The experiences so far confirm some of the assumptions made about the properties of effects in relation to innovation and highlight also some of the challenges CSC faces when innovation is to be driven by, and translated into, IT products.

The EDIT research has resulted in lessons learned regarding CSC's use of effects in the specification and development work with the client as listed below.

Effects are easier to understand, formulate, and prioritize for clinicians than functionality specifications.

This is of great importance to establish a genuine involvement of the end-user organization that does possess IT-technical skills, and it supports the end-users to contribute to innovation in the specification and development process. Although the client has a very professional and skilled group of clinicians, they are not necessarily knowledgeable on technical issues and terms. Therefore it would be a mistake to believe that their clinical requirements were thoroughly represented if they were expressed in terms that belong to the technical domain only. CSC's strategy is motivated by this involvement and representation of requirements that must be clear to end-users. Experiences and challenges with effect specifications are further discussed in Chapter 7 by Simonsen, Hertzum, and Barlach.

Effects are stable, tempting, yet ambiguous for the IT developers.

Effect specifications do not change and after the early workshops (see Figure 1) and in CSC's projects they have proven to be very stable. It allows the project to concentrate on experimenting with innovation supported by prototypes without having to spend much energy on aligning all effect requirements in the process.

Effects create a sort of tempting innovative "free space" for CSC's developers. Innovation assets from the technical domain are allowed to more or less freely translate the requirements related to specified effects without the constraints of traditional technical specifications of IT requirements. This "free space" (and dealing with the lack of technical requirements) can, however, prove problematic and require more experimentation with prototypes. The ambiguity inherent in the effects (when the developer is trying to translate effects into technical requirements) is a major issue to be taken into consideration by any project that applies the effects method and it entails a high demand for experiences, skills, and collective knowledge of the developers responsible for developing and implementing the IT system.

The inherent ambiguity lies in the effects' universal notation capability, and, as reported by earlier work on goal methods, effects can also be disruptive as

communication and pose a risk by not providing any detailed multiple technical specifications (Stacey and Eckert, 2003, Jureta et al., 2008). End-users tend to tolerate these imperfections and value the negotiation benefits stemming from the speed and innovative space of using workshops with prototypes (see Figure 1). The purpose of designing with prototypes is to negotiate these uncertainties and challenge the participant's visions, expectations, and hypotheses through concrete IT experience enabled by the prototypes. The series of workshops should add to the confidence that the implementation is in line with the user requirements represented by the effects. Hence, the ambiguity should not be viewed in a disruptive or counterproductive way. The effect method should work to avoid requirements change resulting in either dissatisfaction with the client ('that was not what we asked for'), or increasing cost on the project's bottom line because 'feature creep' forces a change in an already developed code.

Effect measurement at implementation requires technically robust framework systems of a reasonable quality.
The systems from which effects are to be measured and evaluated must be technically robust so that errors identified initially when they are implemented can be corrected immediately – otherwise an interrupted implementation will result in the expensively built user motivation being lost and the effect driven process being terminated prematurely. The quality of the solution must be sufficient for effects to be able to realize. This entails that reasonable change requests that do not emerge until the clinicians' start using the system must be implemented promptly without interrupting the process.

It is indeed possible to ensure the robustness of a technological framework and to establish a prompt inclusion of immediate and emerging requirements from functional innovation, but it requires careful planning of available resources from CSC. However, technical uncertainty should not become a disincentive to explore the functional innovation during implementation and use of the system. For example, if you discover missing functionality in a given technological framework that is necessary to implement a user effects request, the project has a problem and continuing the implementation without this functionality poses a threat to the progress or might result in the client aborting the project.

8 Conclusion

The ambition of carrying out effects-driven strategic partnership sourcing between CSC and its clients is not met overnight. As mentioned by Christensen (1995), such a venue is a mix of existing and new organizations of the innovative assets striving to create a viable realization of the vision for innovation in CSC. The effects can be seen as a tool to fulfill ambition where there is a need for innovative work on many levels between the very different stakeholder groups, both internally within CSC and externally with those clients who are signing up for partnership.

The stability and applicability of effects among the nontechnical client stakeholders provide the opportunity to work systematically with innovation, while the formative evaluation ensures feedback and control over the process as well as its solutions. Effects-driven IT development has demonstrated that it can support CSC's product strategy and vision for the involvement of clients and hereby create value through innovation in a larger context, as quoted by CEO Freddy Lykke. At the same time, this approach supports CSC's strategy by taking specific technological frameworks into consideration as a platform for technical and functional innovation. Working with effects specifications (see also Chapter 7 by Simonsen, Hertzum and Barlach) illustrates how the diversity represented by developers and client/end-users can be constructively exploited forming a prerequisite for innovation. Developers' experience a 'free-space' to come up with innovative technical designs, but the inherent ambiguity when interpreting specified effects and translating these to technical innovation is also both a potential and a challenge.

CSC Scandihealth has been working with effects-driven IT development for years now (see Chapter 8 by Hertzum and Simonsen) but there is still a need to continue with systematic confrontations of the experience attained with the realities at the clients' side. This implies that CSC sustains and develops the knowledge obtained so far by bringing it into action in new projects and IT product contexts. An appreciation of innovation as comprised by process innovation, product innovative application, and aesthetic design implies that effects can work expeditiously as an instrument supporting both technical and functional innovation. In situations where mutual learning is established, through partnership sourcing and user participation, a valuable knowledge regarding innovative IT usage, effects, and utility value that can be directly translated into projects with subsequent clients is created.

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Coping with multi-sourcing decisions: A case study from Danske Bank

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Abstract. This chapter presents the design of a *Multi-sourcing Nexus* for Danske Bank Group. Multi-sourcing decisions become important to many companies when they have outsourced something to a single supplier and face a situation in which they can either outsource more to the same supplier or to another supplier. A Design Theory Nexus is a set of constructs and methods that enable the construction of a decision model for a wicked problem, such as the multi-sourcing decision. In sourcing literature, three perspectives that deal with the multi-sourcing decision problem can be found, namely, utility considerations, transaction costs, and risk management. However, it is unclear which perspective to use, as well as how and why? The Design Theory Nexus for multi-sourcing that answers this wicked problem was designed and evaluated in an action–research undertaking in a Scandinavian company. The chapter presents the details of the Nexus design as well as the very positive evaluation that the design received when it was applied.

Keywords: outsourcing, multi-sourcing, decision support, Nexus.

1 Introduction

Outsourcing is the practice in which an organization *purchases goods or services that were previously provided internally* (Lacity & Hirschheim, 1993, p. p. 74). IT outsourcing thus means aggregating specific IT tasks or entire processes and moving

them to one or more outsourcing vendors, typically to a place where wages are lower or where a more appropriate business structure can be provided to deliver the IS goods and services (McFarlan & DeLacey, 2004).

Organizations have claimed that IS outsourcing reduces cost and time, increases quality and reliability of products and services, improves business performance, and helps organizations to concentrate on core competencies.

Multi-sourcing decisions become important to many companies when they have outsourced something to a single supplier and face a situation in which they can either outsource more to the same supplier or to another supplier (Swift, 1995).

However, the multi-sourcing decision is very complex (Berger, Gerstenfeld, & Zeng, 2004; Tullous & Utrecht, 1992). When do you need to consider multi-sourcing? When you have a problem with the current outsourcing partner? When you can see that a problem may arise? Or just to keep the current partner on their toes? Another issue is which countries to look at? Same country as the current partner to make the best use of the knowledge obtained? Or in another country to dissipate the risk? And what about the set-up? Should it be a close partnership? Or just based on simple transactions; 'here is a package of work, please do'? Or maybe a strategic alliance? Or staff augmentation?

In fact the muti-sourcing decision is what in the literature has been called a *wicked problem* (Rittel & Webber, 1973). What characterizes a wicked (policy) problem is: (1) That there is no definitive formulation of the problem. Typically you need to understand the problem (better) through working with the solution. (2) That there is no stop signal embedded in the problem. This is because the process by which to solve the wicked problem is identical to the process by which one understands the problem. (3) That there are no true or false solutions but only solutions of varied goodness. (4) That any solution to a wicked problem is a unique one-time solution.

One of the few approaches that can handle a wicked problem is a 'Design Science Nexus,' developed by Jan Pries-Heje and Richard Baskerville (2008) for a special issue on Design Science Research and based on an early DESRIST conference paper (Pries-Heje & Baskerville, 2006); so we decided to take a closer look at that.

Pries-Heje & Baskerville (2008) describe a five-step process for developing a *Design Theory Nexus* that can deal with a wicked problem such as the multi-sourcing decision:

1. Analyze different (decision) approaches available in the relevant area
2. Analyze the alternative approaches discovered
3. Design and construct an artifact based on the analysis

4. Design and develop a decision-making process
5. Integrate approaches, conditions, assertions, and process into a tool (an artifact)

Following this 5-step process we have managed to identify and combine three perspectives found in existing literature – utility considerations, transaction costs and risks – into a Nexus where the underlying *Design Theory* is that the higher the transaction cost of multi-sourcing, and the greater the risk, the greater the utility of multi-sourcing has to be to be recommendable.

The remainder of the chapter is organized as follows. First, in Section 2 provides a short introduction to Danske Bank Group, which we use as our case, and the research method we have used. Then in Sections 3–7, we give an account of our five-step development of a *Nexus*. This is followed by Section 8 in which we describe our successful evaluation of the Nexus in Danske Bank Group, and finally we conclude the chapter in Section 9.

2 Our research method and the Danske Bank Group

We have used the design research cycle (Hevner & March, 2003; Hevner, March, Park, & Ram, 2004) as our research approach. For the relevance part, we started out with Danske Bank Group facing a multi-sourcing decision problem and asking for help on how to make that decision. For the rigor part, we found the Design Theory Nexus (Pries-Heje & Baskerville, 2008) as our approach and we used the five steps for our design. A thorough literature survey is included in Step 1, thereby adding more rigor. Danske Bank Group is a leading player in the Scandinavian financial markets. In total, the Group serves more than 5 million retail customers and a significant number of public sector and institutional organizations. During the last ten years, the company has grown considerably through acquisitions. In 2006, the Danske Bank Group decided to outsource. They found a partner in Bangalore, India, to work with.

Today (2011), close to 500 people work in India for the Danske Bank Group. A year ago, this figure was 400 and Danske Bank Group considered whether future growth should be with the same partner or they should multi-source?

In a concrete cooperation with the Danske Bank Group, we used the five phases recommended by Susman & Evered (1978): (1) Specification of infrastructure in the project. (2) Diagnosis of the problem. (3) Planning of actions. (4) Implement-

ing actions. (5) Evaluation of results. We thus closed the relevance cycle by applying the design to the problem.

3 The Nexus design process Step 1: Approaches available

A Design Theory Nexus is a set of constructs and methods that enable the construction of models that connect numerous design theories with alternative solutions. In the paper published by Pries-Heje & Baskerville (2008), a five-step method for constructing an instance of a theory-nexus artifact was found.

The first step in constructing a Nexus instantiation is an analysis of the different approaches available in the given area of innovation. This analysis requires a survey of existing literature and findings.

In sourcing literature, three perspectives can be found to deal with the multi-sourcing decision problem, namely utility considerations, transaction costs, and risk management. However, it is unclear which perspective to use, as well as how and why?

3.1 Utility perspective

The first approach we found was the classic cost–benefit analysis. Here the idea is that all the pros and cons are converted into dollars and cents. Dollar values in the future are discounted to the present value. Benefits must then surpass the disadvantages (measured in dollars) and one can calculate an Internal Rate of Return (IRR) of the proposed investment – here the multi-sourcing decision.

Many have shown that it is quite difficult to put everything in dollars and cents. An exciting alternative was called *Information Economy* (Parker, Benson, & Trainor, 1988). This alternative was based on studies in the U.S. Fortune 500 companies looking at what actually led to the decision of starting a project. These studies were then translated into an approach where the things that mattered in the start-project decision were scored on a scale from "0" to "5". One thing to look at, for example, is to assess how the project idea in question provides better management information. Scoring at "5" means that it specifically and directly leads to much better management information. "0," however, means 'not in any way.' Likewise, things like strategic alignment, fit to Enterprise Architecture, and competitive advantage are scored.

To take into account the broader-than-cost–benefit approach represented by, for example, Information Economics, we decided to call this perspective the *utility perspective*.

3.2 Transaction cost perspective

A transaction cost is a cost associated with the transfer of ownership, including organization, adjustment, and regulation of services in the market. The prevailing definition was first proposed by Williamson (1979). Any transaction between a customer and a supplier will cause *friction*. Whether a company is to multi-source or not is determined not only by production costs but also by the friction that is caused by the client's switch over from one to more sourcing partners causes. In summary, the multi-sourcing friction depends also on the degree of uncertainty and measurability of the transaction itself as well as the size of the friction (frequency and uncertainty) incurred. In assessing the friction of multi-sourcing we need to include: (1) The cost of search and information, that is, to find alternative suppliers and assessing their price and quality. (2) Negotiation, that is, to exchange views and agreeing with potential suppliers, and (3) Verify and enforce the agreement, that is, management and undertaking eventual sanctions to ensure that the counterparties meet the contract and penalties.

In principle, if the transaction costs of multi-sourcing are too high, it is viable to stick to 'single sourcing.'

3.3 Risk perspective

A risk is a potential problem. Risk analysis is to list things that can go wrong and then assess the probability and consequence. Many have looked at outsourcing risk classes (cf. Berger & Zeng, 2006; Treleven & Schweikhart, 1988) and it is obvious that one can look at risks in relation to multi-sourcing.

4 Nexus design Step 2 – Analyzing approaches

The second step involves analyzing the alternative approaches discovered in the first step, carefully mapping out the ideal conditions under which each approach has the highest utility.

In the case of utility, friction (transaction cost), and risk, the three approaches to considering multi-sourcing that we identified, we found them to be analytically unequal such that hardly any conditions are equivalent for any comparison of the approaches.

Nevertheless, we looked hard and tried many approaches to identify a way to make use of all three approaches in a nexus. To make a long story short it was here that we identified three design theories, written in this context by the use of the technological rules of Van Aken (2004; 2005):

1. If you are in a situation where you can gain high utility value from multi-sourcing, then do it
2. If you are in a situation where you have very little or no transaction friction when moving from single sourcing, to multi-sourcing then do it
3. If you are where you have very little or no risk caused by the switching over from single sourcing to multi-sourcing, then do it

And then – after a few iterations – we can summarize them as follows:

The higher the friction/transaction cost of multi-sourcing, and the greater the risk, the greater the utility of multi-sourcing has to be to make multi-sourcing recommendable.

5 Nexus design Step 3 – Design and construct

The third step shifts the process from an analytic to a constructive design of an artifact that can be used to indicate whether the conditions identified in Step 2 can be found in an actual problem setting.

An early experiment in the case Danske Bank Groups involved a team of four researchers and two practitioners in developing a very simple framework

First, we found six *utility* dimensions of relevance. Our starting point was Information Economics (Parker et al., 1988) as well as a multi-sourcing book (Cohen & Young, 2005):

U1. (Classic) Return on Investments (ROI) – dollars and cents
U2. Business alignment
U3. Competitive advantage
U4. Innovative ability
U5. Enterprise architecture
U6. Flexibility and Scalability

Second, we did a thorough analysis of what had caused friction in the literature in the case company and in another company that we had access to. We ended up with 16 causes of friction/transaction cost:

TC1. Contract negotiation and signing
TC2. Friction related to transferring the necessary knowledge to the multi-sourcing site
TC3. Loss of performance when moving tasks to a new site
TC4. Cultural distance and differences causing friction in the form of misunderstandings and need for more specification
TC5. Differences in the levels of maturity
TC6. Friction in establishing communication infrastructure (telephone lines, video conferences, tele-presence)
TC7. Friction in establishing working infrastructure (server, clients, networks)
TC8. Training people and management from multi-sourcing sites
TC9. Finding and establishing liaison officers at multi-sourcing sites
TC10. Cultural training
TC11. Friction in developing processes to move tasks from the single-sourcing site to the new site
TC12. Having liaison officers permanently stationed at multi-sourcing sites
TC13. Analyzing which country and company should be the multi-sourcing site
TC14. Visiting a number of potential countries than can become multi-sourcing sites
TC15. Ensuring that contractual agreements are kept
TC16. Friction caused by the varying price and salary level and structure at multi-sourcing sites

Third, we analyzed what had caused trouble in the past as well as problems found in the literature. We ended up with a list of 18 risk areas:

R1. The current single-sourcing partner shows resistance to the new multi-sourcing site
R2. The current single-sourcing partner decides that we (the customer) are not important any more
R3. Unexpected unrest or instability, for example, because of war or terrorism in the single-sourcing partner country
R4. Important knowledge only at single-sourcing partner site (and not at original customer site any more)
R5. That single-sourcing partner comes too close and gets to know too much
R6. That we (the customer) becomes too dependent on one company

R7. Price raises because the single-sourcing partner establishes a monopoly-like situation
R8. That the investment in multi-sourcing does not give the expected benefits
R9. That delivery times from the existing single-sourcing partner lengthens
R10. That our people become tired of the single-sourcing partner
R11. That the single-sourcing partner closes down or goes bankrupt
R12. That it is difficult to keep attrition rate down
R13. That salaries in single-sourcing partner rises at the rate of, for example,10% a year
R14. That we have too little negotiation power in relation to the current single-sourcing partner
R15. That existing single-sourcing partner's share of work grows too large
R16. That it becomes impossible to find willing liaison officers (Danske Bank Groups outsourcing coordinators/managers)
R17. Cooperation deteriorates suddenly
R18. That our people show resistance against the new multi-sourcing site

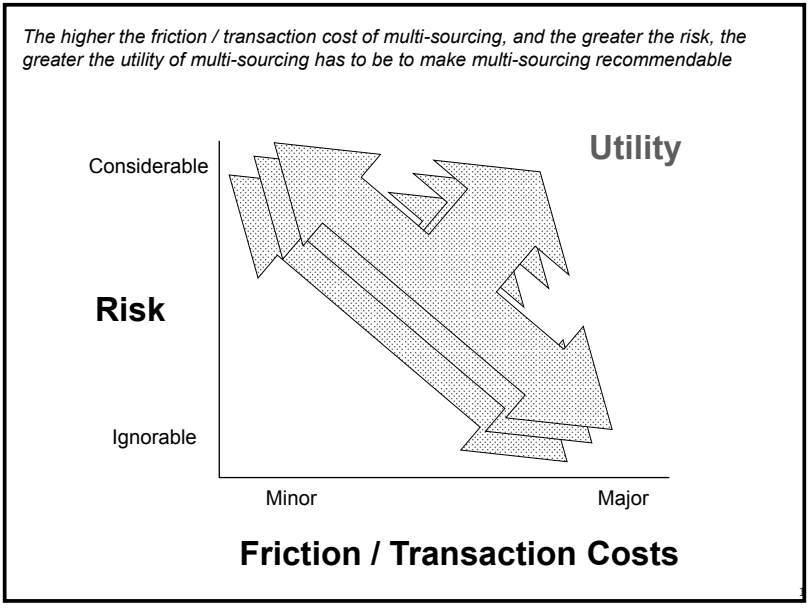

Figure 1: *The overall design theory used in the multi-sourcing nexus.*

6 Nexus design Step 4 – Design decision making process

The fourth step is to design and develop a decision-making process for the evaluation of the formulated assertions. Depending on the area of innovation, there may be more or less facilitation required in this decision-making process. The three perspectives for multi-sourcing that we had identified above – utility, transaction cost, and risk – themselves represent a wicked problem. Nobody can say which of the three perspectives is best and they are not comparable at once; no rational, hierarchical, or optimal solution model presents itself.

We used the overall Design Theory to come up with the decision model presented in Figure 1. Figure 1 shows the relationship between utility, risk, and friction. The more utility the more acceptable higher risk and friction costs.

We decided to use a 1–5 scale to measure utility. For each of the six sources of utility we derived a scale from 1–5, where "5" meant yes, considerably and "0" meant no utility at all. An example is shown in Figure 2 of Utility area no. U6. on Scalability and Flexibility.

Flexibility and scalability are first of all about obtaining resources with new skills and getting them 'up to speed'. Second, it is about the ability of rapidly scaling up or down, for example, with several hundred new resources (people) in a few months:
5. Multi-sourcing will significantly increase our flexibility and scalability
4. Multi-sourcing will increase our flexibility and scalability
3. Multi-sourcing will increase either our flexibility or scalability
2. Multi-sourcing will either make us somewhat increase our flexibility or our scalability
1. Multi-sourcing will have only peripheral effects on flexibility and scalability
1. Multi-sourcing has no effect whatsoever on flexibility and scalability

Figure 2: *Example question on utility from the multi-sourcing nexus.*

Summing up the scoring, we calculated an overall utility level as shown in Figure 3.

For risk and transaction cost, we decided to apply a scale from 0 to 100 points. First, we assigned the same number of points to each. However, we quickly found that we needed to assign them different weights. In a workshop in October 2009 with the Danske Bank Group, we divided the areas of risk and transaction cost into three groups: large, medium, and small. This division into groups was mainly based on the concrete figures that came out of the experience from zero-to-single sourcing as well as research literature and experience from other companies.

An example of a large transaction cost is given in Figure 4 (no. 2 in the list above).

Scoring in question U1:_____	Sum of scoring from 0 to 6 points => Utility level = 1
Scoring in question U2 :_____	Sum of scoring from 7 to 12 points => Utility level = 2
Scoring in question U3 :_____	Sum of scoring from 13 to 18 points => Utility level = 3
Scoring in question U4 :_____	Sum of scoring from 19 to 24 points => Utility level = 4
Scoring in question U5 :_____	Sum of scoring from 25 to 30 points => Utility level = 5
Scoring in question U6 :_____	

Figure 3: *From scoring to utility level.*

The following transaction costs were considered large (and therefore scoring 9, 6, 3 and 0): Number TC1, TC2, TC3, and TC12

The following transaction costs were considered medium (and therefore scoring 6, 4, 2 and 0): Number TC4, TC5, TC9, TC11, TC13, TC14, and TC15

The following transaction costs were considered small (and therefore scoring 3, 2, 1 and 0): Number TC6, TC7, TC8, and TC10

Transaction cost TC16, on friction caused by different price and salary level and structure at the multi-sourcing site, was given special treatment in that a scale from +10 over zero to -10 were assigned here. Thus, if the multi-sourcing site had a relatively better salary and pricing structure we assigned -10 (= reducing friction) and if the multi-sourcing site had relatively higher cost we assigned +10 (= adding friction). And if it was about the same we put it at zero points.

All in all, the point structure chosen to be assigned for friction/transaction cost could sum up to 100.

An example of a small risk is given in Figure 5 (No. P in list above).

Estimate the transaction cost in the following situation After the multi-sourcing decision: to add the necessary domain and technical knowledge 9 points Involves significant and very expensive cost 6 points Involves significant cost 3 points Involves smaller cost 0 points No cost whatsoever

Figure 4: *Example question on Friction/Transaction cost*

Estimate the likelihood that it will not be possible to find liaison officers for the new multi-sourcing country:	
3 points	Happens almost certainly
2 points	Likely to happen
1 points	Will hardly happen
0 points	Completely unlikely

***Figure 5**: Example question on Risk*

The following risk areas were considered to have large consequences (and therefore scoring 9, 6, 3, and 0): Number R7, R8, R9, R10 and R11G, H, I, J, and K

The following risk areas were considered to have medium consequences (and therefore scoring 6, 4, 2, and 0): Number R1, R2, R3, R4, R5, and R6

The following risk areas were considered to have small consequences (and therefore scoring 3, 2, 1, and 0): Number R12, R13, R14, R15, R16, R17, and R18

All together the points can sum up to 102 points. Therefore, for the sake of symmetry we decided to subtract 2, thereby ending up with a scale from 0 to 100.

7 Nexus design Step 5 – Bringing it all together

Finally, the approaches, conditions, assertions, and the process are integrated into a tool (an artifact) to support the evaluation.

The multi-sourcing nexus was implemented as a series of questions to be answered as explained in the previous section. It is meant as a tool to help a company – typically top and middle managers – make a decision on whether to outsource or not. Thus, we need to facilitate a discussion for a group of people. Second, the answers are put into an information system artifact (based on a spreadsheet). The answers decided on by the group will then result in a number betwee one and six for utility. A number between 0 and 100 for friction/transaction cost and a number between 0 and 100 for risk.

As a result of answering the questions regarding a concrete multi-sourcing decision using the nexus tool, we decided to provide the recommendation in the form of a 'traffic light' where green (light gray) means that multi-sourcing is very favorable, yellow (medium gray) means that multi-sourcing is worth considering, and red means (dark gray) that multi-sourcing has no intrinsic interest. The two

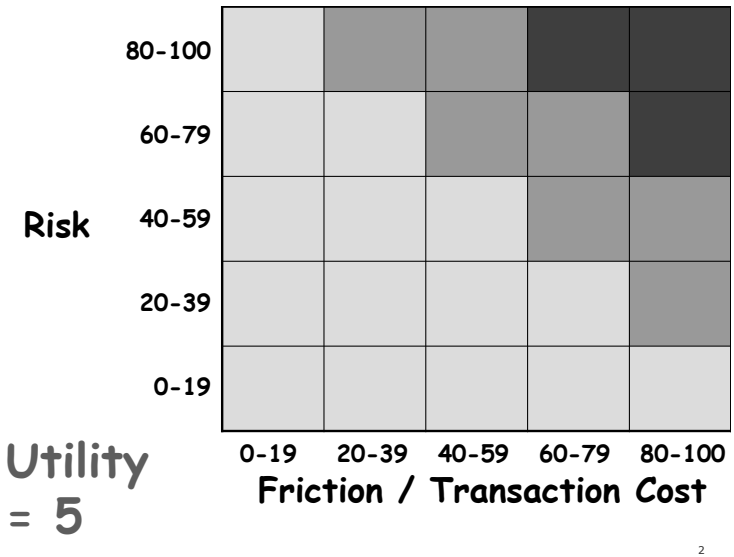

***Figure 6**: The output from the Nexus artifact when utility level = 5 (very high)*

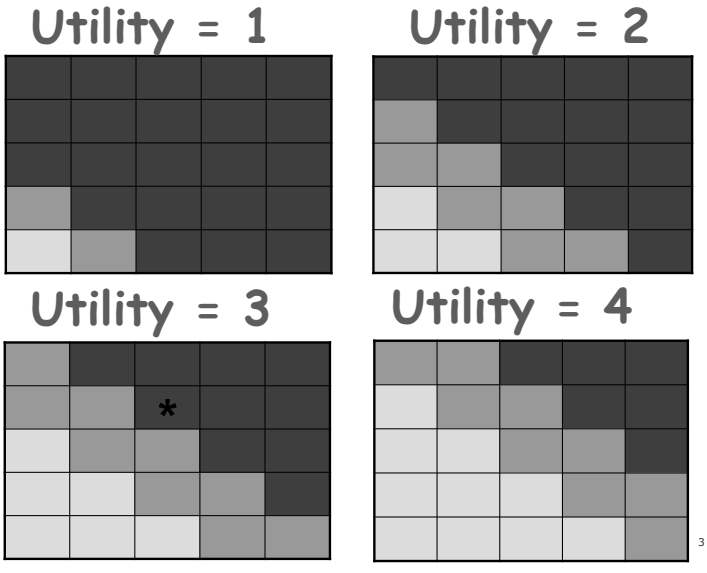

***Figure 7**: The outputs from the Nexus artifact when utility level is 1 to 4*

figures 6 and 7 show the resulting output screen (from the spreadsheet artifact) if utility is 5 and an overview of outputs if utility is 1, 2, 3, or 4.

8 Evaluation

Evaluation is a core activity in any kind of Design Science Research. Hevner et al (2004, p. p. 85) even opine that evaluation is "crucial" and ask for researchers to demonstrate the utility, quality, and efficacy of a design artifact. Evaluation can take different forms depending on whether the output of research is design theory (Gregor & Jones, 2007; Walls, Widmeyer, & El Sawy, 1992) or an artifact (March & Smith, 1995). In the case of an artifact – as this multi-sourcing nexus – Vaishnavi and Kuechler, (2004) state that designed artifacts must be analyzed for their use and performance as possible explanations for changes (and hopefully improvements) in the behavior of systems, people, and organizations.

Our aim was to design a nexus to facilitate a group decision process, so that was what we asked Danske Bank Group for. However, in December 2009, they were in the middle of a process of creating the material for making a multi-sourcing decision. So, the first vice president, responsible for the outsourcing site that had been entrusted with making the material on multi-sourcing, asked us to carry out the first evaluation with her alone.

In the first evaluation, we went over all the questions. The first vice president decided an answer and at the end our artifact calculated the following figures:

- Utility at 11 point => Utility at level 3
- Friction/Transaction cost at 40 points
- Risk at 65 points

This meant that the recommendation (illustrated with a small star in figure 7, bottom left) was "that multi-sourcing has no intrinsic interest."

Overall, this pre-evaluation with one person gave some very valuable feedback. The evaluation of our multi-sourcing artifact was considered "surprisingly useful." On a scale from 1 to 5, we were close to 5 (= best), thus in that sense the evaluation was a success. There were also some minor comments on the design and the wording of friction and risks. These things were changed before the second evaluation.

The second evaluation took place in Danske Bank Groups tele-presence room(s) on 19 January 2010. The managers involved in the decision were present. Three

people were in the room in which we were (2 researchers). Two in another room but connected via tele-presence, and one person participating from India via tele-presence.

This time utility was evaluated at level 2. Especially, enterprise architecture was evaluated to have lower utility. Friction ended up at 47 points, a little more than in the first round. And risk was at 44 points, a little less than in first round. Again, the outcome of the exercise and the use of the multi-sourcing nexus was "that multi-sourcing has no intrinsic interest."

There were several important outcomes of this second evaluation. First of all the usefulness of the multi-sourcing nexus was again considered high. When the recommendation came "that multi-sourcing has no intrinsic interest" it became clear that the first round evaluation had led to the decision of not doing multi-sourcing. Thus a senior vice president said "that was also the decision we have made" and "it is good to have it confirmed."

Another outcome was that the cost–benefit perspective and the transaction cost perspective were too close. That led to the renaming of the cost–benefit perspective to "utility perspective" instead – as we have done it throughout this chapter. We also emphasize the friction part of the transaction cost perspective as a result of the second evaluation.

Another thing that confused the participants was that some of the risks were related to the situation today (as-is) and some of the risks were related to risks that would occur in the future potential multi-sourcing situation (to-be). We therefore ended up dividing the risks into two groups:

- As-Is: R1-R7 and R9–R15
- To-be: R8 and R15–R17

But keeping the same scales and scoring

The third round of evaluation took place in November 2010. Here the Danske Bank Group again faced a multi-sourcing decision and the first vice president was interested in going over the dimensions in our nexus again.

Again the utility level ended up at 2. However, it was emphasized that flexibility and scalability were the two main courses for single sourcing and thus would need to be taken into account in the multi-sourcing decision. That is why we have added flexibility and scalability as dimension VI to consider in relation to utility.

Friction/transaction cost ended up at 39 points and risk ended up at 53 points. Thus, this time we were right at the border with our recommendation between "no interest at all" (red) and "maybe consider further" (yellow).

A final thing that was revealed in this third evaluation was that the response time – from using the nexus and making the multi-sourcing decision – to a future 1–3 years ahead where the multi-sourcing decision is firmly established – needs to be taken into account. Possibly in the formulation of risks; instead of asking as-is questions such as "that we (the customer) becomes too dependent on one company" we could instead say "will we (the customer) in the next 1–3 years become too dependent on one company?"

Again, the third evaluation was considered very useful and it ended up having a considerable and important impact on the multi-sourcing decision made in the beginning of 2011 by the Danske Bank Group.

Seen from a Danske Bank Group perspective, the participation in the development of the multi-sourcing nexus has added a large value to the decision to multi-source or not and it has given a clear overview on how to tackle the different factors that have a large impact on the decision.

When Danske Bank Group used the multi-sourcing nexus for the first evaluation, the outcome from the evaluation was used, in combination with other inputs, to actually produce the recommendation for continuing with the single sourcing set-up.

Danske Bank Group has decided to do the multi-sourcing evaluation with a fixed interval, to evaluate if the situation has changed, and the decision with a single sourcing set-up needs to change.

The third evaluation of the model was made in connection with this recurring evaluation, and in the third evaluation it became clear that it was not enough to evaluate the current situation, as the time line for the establishment of a multi-sourcing set-up also would have an impact when multi-sourcing could be relevant – estimated at 1–1.5 years ahead. Combined with the fact that the change of out-sourcing situation do not change significant from evaluation to evaluation, when it is done frequently.

So the use of the multi-sourcing nexus was combined with a set of scenarios with a 3 year projection , and result was that dependent on choice of scenario, the outcome from the multi-sourcing nexus actually varied from a recommendation of a single sourcing set-up to a recommendation of a multi-sourcing set-up. Again the outcome from the multi-sourcing nexus was used in connection with the actual evaluation of the need for multi-sourcing in the Danske Bank Group (combined with other inputs), and the outcome from the evaluation was used as input for the recommended action plan for each scenario.

The impression is that multi-sourcing nexus actually covers the primary factors that will have an impact on the decision on multi-sourcing, it simplifies the rather

complex decision, and it is easy to provide a management overview, based on the multi-sourcing nexus.

9 Discussion

During some of the reviews of the model and the article, some of the reviewers asked if the model could be used for the initial evaluation of whether to start up with outsourcing or not.

Our conclusion is the overall approach with the evaluation of the 3 problem areas:

1. Utility perspective.
2. Transaction costs perspective
3. Risk perspective

All will add value in an initial evaluation of whether to initiate outsourcing or not, but the specific questions for each perspective are all designed for a multi-sourcing evaluation, and cannot be used for an initial evaluation in connection with the decision of whether to initiate outsourcing or not.

10 Conclusion

More and more companies are in a situation where they have outsourced something to a single supplier and face a situation where they can either outsource more to the same supplier or to another supplier – a multi-sourcing decision.

In this chapter, we have now described the iterative design and evaluation of a multi-sourcing nexus combing through utility considerations, transaction costs, and risk management. We have showed that the Nexus derived performed well and worked as a solution when it was applied to the practice in a Scandinavian company; it was actually considered very useful.

Furthermore, we have followed the 5-step process of developing a Nexus that was published in a special issue of MIS Quarterly (Pries-Heje & Baskerville, 2008). We have found it relatively easy to follow and apply the outcome of our Nexus in practice in three rounds of evaluation

Throughout the chapter, we have tried to give sufficient details as to allow the

reader to follow our design process and eventually use the design presented if ever facing a multi-sourcing decision.

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Tactical sourcing – the development of a decision support tool

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Abstract. This chapter describes a decision support tool that aids the decision whether a project or an area should be outsourced and how it should be outsourced. The tool is implemented in Excel because most users will be familiar with it. The tool also contains a description of the process to follow in an early stage of the decision process.

Keywords: Tactical sourcing, decision support tool, sourcing model.

1 Introduction

When a company takes a strategic decision to outsource, part of this decision is the determination of the type of projects and areas to be outsourced. Most likely the first project or area will be decided as a part of the strategic decision as well, but later on, it is left to the tactical level to decide which projects and areas to outsource and how the set up should be. Ways of setting up the sourcing cover the range of possibilities (set by the strategy), for example, the task in its entirety is performed by the sourcing partner, or the task is dealt with by some in-house staff in Denmark and some staff in India, or the sourcing partner's staff who are relocated to Denmark.

Two of the companies in SourceIT and a third party indicated that they used internally developed tools (implemented in Excel) to support the decision whether to outsource a task. It is a well known technique to create such a tool to support decision making (not only when it comes to outsourcing).

The goal of the work described in this chapter was to construct a tool (implemented in Excel) that is based on the tools and experience of the partners of SourceIT and to generalize the tools into a unified tool useful to the IT-industry in general, rather than the individual company. The intension is also to improve the tool to make it more complete than the individual tools already in use. Discussion and trial runs of the tool aim to contribute to its versatility.

The main principle of the tool is to assign values and weights to various characteristics of the project or area at hand, such as complexity, risks, and amount of communication – and then compare various scenarios to select the preferred set up.

Essentially, the tool supports the select-activity in tactical sourcing in the four-level model, which is described by Hertzum and Jørgensen (2011) in Chapter 1. While the main focus of the select-activity in the four-level model is about selection of the outsourcing partner, this tool has its main focus on selecting the projects or areas to outsource.

The advantage of such a tool is that it will be based on the experiences of more companies and a good point of departure for companies that are new to outsourcing. At the same time, it may be used in companies already taking this type of decisions on a regular basis to improve their tools.

This chapter describes the process that led to the developed tool, the rationale behind it.

In this chapter, we use the term *project* to represent any entity representing a finite piece of work, while the term *area* is used to represent a continuing stream of tasks or projects. In this chapter, we use the term sourcing scenario to denote one way of running a project or an area, such as outsource the entire work, splitting the work between in-house staff and ODC-staff on equal terms, splitting work so that domain knowledge is kept in-house, run in-house partly with staff from the sourcing partner or entirely in-house. For practical reasons, we also denote pure in-house work as a sourcing scenario because it is compared with the genuine sourcing scenarios on equal terms.

The tool consists of the following parts:

- The Filter Template, which is a template for a score sheet to find candidates for good sourcing scenarios.
- The Model Template, which is a template for a set of score sheets to analyze the individual candidates for sourcing scenarios.
- A process description of how to decide which projects or areas to outsource.

The template score sheets are implemented in Excel files because Excel is widely accessible and many users are already familiar with it. The filter template has recently been suggested and has not yet been thoroughly examined.

The intended user of the tool is the decision maker who is involved in deciding whether to outsource a particular project or area (as opposed to the decision maker who decides whether or not to outsource in general). The intended usage is to support the early stages of the decision making, before solid data are available.

2 Method

The method used has been inspired by action research as described in Susman and Evered (1978). The work presented in this chapter is based on an iterative process, outlined in figure 1. The preliminary analysis and the task resemble the *Diagnosing* step in action research, the steps *acquire tools* to *merge tools* and *improve tool* resemble the *Taking action step* in action research and finally *present tool* resembles the *Evaluating* step in action research.

At a workshop in which all SourceIT partners participated, the need for a tool to analyze whether a project or an area should be outsourced or not was identified.

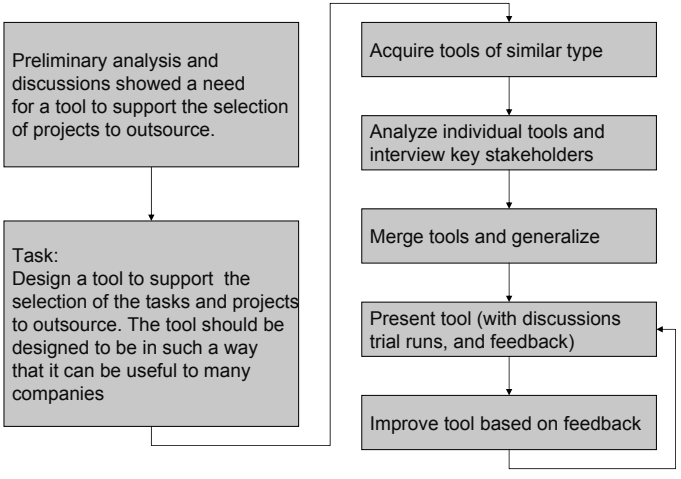

Figure 1: *Method*

It was suggested that it took business risks, financial aspects, and complexity into account.

The task was to construct a tool, as identified by the workshop, that is based on the tools and experience of the partners of SourceIT and to generalize the tools into a unified tool useful to the IT-industry in general.

The first step in the construction of the tool was to acquire those tools that the partners and a third party used for selecting projects to outsource. In the first place, we got access to three tools, all of which were implemented in Excel and later in the process we also got access to a set of guidelines used in one of the companies.

The second step was to analyse and compare the tools and interview key stakeholders, with a deep insight into the use of and rationale behind those tools. These interviews took place during a visit to Danske Bank and a couple of telephonic conversation with CSC Scandihealth and a third party.

The third step was to generalize the insight gained from the second step and merge it into a tool.

The fourth step was to present the resultant tool (the first time was at a workshop with the participation of all partners) and the rest of the times in individual presentations in the companies. These presentations took place during four visits to Nets, one visit to Danske Bank, and two to CSC Scandihealth where the presentation and feedback of the tool has been the sole concern. Apart from these main meetings, there has been supplementary communication.

The fourth and fifth step were iterated a number of times.

The fifth step was to improve the tool on the basis of the wishes, feedback, and experiences from trial runs done in step four.

3 Considerations when selecting projects to outsource

When a company is about to select a project or area for outsourcing, some important issues should be considered and this section will point to some of these issues. In this section, some important issues to consider will be described.

According to Kremic, Tukel, and Rom (2006), three main motivations seem to be predominant and they are *Cost-driven*, *Strategy-driven*, and *Political-driven outsourcing*. The first two motivations are normally the driving ones for commercial companies, while the last is a motivation for non-profit organizations. In this chapter, we only take the cost-driven and strategy-driven approach into account,

assuming that both motivations can play a role in the same company but with different weights. Kremic et al. (2006) call it cost-driven, when the main reason for outsourcing is to save money, while it is strategy-driven when issues such as core competencies and flexibility are the driving forces. According to Kremic et al. (2006), one of the most cited strategic reasons for outsourcing 'is to allow the organization to better focus on its core competencies'.

According to Kremic et al. (2006), literature shows a need to be cautious in the cost-driven situation because some indirect cost may reduce savings, and there are even cases where outsourcing increases costs. Part of the indirect cost is denoted *social cost* referring to lower work morale or lower productivity etc.

Literature shows the need to be cautious in the strategy-driven situation because the company may 'give away the crown jewels' (Gillett 1994, cited in Kremic et al. 2006). They mention IBM's outsourcing of the operating system as such an example, where lost knowledge base precludes them from future opportunities.

Kremic et al. (2006) set up a decision framework, which is the inspiration for the decision framework described in figure 2. This figure describes the relation between strategic and tactical level and shows which part of the tactical decision process the tool described in this chapter deals with.

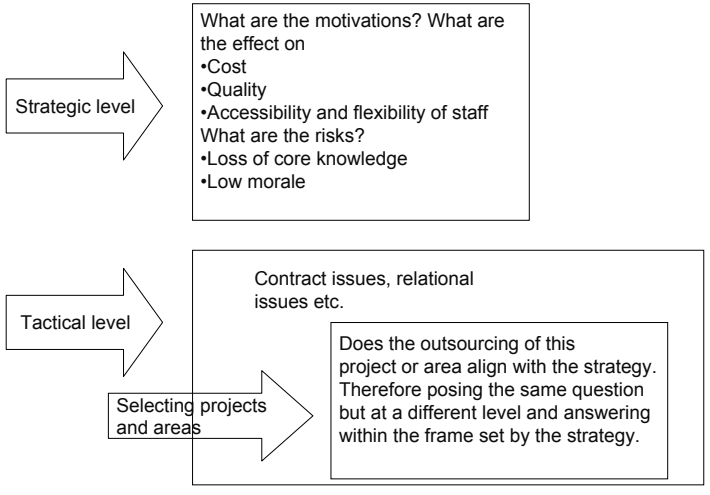

Figure 2: *Decision framework*

Therefore the following question must be posed both at the strategic and tacticallevel:

- Where are direct costs taken into account?
- Where are indirect costs taken into account?
- Where are social costs (part of indirect costs) taken into account?
- Where are the crown-jewel problems taken into account?
- What are risks?

Generalizing the "crown-jewel" problem a bit leads to the "future business" problem, meaning how the company's and the sourcing partner's capabilities are affected by the outsourcing? And how does that affect the company's future ability to run its business? Note that the social costs affect the company's capabilities if, for instance, the work morale drops and the company becomes less capable in the area affected.

It is important to realize that the changes at both the company and at the sourcing partner can be both desirable and undesirable. The company may lose some competencies which would render it incapable of innovating in a specific area – and that may be both desirable and undesirable depending on the situation. In the same way, the sourcing partner may learn something that so far has been a secret of the company and even that may or may not be desirable.

These questions have most likely already been answered at the strategic level, but they are posed at the tactical level as well to align to the strategic level.

4 The tool

The purpose of the tool is to bring the decision maker through a number of thorough considerations and not, as with many other tools, to deliver some kind of recommendation. This idea is in accordance with (Winograd & Flores, 1986) according to (Morten Hertzum, private communication).

As explained in the introduction of this chapter, the tool consists of two Excel files (filter template and model template) and a process description. Each of these is be described in this section. The filter template is optional and will be described in the example. This template is used to take a very quick decision on which scenarios not to consider because they are obviously inappropriate.

The Excel files must be adjusted both to the organization and to the project at hand before it is taken into use.

The benefits of using these score sheets are especially the considerations through which the decision makers are taken. These parameters can be considered as questions such as: How complex is the project or area we are considering outsourcing? What are the consequences of cultural differences? Or how will it affect the organization's ability to innovate? The answers are given in terms of values in one or more score sheets.

We never believed that we were able to set up one set of parameters that suits all companies ("one size fits all"). Each company is expected to tailor the tool to its own needs. This is done by adding new parameters and removing parameters that are not relevant to the particular organization.

Nevertheless, the parameters can be seen as a comprehensive checklist containing parameters that are likely to be in the final score sheet.

The overarching idea is to compare a number of sourcing scenarios for **the same project or area** and pick the best scenario. The model template is an Excel file that only contains the possibility of describing **one sourcing scenario**. A set of spreadsheets should be filled in, **one per sourcing scenario** and these should be **compared**. In other words, all data in a specific Excel file reflect exactly one specific sourcing scenario and nothing is compared within one Excel file – all comparison happens among different Excel files, each of which has the same structure, but different data.

The model template contains five sheets: Start page, Risk section, Finance section, Future business section, and Result section. The start page contains a very brief introduction and the result section contains the result from each of the main section.

The risk section is a risk analysis of the project or area for that sourcing scenario, the financial section is in principle a budget for the project run under that sourcing scenario. The future business section is a description of the effect that the outsourcing scenario at hand has on the future capability profile of the company.

The risk section is built in the following way: The scale for probability is chosen to be percentage, and the scale for consequence is chosen to be *low*, *medium*, and *high*, each of which is further specified into ranges of consequences. When risks are identified, they are more like a family of possible events rather than a very precise event. For that reason, the same event may result in different consequences if it occurs and therefore we set the probability for each of the three consequences. Because each term of consequence (high, medium, or low) represents a range of

Event	*Consequence of event*	*No difficulties – some difficulties.* *Low level of consequences*	*Some difficulties – severe difficulties Medium level of consequences*	*Severe difficulties – complete failure High level of consequences*
Problems arise due to **unexpected quality or number of staff**		97.5	2.5	0.0

Table1: *The structure of a risk*

consequences and the full range of possible consequences are covered, the sum of probabilities must be 100 %. The structure of the individual risks is shown in Table 1.

Risks are combined into groups of risk, which are finally combined with the total risk. Risks are combined using the following formulas:

$$P_{total}(low) = \prod_{Risks} P_{risk}(low)$$

$$P_{total}(medium) = (\prod_{Risks} (P_{risk}(low) + P_{risk}(medium))) - P_{total}(low)$$

$$P_{total}(high) = 100 - (P_{total}(low) + P_{total}(high))$$

The basis for these formulas is the following simplifying assumptions:

- The risks are statistically independent
- The project as such is exposed to the consequence of the maximal consequence of any event

The financial section contains estimates of time used both at the outsourcing organization and at the sourcing partner. It also contains estimates of the costs used in the outsourcing organization itself and the cost paid to the sourcing partner. It contains the income as well (to give a better understanding of the relative

differences among the sourcing scenarios). Finally, a section for the cost of taking the project or area back in case it fails.

In earlier versions, the financial section did not contain the time used, but feedback from all the companies was that they wanted that information in the financial section. Earlier versions did not contain the take-back costs either, but its introduction was welcomed by the companies.

The future business section deals with the *future business* problem described in the previous section. The strategy ought to point out the core capabilities that are important to keep (or develop further), and it should also point out capabilities that are not needed any longer (or even harmful in the future). In short, the sourcing strategy should indicate the desired profile of capabilities affected by outsourcing. The future business section attempts to describe the following facets of the future capability profile for the sourcing scenario at hand:

1. A set of capabilities that may be affected by the sourcing scenario.
2. A set of expected degrees of capabilities (and their distribution) in the future.
3. The desirability of each of the degrees of capability above.
4. A weighting of the importance of each of the above capabilities relative to the others.

The capabilities of interest should be identified. It is important to have a focus on the future. Capabilities that are important in the future may or may not be important now and capabilities that are important now may even be considered harmful in the future. In earlier versions of the tool we focused on the *change* in capabilities and that confused people, because it very rapidly became unclear as to which point in time to think of. As a result of that, the tool was changed to focus only at one specific time in the future namely just after the project at hand has ended or the time horizon of the area at hand.

The degree of capability goes from 0 to 100 where 0 indicates unable to perform what is needed and 100 denotes fully capable. Three values are given for each capability: the minimum, the maximum, and the most likely. These values are the expected values *after* the project has run or after a specified duration for an area.

The capability values are now assigned a probability, that is, what is the likelihood that the capability ends at the minimum, at the expected, or the maximum value.

Each and every value of capability should also be assigned a degree of desirability. This is in its nature a rather subjective and fluffy value and this is the reason it is important that it is the same group of people that fills in this sec-

tion for all the outsourcing scenarios. In this way, they become more comparable.

In the process description coming from one of the companies, that is, one of the underlying tools, there was a similar request that should be the same group that should do the all the work and they used an equivalent augmentation.

Finally, each capability is given a relative weight. The scale of the weight is arbitrary because it is normalized before the total desirability is calculated. The total desirability is now calculated with the following formula, where W stands for the weight, P stands for the probability, D for the desirability.

$$D_{total} = \frac{\sum_{Capability} W_{cap}(P(cap_{\min})D(cap_{\min}) + P(cap_{likely})D(cap_{likely}) + P(cap_{\max})D(cap_{\max}))}{\sum_{Capability} W_{cap}}$$

In Section 3 of this chapter, a number of questions were posed. In the following lines it will be described how these questions are related to the filling in of the model template. What are the direct costs? – The answer to this is set in the finance section. What are the indirect costs? – The answer to this has to be split into three parts.

- The indirect costs that we realize for certain and that affect the project are placed in the finance section.
- The indirect costs that we realize but are uncertain and still affect the project are reflected as a risk in the risk section.
- The indirect costs (like social costs) that affect the entire business are reflected in the future business section.

We urge people to be conscious about the indirect costs because some them can be difficult to realize and those that are realized (on some level of abstraction) are the only ones that can be taken into account.

The crown-jewels problem is part of the future business problem which is covered in the future business section and finally the risks are dealt with in the risk section.

5 Tailoring the tool

Trial runs filling in the future business section in the model template (earlier versions) showed that one could not fill in this section. Two major problems arose: 1. Point in time to focus on. 2. Exactly which capabilities to think of. The first problem is dealt with in the previous section of this chapter, but the second led us to the conclusion that the future business section should be tailored. The reason was that the capabilities set up in this section were (and are) very general. When people had a chance to reformulate these into more specific capabilities, which are relevant to the situation, it seemed to improve things considerable.

The fact that this is a tool for many companies, not just for one, made it obvious from the outset that tailoring was necessary, but the degree to which future business should be tailored was a surprise. In short, one could say that the future section should be tailored while the others section should be "adjusted".

The tool should be tailored both to the company and to the project or area or family of projects and areas before it is used to describe the various scenarios. Figure 3 shows an overview of the process.

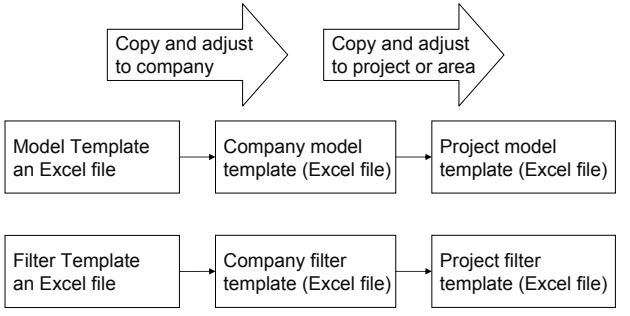

Figure 3 : *Adjusting the Excel files*

In this section , we focus on the model template, while the adjusting of filter template is dealt with in S ection 7.1.

Going from the model templates to the company model template s requires that all sections are considered. In the risk sections the question is: Are there risks that are not relevant for this company? Are there risks to add, that should be considered in this organi z ation. In the finance section: Are man hours relevant to this organi z ation or is only cost relevant? Do we have a wish to have more cost fields than specified in this section? The future business sec-

tion is a bit more complica ted because the changes tend to be more extensive.

Tailoring future business section includes replacing the very general capabilities (future business section) with those that the company has specified to be desirable (or undesirable). Finally , certain fields might be filled in as part of the tailoring. The fields that are most likely to be filled in are the weight s of the capabilities. This adjusting of the SourceIT template to fit the company reflects some of the strategic decisions.

Going from company model template to project model template in principle one goes through the same considerations, but in this step minor changes a re expected to be made in the risk section, finance section is likely to be unchanged, while future business section is likely to change.

These later adjustments reflect the decisions on the tactical level.

5.1 Example – Tailoring the Future Business section

The generic values are *technical skills* (*in-house* and at *sourcing partner*) and *domain skills* (*in-house* and at *sourcing partner*). In the discussions and trial runs, the companies have given these examples of capabilities that they in their concrete situations would consider.

- Ability to create test cases.
- Ability to design new products.
- Knowledge about newest database technology.
- Knowledge about customer wishes

Remember to consider both parameters regarding the company itself and the ODC. Note that the template resulting from the tailoring step should be used in **all** sourcing scenarios examined to ensure that the data for each scenario can be compared.

The last thing to do in the tailoring step is to give a relative weight regarding the importance of each skill relative to the other skills. The scale is arbitrary because it is the ratios that matter and not the individual values. Below in figure 4, an extract of the *Future Business section* can be seen after tailoring the capability to create test cases in the *Model Template* in the project template. The field average desirability is calculated for general information – in reality it is the total desirability that is of interest.

Technical skils in house				
		what is the minimum value	**what is the expected value**	**what is the maximum value**
How is the **future technical skills** in house after the task has been performed - on a scale from 0 -100		10	20	30
		if the value appears to be the minimum	**if the value appears to be expected**	**if the value appears to be the maxium**
what is the **probability** of this outcome? - on a scale from 0 to 100 %		30	20	50
How **desireable** is each of these posibilities - on a scale from -10 to +10, where + 10 is extremely desireable 0 is neutral and -10 is extremely undesireable		-4	-3	0
			Average desireablility	
How **desireable** is on average the situation regarding the **future technical skills in house** - on a scale from -10 to +10, where + 10 is extremely desireable 0 is neutral and -10 is extremely undesireable			-1,80	
Relative to other organizational aspects how important is technical skills? - Scale 1 -100			20	

Figure 4: *Extract of the future business section after tailoring it to the project*

6 Intended use

Feedback from the companies consistently state that there has been a requirement for the tool to support the decision process at a very early stage and should not take more than 2–4 hours to achieve an outcome. Feedback from the companies has indicated that the tool can also be a mean to follow up on whether the decision taken is still valid while the outsourcing of the project or area is still in progress, but has not been tried out yet in any way.

This tool has the same purpose as a business case, but is less time and resource consuming (and less thorough). If desired it can act as an input to a business case and in more simple cases it may even replace the creation of a business case. It helps to make the quick and rough estimates and works as a filter to decide on cases that are to be examined more thoroughly.

The tool is expected to be used by one or a small group of decision makers at an early stage of the decision process browsing through possible sourcing scenarios – typically a meeting of 2–4 hours to talk about the parameters and to decide on their values.

7 An example

The following section gives an example of how to use the tool. In this example, both templates have already been tailored to the project or area.

Please note that the figures shown are extracts only (in the sense that many rows are hidden). This is done to keep figures as simple as possible, but sufficiently complete to support the understanding of the text. *A consequence is, however, that the reader cannot recalculate the results.*

7.1 Finding the relevant sourcing scenarios

Consider which sourcing scenarios could be relevant. The sourcing strategy ought to point out the list of possibilities, but this step finds the subset of this list relevant in exactly this project or area. This step can either be done simply through discussions or, as an alternative solution that has been suggested (but not tested), by the support of an Excel file that we refer to as filter template.

Below, in figure 5, an extract of filter template is shown. It is a score sheet to select candidates for sourcing scenarios. In this, each column in the table represents a potential sourcing scenario. The Excel file has been tailored to the company at hand and in this case the following sourcing scenarios are available:

- In house.
- Specialist consultant.
- Partial sourcing.
- Full sourcing.
- Staff augmentation.

In the tailored Excel file every sourcing scenario relevant for that company must be defined and explained. For example, partial sourcing means that certain parts of a given project or areas are delivered by the ODC (Offshore Development Centre) and certain parts are delivered by in house employees.

The rows represent characteristics of the project or area with respect to the sourcing model specified in the columns. The column "Value" is for common information and the values in this column *do not* influence *any* calculation.

The sheet must be filled in such a way that the sum of all fields in one row sums up to 10. When the sheet has been filled in with scores, the resultant scores indicate how the individual sourcing model scores relative to the others. The most prom-

Project:	xxxx					Support for different sourcing	*Share a total of 10 points between each of the sourcing models for each parameter*			
Parameters	**Scale**	**Constraints**	**Measure**	**Value**		**Inhouse**	**Specialist consultants**	**Partial sourcing**	**Full sourcing**	**Staff augmentation**
System stability	Defects pr function points	Only maintenance	Reported defects last year / FP	0,2		1	1	2	3	3
Competence (inhouse)	1 available 10 not available		Subjective	5		0	3	3	1	3
Capacity (inhouse)	1 available 10 not available		Subjective	5		2	0	3	2	3
Core bussiness (innovation capability)	1 not 10 core business		Subjective	1		0	0	4	2	4
Technology	1 known inhouse technology 10 new tech		Subjective	5		3	3	1,3	1,3	1,4
New Product development / Maintenance	1 Maintenance 10 NPD		Subjective	2		1	1	3	1,5	3,5
Insight into competence	1 none 10 Very		Subjective	7		2	1	2,3	2,3	2,3
						19	13	42,4	24,9	40,5

Figure 5: *Extract of the Filter Template*

ising models are selected for further analysis. The number of models selected for further analysis is dependent on the context.

Based on the total score of the model score sheet the decision makers might choose to analyze the *partial sourcing scenario* and the *staff augmentation scenario*.

Irrespective of whether the relevant sourcing scenarios are found ad hoc or through the filter template, **there must be one model Excel files per scenario!** Remember that it is through the **comparison** among different Excel files that the best scenario is found.

7.2 Deciding risk levels

Risks are usually described as a possible and negative event that may happen with a certain probability and a negative consequence.

In the template, there is a sheet called *Risk section* and in this section there are three ranges of consequences: *No difficulties–Some difficulties*, *some difficulties–Severe difficulties*, *and Severe difficulties–Project fails completely*. No matter which model you use, there is a large element of subjective judgment – even if you use money as the scale of measurement (what exactly is the price of a partial failure of the project?). Therefore, one has to align the participants' sense of scale by agreeing on examples of the two borders between the three ranges. In some of the trial runs, we did not have this step and we observed a big uncertainty among the participants when assigning values to the fields in the risk section. The feedback from introducing this step was very positive and

reduced the uncertainty substantially because one could refer back to the examples.

For simplicity, we name the ranges in the following way:

- **Low** denotes consequences in the range *No difficulties–Some difficulties.*
- **Medium** denotes consequences in the range *Some difficulties–Severe difficulties.*
- **High** denotes consequences in the range *Severe difficulties–Project fails completely.*

As an example, an organization may decide that the border between *low consequence level* and *medium consequence level* is, for example,

- A delay exceeding 20 % of the estimated time must have occurred..
- Cost is more than 15 % higher than the budget.

Similarly you must specify the border between *medium consequence level* and *high consequence level*, for example,

- A delay of more than 150 %.
- Substantial reduction of the project (more than 50 %).
- Project is declared a failure by management or …

After these ranges of consequences are exemplified, the risk section can be filled in.

7.3 Filling in the risks

The risks presented in the *Risk section* are grouped as follows:

- Legal risks.
  - o Laws
  - o Contracts
- Complexity.
- Communication and organizational risks (including language and cultural misunderstandings).
- Staffing problems.
- Quality problems.

Each row in the risk section represents a risk (a problem in this area could occur).

	A	B	C	D	E	F
1	**Risk section**					
2						
3						
4		**Sourcing model**		**<sourcing model>**		
5	**Events**	**Consequence of event**	**No difficulties - some difficulties.** Numbers in this column indicates the probablity that the event of the row either does not occur or has **low** level of consequenses	**Some difficulties - severe difficulties** Numbers in this column indicates the probablity that the event of the row does occur and has **medium** level of consequenses	**Problems Severe problems - complete failure.** Numbers in this column indicates the probablity that the event of the row does occur with **high** level of consequences	**must be 100 %**

Figure 6: *Assignment of risks to a row in the Risk section.*

Each number in the fields represents the probability that the risk has a consequence in the range presented in that column. Look at this example:

In one of the rows under contract risks it says: *Some issues in the client-supplier contract will cause problems.*

The decision maker should ask him self or her self how probable is it that the contract suddenly causes problems during this project? And imagine that he or she estimates a 2 % probability that the contract will cause problems in the medium range and further 0.5 % probability that the contract will cause so severe problems that the consequences fall into the high consequences range. Figure 6 shows how these are represented in the tool (Only 2.0 and 0.5 are typed in by the user).

After having filled in all risks, the total risk distribution in terms of the probability of each of the ranges from low to high is calculated. The result is shown

	A	B	C	D	E	F
5	**Events**	**Consequence of event**	**No difficulties - some difficulties.** Numbers in this column indicates the probablity that the event of the row either does not occur or has **low** level of consequenses	**Some difficulties - severe difficulties** Numbers in this column indicates the probablity that the event of the row does occur and has **medium** level of consequenses	**Problems Severe problems - complete failure.** Numbers in this column indicates the probablity that the event of the row does occur with **high** level of consequences	**must be 100 %**
34	**Communication and organisational risks**		63,4	25,7	10,9	100,0
35						
36	**Staffing**		97,5	2,5	0,0	100,0
37	Problems due **unexpected quality or ammount of staff**		97,5	2,5	0,0	100,0
38						
39	**total risk staffing**		97,5	2,5	0,0	100,0
40						
41	Problems due to **poor quality in the solution** of the task		87,5	12,5	0,0	100,0
42						
43						
44	**total risk**		24,9	60,2	14,9	100,0

Figure 7: *Extract of Risk section* showing the calculated total risk.

in at the bottom line in figure 4. (note this is only an extract, so recalculation by reading is impossible, but the formulas shown in Section 7 is used)

An important experience gained in one of the trial runs of this section was that the participants found that some of the risks were important, but they had no knowledge to fill them in. A discussion showed that they had to search for some information before they could fill out those fields. Our claim as well as their understanding was that this search for information actually improved the quality of the decision making.

7.4 Filling in the Finance section

This section is basically a budget. How many man hours do we expect to use on this project? What are the costs and incomes of this project?

In case we are dealing with an area (a stream of tasks) you need to set duration, for example, this area for the next three years, and then handle it as a project.

In a full fledge business case, a more elaborate budget will be made also showing the development of the cash flow.

The rows in the finance section can be seen as subtotals of a budget, so the filling in this budget will in most cases require the usage of an ordinary spreadsheet to create the budget. The budget is probably based on rather rough estimates.

Cost to set up the project covers negotiating, initial teaching, hiring staff etc.

In sourcing can become a very urgent problem if the sourcing partner changes service level, or simply goes out of business. If the sourcing object is business critical, you need to have contingency plans in place. By estimating the in sourcing cost, you act consciously at the risk of sudden loss of services. These costs are estimated in the finance section, but are not added to the final result.

In the columns, the budget distinguishes between expenses incurred in-house and those paid to the ODC.

7.5 Filling in the Future Business section

In this section, there is a list of capabilities that are considered important for the company's ability to run its business. The questions to answer are: **After** having run this project using this sourcing scenario, what are the company's capabilities on a scale from 0 to 100? 0 represents unable while 100 represents fully capable.

Actually, there are three columns to fill in, one for the minimum value, one for the expected, and one for the maximum. Look at this example:

'How are the future abilities to create test cases in-house after the task has been performed'?

In this case, the minimum score is set to 10, the expected is set to 20, and the maximum is set to 30.

Further, the decision maker has to indicate the probability for each outcome. It is indicated as a probability in percentage.

For each of these values one has to indicate the probability for that outcome.

Finally, one has to indicate how desirable each of the outcomes is on a scale from -10 to +10. The value +10 indicates very desirable, the value 0 indicates neutral, and the value -10 indicates very undesirable. From these values the degree of desirability is calculated.

In a naïve interpretation having as high score on abilities as possible is the desirable outcome, but in reality **lack** of abilities over a certain level can be an **advantage**, for example, even if the company does not want to perform certain tasks, some employees could be tempted to do it themselves if they able to.

Therefore the *model template* contains these "desirability factors".

Based on the weights assigned to each capability to state their relative importance, the "total desirability factor" is calculated.

7.6 Repeat for other relevant scenarios

When you have filled in one model you go to the next model selected in "Finding the relevant sourcing models". Now go back to "Filling in the risks". It is important to realize that the tailoring goes for the project, not the scenario. The whole idea is to compare the scenarios and that requires the same tailoring.

In some scenarios certain parameters are not relevant, for example, cost to the ODC in running the project is not relevant in the in-house model. Instead of removing the parameter, you should use a neutral value. Which value is to be considered neutral is context dependent. In this example just set the cost to 0.

For instance, in the risk section there are some probabilities where the neutral value is 0 % and there are others where it is 100 %.

7.7 Compare and decide

The scenarios can now be compared. There is a result section in the model template summarizing the scenario to which it belongs. In the result section, one finds the total risk level of the scenario, the expected financial result of the project (or area in a given period), and finally a total desirability measurement.

So one can either use those result sections or the full models to compare and decide which model to use.

8 The decision process

The decision process for choosing areas to outsource can be summarized in this way:

The prerequisites for choosing the areas to outsource are that it has strategically been decided to outsource. At the strategic and tactical level who are the sourcing partners, contractual relationships, and principals for working together. For further details on sourcing strategy see Chapter 3 sourcing strategy.

From the sourcing strategy for the company, extract the following information:

- Purpose of outsourcing.
- Sourcing scenarios to consider.
- Risks that are considered generic in this company.
- Budget elements to use.
- Capabilities to consider in relation to future ability to run the business.

- The relative importance of the capabilities for the future business.

1. At the tactical level, when choosing projects or areas to outsource (in accordance with the strategy)
   a. Decide the detailed capabilities to consider in relation to future ability to run the business.
   b. Decide the capabilities' relative importance (in detail).
2. Analyse concrete projects and area
   a. Decide which sourcing models are relevant for further analysis.
   b. Estimate risks for each of the chosen sourcing models.

c. Estimate the budget for each sourcing model.
d. Estimate the desirability regarding the ability to run future business.
e. Compare the sourcing scenarios.

3. Decide the sourcing scenario to follow for the area or project, based on the purpose stated in the strategy and the comparison and the insight achieved from using the tool and seeking background information.

The decision process described here are the decisions taken either affecting (tailoring) the tool or using the tool.

9 Conclusion

A tool has been constructed on the basis of the existing tools. It is more general in its nature than the tools on which is was based and therefore a good point of departure for companies to create their own. Experience has also shown that tailoring is needed. The user of the tool can express facts about risks (also covering uncertain indirect costs), costs (direct and known indirect), and social cost as part future capabilities. In this way, the tool supports the decision makers in choosing the right projects and areas to outsource. Trial runs have shown that the experience of the users is that they take a decision on a much safer ground. Trial runs have also shown that users have difficulties in dealing with consequence of risks, but that discussions about levels of consequences help.

Finally, the basic idea that the filling in of the Excel file has helped the decision makers more than the actual calculations done by Excel was supported by the trial runs.

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Sourcing capability assessments

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Abstract. This chapter describes the detailed insight you need into the sourcing processes to improve them efficiently and thereby improve the ability to succeed in sourcing. Various approaches will be discussed to determine how well an organisation is capable of utilising sourcing to the benefit of the business, and the necessary terminology will be explained. A research issue in the SourceIT project is to identify the condition for optimal sourcing. Several studies have been made to identify what models and methods are the most usable to support this. Together with the partners in the SourceIT project and other involved parties, a new model and method is developed, based on their practical knowledge about what most important aspects lead to success in sourcing.

Keywords: CMMI ACQ, assessments, capability, maturity, eSCM, SourceAbility, SourceIT

1 Introduction to sourcing capability

Some organisations source 100% of innovation, development and production and make good business.

Some organisations are considering cleaning the windows themselves because they have severe problems with the cleaning service.

The difference lies in the organisational sourcing competencies. One is good at performing the sourcing process, the other is bad. One is capable of sourcing, the other is not. The way to higher capability goes through building of organisational competencies. But which competencies build the sourcing competencies? And how good is your organisation when it comes to the sourcing competencies?

This chapter explains the concepts behind capability assessments and provide guidelines for performing an assessment.

1.1 Capability

To answer the question, we use the well-established concept of process capability and organisational maturity. However, these concepts require some explanation of the background, since a lot of unfortunate misunderstandings have developed over the years.

The capability levels express the level of mastering the process. Suppose the organisation has had a good sourcing experience, then the capability levels will answer the question 'Can the organisation do it again?' Answers can vary from Level 0 = Not likely, Level 1 = Maybe, Level 2 = Yes, if the same persons are in charge, Level 3 = Definitely, and Level 4 = Yes, including statistics for performance to Level 5 = Better.

Let us use the swimming analogy and take a look at Fred's swimming capability:

Capability level 0: Incomplete – some processes are not performed. Fred can swim breast stroke for a few minutes, but is not capable of jump head forward. This is good enough for playing around in shallow water.

Capability level 1: Performed. Fred can do all the basics included in a swimming contest. He can measure the time it takes to do 200 m breaststroke – if he cared at all. By the way, most people do not know how fast they do 200m breast stroke and they live a perfect life not knowing. Good enough for most of us, but certainly not if you have professional ambitions.

Capability level 2: Managed. Fred has planned his swimming. It is divided into subtasks (jump – stroke – turn – finish) and he has started to measure each sub process.

Capability level 3: Defined: Each sub process is now described and measured and Fred has been trained and can be compared to the other swimmers. He is now not only doing a turn, but he does it in a way that is both legal and the same way as the fastest swimmers do. Now he knows if he on a good day will perform the turn faster or slower than the other swimmers. Same goes for the other subprocesses, and if he looks at his historical data, he has a pretty good picture of his chance in the next competition.

Capability level 4: Statistically managed. Fred has statistical control of his swimming performance. He uses this to predict his next performance with statistical significance. He has deleted data that was irrelevant due to special circum-

stances, so he can now tell his sponsor that he can beat the regional record next week with a 45% chance.

Capability level 5: Optimising. Fred is now improving his swimming – optimally because his insight into his swimming sub-processes allows him to focus on the weakest sub-process or the one that has the largest variation, and hence is the most unreliable in the contest. Fred is now on the shortest path towards the world record.

> Can Fred swim – oh yes, he demonstrated that all ready at capability level 0! The difference is that his insight into the complexity of the swimming process made him increasingly more capable of becoming better. And the capability levels are expressing how much insight he has, and hence how much and how fast he can improve.
>
> Will Fred win the worlds if he reaches level 5? Not necessarily, but if has what else it takes, he will go there fast.
>
> Will Fred win the worlds if he stays at level 1? Mostly unlikely! But then again, extreme physical advantages can work in his favour.

Exactly the same goes for sourcing – only that it is so much more complicated. But you can still ask: Can the organisation source? You look out of the window and the answer is always yes. Whether it is window cleaning service or hiring an extra programmer for 6 months, it is sourcing. But from there to the sourcing practice of companies like Toyota there is a long way. Toyota has outsourced 70% of the development of a new car to companies with which they have built up partnerships over decades. To describe and discuss the difference, we need the detailed process insight that the process capability provides. Without process insight we can still play cheerfully in shallow water.

1.2 Capability vs. maturity

Terminology: unfortunately there is no strict definition, and confusion prevails. If you are confused, my advice is that you just think of them as the same. Not true, but close enough to be useful. This definition is inspired mostly by CMMI.

We talk about organisational maturity when we look at organisations' capabilities to, for example, sourcing. The idea behind the maturity view is similar to the one behind the capability view on one process, but the scope is an organisation's

overall capability in a certain set of processes, such as sourcing. So maturity is a different view on the same issue. An organisation has a capability level in each of the many processes. If the capability level is high enough in a defined set of processes, the organisation is operating at a certain maturity level.

When you talk about maturity levels, you leave out some important details about the performance of specific processes. But in the maturity level is included a defined path of improvement which is valuable. When you want to improve the sourcing process, certain processes are more important than others. Which processes to start with and which you need not give priority is the wisdom of the maturity levels.

Maturity and capability are both representations of process performance. They tell almost the same story, using similar levels, but with different perspectives. If you remember the different levels of process insight that constitute each level, and remember that we talk about process *capability* and organisational *maturity*, you will be able to interpret what ever definition you come across. Best survival tip: focus strictly on the concepts and ideas behind and adapt to the terminology used.

2 Terminology

Figure 1 explains the terminology needed to understand the concepts of sourcing process insight and sourcing capability assessments.

The company needs a product or a service, and as an alternative to develop, produce or do it themselves, they outsource it. Everything the company does between the decision to source and until the product/service has become valuable for the company is the sourcing process. The process is what the company does. The input includes requirements and the added cost and risk of sourcing. The output is the required product or service that the company can sell.

The sourcing process is, or should be, described in an appropriate format to support the practitioners. This is the sourcing process description. It is not the process! Just like the recipe is not cooking your food. Cooking is the process, and the recipe is a description. The sourcing process description is the written interpretation of how the organisation believes that it is most efficient and effective to perform sourcing. Please be aware of two important issues:

1. The process may not be performed as it is described in the process description
2. The quality of the process description can make it anything between very useful for the users and completely useless.

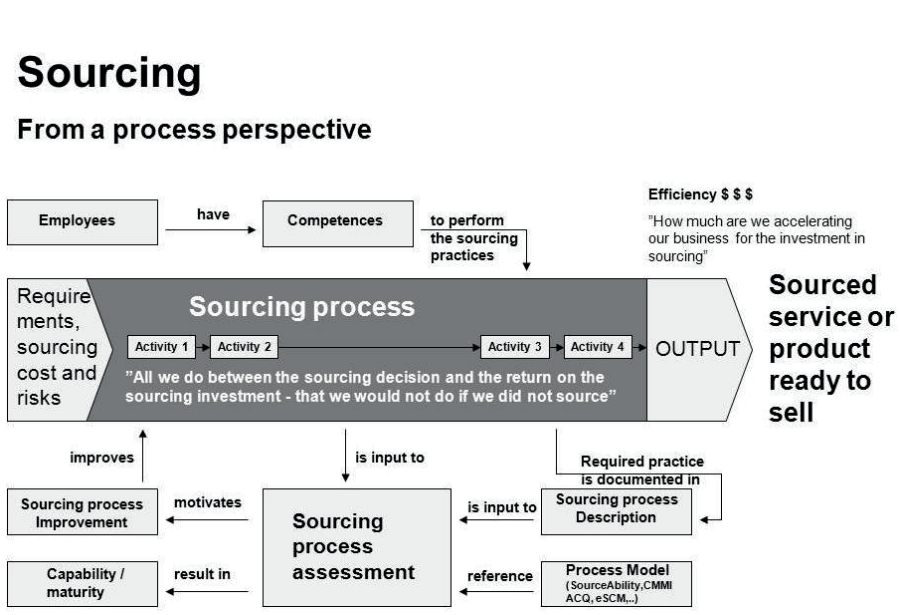

***Figure 1**: Sourcing process terminology*

This implies that if projects are not following the sourcing process description when they perform the sourcing process, there may be good reasons. If so, the description must be updated to reflect what the best practices in reality are.

Sourcing process models contain the characteristics of good sourcing practices. They are generic representations of what international experts have seen, when they studied successful sourcing projects. They tell the story of 'companies who are good at sourcing normally do like this….'. So, if your company is not following a practice the models describe, you are most likely at the risk of not achieving the business goals that the practice is designed to achieve. Comparing your process with the models is called an assessment. Performing an assessment will make you conscious of the risks that are introduced by not performing certain practices.

Employees are the ones who perform the sourcing process. They are people of flesh and blood and competencies, and the sourcing process complexity is surprisingly underestimated. Let us use the recipe analogy for a moment. If you want to make a process description of how to boil an egg, you can do this to a level of detail, that all it requires of skills is to identify an egg and the stove. Still it is surprising how many eggs at the breakfast table are either too soft or too hard. The recipe/process description will not take you all the way, competencies are required. Boiling an egg takes a few competencies, and sourcing a lot of competencies. Often,

the competencies of employees are taken for granted, which is a common source of bad process performance. Even the best process description takes competent people to be valuable.

At the bottom of the picture, you find sourcing process assessments. An assessment is the activity in which a team of assessors take a sourcing model and use it as a reference when analysing how well the employees are performing the sourcing process according to the descriptions. The result is presented as capability levels in specific processes. If the capability in a given process is critical to the overall sourcing performance, the process must be improved. A process improvement activity is initiated, and done, when the improved sourcing performance is achieved. The improvement activity may include the updating of process descriptions and the training of the employees to possess the competencies required to perform the process according to the process description.

3 Assessments

This section will describe how to perform an assessment.

The motivation to perform an assessment is either:

- Internal: Get knowledge about own performance as a baseline for improvement, and if you are a supplier, as a way to distinguish you from your competitors.
- External: Get knowledge about a supplier's performance, as a selection criteria or follow up action.

The goal is to get a snapshot of the capability, or, in other words, how good are we (or our supplier) and information, which enables us to improve our sourcing practice, either internal, or external. The essential quality of information includes the following, which provide the direction for performing the assessment:

1. Correctness – are the information true? To be sure we require "sufficient" evidence.
2. Trustworthiness – will the stakeholders believe in the information? If not, the improvements will fail in implementation.

To balance the correctness, the assessment team must dig deep enough to have evidence to produce the right recommendations. Too little evidence creates

too generic recommendations and too much evidence costs too much to produce.

To balance the trustworthiness, the assessment team must include both assessors from inside the organisation and experts from outside. The insiders will ensure that the result is credible among their peers and the outsiders bring objectivity and model expertise. Too little team size and the result can be distrusted by the stakeholders and too large a team size is too expensive and inefficient.

To find the correct balance is a challenge and you should ensure that appropriate assessment expertise has reviewed the assessment set-up.

The steps that determine the set-up are the following: Scope, depth and team.

3.1 Scope

3.1.1 What processes are assessed and what are not?

Take advantage of the chosen sourcing model and pick out the processes that you find most important. Picking all processes is the best choice and leaving out processes without a specific good reason will not provide the full picture. If there is a time/cost constraint, it may be worth considering restrictions on the depth instead.

3.1.2 Which parts of the organisation are assessed and which are not?

An assessment has a positive side effect that can hardly be overestimated: knowledge sharing and creating process insight. The nature of an assessment interview brings practitioners together in a facilitated session, which allows them to disassociate from their daily work, and discuss with peers what the most efficient way of working is. Add to this the reflections that are encouraged when the participants compare their daily practices with international best practices delivered by the model, and you will know why the assessment interview session looks pretty much similar to the knowledge sharing practices of high maturity companies.

Is knowledge sharing not important, then pick the few employees that represents the company, and can provide the needed input to the assessment. If similar sourcing is practiced in one part of the organisation, you only need one representative from there. Pick the ones with the most experience, both good and especially bad, which is often neglected.

Communicate clearly what parts of the organisation are in or out of scope for the assessment.

3.2 Depth

How much evidential information do you need to create a recommendation that the stakeholders will trust? How deep will you dig until you got enough evidence?

In an interview, the depth depends on how much evidence you want to see for a given statement. The four affirmations you can look for is

1. Verbal. The interviewees confirm that they are doing a given practice.
2. Process description. There is a process description that supports the practice.
3. Footprints. Any physical evidence that the practice has been performed. Can be work products, minutes, items, etc.
4. Audit statements. Documents that prove that the practice has been performed according to the descriptions.

Do not waste time on obvious or easy recommendations, but support the very important issues with more than enough evidence to avoid lack of support due to distrust.

Choose the affirmations to support the level of correctness and trustworthiness you need.

3.3 Team

After the assessment, the team members will be the ones with the greatest insight into the processes in scope. If the manager wants to be on the team, he is definitely demonstrating the right attitude, but unfortunately it does not work. Having a manager on the assessment team will compromise the trustworthiness in most companies because employees will rarely speak freely with peers when their manager is present.

Choose respected peers as interviewers which will also assist the interviewee; the goal is to get the most information from the interviewee, and if the interviewer recognise that the interviewee is missing a point, he can ask supporting questions. An efficient team normally consists of 1–2 external assessor and 2–4 internal assessors.

3.4 Assessment type

3.4.1 Questionnaire

Questionnaires are easy to create and fill in and do not include the trouble of planning physical meetings. Appealing indeed, but questionnaires are generally not reliable for process capability surveys. Remember Fred? If you asked him if he could swim, what was the answer? Even at level 1. It requires a high level of capability to evaluate. If you do not have it, you are a poor judge, and asked to judge yourself does not make the result more credible.

3.4.2 Interviews

The value of face to face interviews is indisputable when it comes to process assessments. This is by far the most effective information collection method for process assessments.

3.4.3 Documentation review

A thorough review of projects' live documentation to find footprints that indicate that a given practice is implemented. The SCAMPI method calls this "Practice Implementation Indicators Documentation" and for the trained assessor, this practice can be very efficient.

This mix is often used for an efficient assessment:

1. Make a brief review of the live documentation to get an initial idea of the strength and weaknesses.
2. Design the interviews to cover the most interesting issues just found.
3. After the interviews, go back to the documentation to find evidence for the most controversial findings.

3.5 Maturity certificate. Do you need one?

You can get, for example, a CMMI ACQ certificate that states that you are at maturity level x, but do you need one? Maybe, but be careful:

Yes – if you can tell your customers that you are a better and more reliable partner than your competitors – then of course you will get one.

Or, obviously, if your customer simply requires you to have one.

But watch out for the most common false start in process improvement!

Neverever let the level be your goal!

Many managers have discovered the obvious connection between maturity levels and the chance for good business and all managers want good business. The link seems evident, and the manager enthusiastically declares 'We want to be maturity level three in two years'.

'NO sir' – 'You want better business in two years! Maturity is an enabler, and if you make it the target, your own employees will find that you have lost track.' It is just a little tweak in the communication, but it means a lot to success. This is the path to follow:

1. Define business targets.
2. Define what your process performance must be to meet the business targets.
3. Improve processes and measure progress.
4. Then, eventually, get a certificate to celebrate and tell your market that you are proud to declare a certain level of capability/maturity.

Better business is the only real motivation for process improvement, not a certificate.

Understanding this statement is important for success.

3.6 More information

The assessment principles described here is a subset of the assessment style developed by Tim Kasse called "Action Focused Assessment" (Tim Kasse 2002). Action Focused Assessments are designed to create as much positive energy for change as possible from the assessment, still compliant with the SCAMPI Class A appraisal requirements as defined by the Software Engineering Institute.

4 Models

Even though they look very different, all the models converge against the same target. After 30 years with process models, they themselves have also matured, and the major differences are the scope (what processes are covered) and how they choose to divide the processes into sub-processes/categories. If you care to go through them individually, you will find that they are all great and provide large amounts of condensed experiences to support a sourcing practice.

In other words, it is not important which model you choose.

The downside is that each model is overwhelming! You need to invest one day in just understanding the framework and another 2–3 days just to get an overview of the processes included and how they are organised. Three or four days of introduction training are rarely part of the initial budget, but worth every second, for more reasons than the original purpose. A common framework of terminology, vocabulary and process understanding develops between the colleagues who have attended the introduction class. That by itself is a strong support to the companies' process improvement.

The value of the models after the introduction training is like getting a Wikipedia and learning how to use it. When facing a challenge, you know where to look for industrial experience and best practices that have solved similar challenges and you will be comfortable with the format of the information.

4.1 SourceIT model

The SourceIT research project has developed a model framework that can be used to generate a model of a company's sourcing capability. With this model in hand, the company will get insight into the strengths and weaknesses in the organisational competencies and create focus on how changes to processes and organisation can improve the sourcing performance.

Several companies have, during the three and a half year the project has passed, been involved in the development of the model. It started at a workshop with the SourceIT partners, where the main parameters with importance for success with outsourcing were identified.

Later, several companies such as KMD, Vibeke Hartkorn, inCaptiva, Trellis and Grundfos have given their input through discussions and workshops. Finally, the Tecpoint knowledge exchange group number 29 about outsourcing has discussed the parameters in the model. This group counts more than 50 members.

The mind-set behind the framework is inspired by the process and process assessment framework as described in, for example, CMMI and ISO 15504 (SPICE). A model is a simplified way to describe reality, and can be used to analyse, demonstrate and communicate. A model must have just enough details to be useful.

Early in the discussions it was clear that the approach to sourcing was different depending on the organisation level: Top management, middle management and project.

The solution was to sort the content of the model into three organisational levels, reflecting the three main groups of stakeholders and extend it to a level for topics which are fundamental and independent of the levels. It was formed as a triangle indicating the degree of involvement and related effort.

The lifecycle in a sourcing relationship is another important condition. Three phases were identified: start-up or exit, establishment or closing and finally daily operation. These three phases are also related to three different viewpoints: strategic, tactic and operational.

Organisational stakeholders:
Top management:
Parameters relevant for top management
Middle management:
Parameters relevant for middle management
Project management:
Parameters relevant for project management
Foundation:
Parameters related to maturity.

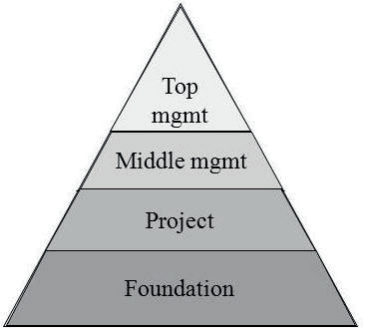

Figure 2: *The overall model.*

Lifecycle phase
Each parameter may be relevant to one or more of the lifecycle phases.

Strategy:	Parameters relevant for start-up and exit of sourcing activities.
Managing:	Parameters relevant for establishing and closing sourcing contracts
Operating:	Parameters relevant for the day-to-day operation of specific sourcing activities.

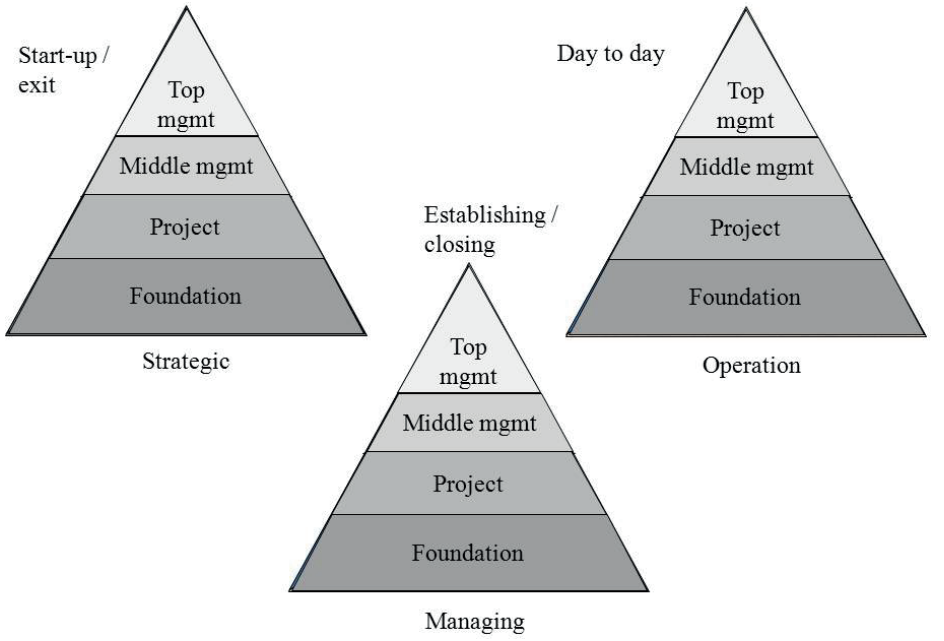

Figure 3: *The overall model including lifecycle phases.*

This overall model was used to group all the information from workshop and discussions. Every topic that was made into a parameter was grouped in a matrix, which is described below as the SourceIT parameter model.

SourceIT parameter model

The model takes shape as a set of parameters that is grouped by relevance in two dimensions: Organisational stakeholders and lifecycle phase. The grouping allows you to take a quick decision on which parameters are relevant to, for example, the top management in the establishing phase.

The model has 48 parameters in total, 16 Strategic, 29 Tactic and 12 Operational as shown in table 1.

There is no prioritisation of the competencies that the represented parameters included in this model. Each parameter is supported by a set of questions and scoring guidelines.

Each parameter is supported by questions, which are developed in cooperation with a number of companies. The parameters represent topics that a company

	Start-up (Exit) *Strategic*	*Establish (Phase out)* *Tactic*	*Operating* *Operational*
Senior management	Strategy development Decisions Communication	Planning Organisation Responsibilities Frameworks and languages Communication	Strategy monitoring Strategic changes Business case monitoring
Middle management	Law Culture management Impact analysis Implementation strategy Basic process establishment Communication Organisation Choice of sourcing partners	Law Contract negotiation Communication media Coordination Model/process tailoring Support process establishment Reporting structure Sourcing governance Technical and security issues	Progress monitoring Planning Process monitoring
Project management	Knowledge management Process improvement Roles and competencies Culture	Project team Process capability Knowledge exchange Support process establishment	Virtual leadership Process capability Communication Experience exchange
Foundation	Process capability	Process capability Communication	Process capability Communication

Table 1: *The SourceIT parameters*

needs to master, which means to have sufficient competencies, knowledge and experience and invest the necessary effort to fulfil the requirements the parameters indicate.

The questions are developed in dialogues with persons working with sourcing in companies. For each parameter, the participants were asked what would show if a company was excellent in fulfilling the topic a specific parameter referred to. In this work, most of the parameters were supplemented with sub-parameters.

From these two levels of parameters, an overall question per sub-parameter and a set of detailed questions also per sub-parameter were identified. An example is

Strategy development	
Development	**To what degree is the organisation developing strategies, and are sufficient resources allocated to the task?**
	To what degree is a strategy development process defined?
	To what degree are the resources for strategy development available?
	To what degree is the organisation involved in the strategy development?
Strategy	**To what degree does a sourcing strategy exist?**
	To what degree does a sourcing strategy exist?
	To what degree is the sourcing strategy integrated with the other strategies in the organisation?
	To what degree does the strategy include measurable targets against a baseline?
	To what degree does the strategy include risk analysis?
	To what degree is the strategy related to a business case?
Strategy implementation	**To what degree is the sourcing strategy implemented and used?**
	To what degree can you find evidence that the strategy is introduced to the organisation?
	To what degree is the strategy communicated at all levels, from top management to the practical level?
	To what degree are the sourcing objectives defined and communicated?
	To what degree is the strategy implementation success criteria defined and communicated?

Table 2: *Example: Parameter Strategy development with sub-parameters questions.*

shown in table 2 for the Strategic parameter Strategy development. This parameter has 3 sub-parameters with one overall question and 3, 5 and 4 questions for each parameter respectively.

In total, the SourceIT questionnaire includes 96 overall questions and 237 detailed questions. Each question is scored on a rating scale with 5 levels of achievement: N – Not achieved, P – Partially achieved, L – Largely achieved and F – Fully Achieved (same as ISO 15504). An assessment will, after the scoring, "draw a picture" of the company's strong and weak parameters, thereby indicating the company's ability to succeed with sourcing.

Indirectly it will also give the basis for deriving recommendations for improvement – strengthening of the weak parameters and a more efficient use of competencies related to strong parameters.

The mission for SourceIT is to generate recommendations that will enable a

Process Area	*Category*	*Maturity Level*
Agreement Management (AM)	Project Management	2
Acquisition Requirements Development (ARD)	Acquisition Engineering	2
Acquisition Technical Management (ATM)	Acquisition Engineering	3
Acquisition Validation (AVAL)	Acquisition Engineering	3
Acquisition Verification (AVER)	Acquisition Engineering	3
Causal Analysis and Resolution (CAR)	Support	5
Configuration Management (CM)	Support	2
Decision Analysis and Resolution (DAR)	Support	3
Integrated Project Management (IPM)	Project Management	3
Measurement and Analysis (MA)	Support	2
Organisational Process Definition (OPD)	Process Management	3
Organisational Process Focus (OPF)	Process Management	3
Organisational Performance Management (OPM)	Process Management	5
Organisational Process Performance (OPP)	Process Management	4
Organisational Training (OT)	Process Management	3
Project Monitoring and Control (PMC)	Project Management	2
Project Planning (PP)	Project Management	2
Process and Product Quality Assurance (PPQA)	Support	2
Quantitative Project Management (QPM)	Project Management	4
Requirements Management (REQM)	Project Management	2
Risk Management (RSKM)	Project Management	3
Solicitation and Supplier Agreement Development (SSAD)	Project Management	2

Table 3: *Process Areas, Categories, and Maturity Levels*

company to improve the business benefit of their sourcing practice. The SourceIT model is one part of the SourceAbility services delivered by DELTA.

For more information about SourceAbility services, please contact DELTA (SourceAbility@delta.dk).

4.2 CMMI for Acquisition (ACQ)

CMMI is one of the two major maturity frameworks, with roots that can be traced back to the mid-eighties. During the first two decades, the scope of CMMI was product development, but including one process area called Supplier Agreement Management, because some level of sourcing almost always existed. Along with the focus on product development flourished the focus on acquisition as the counterpart discipline. The scope of CMMI ACQ is the acquisition of the required products and services.

Today, there are three constellations of CMMI:

- CMMI DEV, for companies engaged with product development
- CMMI ACQ, for companies that acquire products and services
- CMMI SRV, for companies that provide services.

Browse Table 3 to see what a CMMI-ACQ covers from a list of process areas and their associated categories and maturity levels.

- Recommended training: introduction to CMMI for Acquisition.
- Recommended reading: Gallagher et al 2009

4.3 eSCM

e Sourcing Capability Model is from the beginning designed to support sourcing practices.

It has two models, eSCM-CL that supports the client (CL) organisation and eSCM-SP that supports the service provider (SP).

eSCM-SP is developed with three purposes in mind:

1. to give service providers guidance to internal process improvement
2. to provide clients with objective means to evaluate the service providers' capability

3. to offer service providers a standard to use when differentiating themselves from competitors.

eSCM-CL has two purposes

1. to give client organisations guidance that will help them improve
2. to provide client organisations with objective means of evaluating their own capability

eSCM has a lifecycle oriented approach, where each process is assigned to a lifecycle phase.

- Training is available from ITSqc.org.
- Recommended reading: Bill Hefley and Ethel A. Loesche 2010

4.4 Guidelines for choosing a model

SourceIT has mapped the different models against each other. We find those to be a relevant selection, but others may be equally valuable. All are useful and cover the sourcing practice from different perspectives. One should be chosen, and from the models described here, we suggest the following criteria.

1. If the organisation has experience in one of them, choose that one.
2. If the organisation has experience in none of them, choose SourceAbility
3. If eSCM and CMMI ACQ appears overwhelming, choose SourceAbility
4. If the assessment and improvement activities only are related to sourcing, choose eSCM.
5. If the assessment and improvement activities have a scope for product development in broad terms, including sourcing, choose CMMI ACQ.
6. If a customer requires a certificate in a specific model, choose that one.

5 Conclusion

If you want to go somewhere, you need to know where you are, and the directions to get there.

If you want to improve the business benefit from sourcing activities, you need to know your current capabilities and how to improve them.

A capability assessment will tell you where you are and the models will provide guidelines on where to improve.

The business potential of sourcing is huge, but sourcing is very complex indeed. If you have serious ambitions, you either take the challenge serious or you better stay in shallow water.

References

Brian Gallagher, Mike Phillips, Karen Richter, Sandra Shrum. (2009) CMMI-ACQ: Guidelines for Improving the Acquisition of Products and Services. Addison Wesley

Bill Hefley and Ethel A. Loesche (2010) eSourcing Capability Model for Client Organizations (eSCM-CL). Van Haren Publishing

Tim Kasse (2002). Action Focused Assessment. Artech House