

Conceptualizing utilization of systems development methods

- An empirical investigation of adoption, adaptation and use of methods

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Summary

The thesis addresses the utilization of systems development methods. The thesis provides answers to the research question: *How can researchers and practitioners conceive utilization of systems development methods?* Method utilization, as it is defined in this thesis, involves adoption, adaptation, and use of methods at an organizational-, a project- and an individual- level in the development organizations. This definition of method utilization is introduced to provide a broad and clearer view on methods in practice.

The thesis answers the research question by providing ways to understand method utilization. This is achieved by providing 1) an analysis of a specific development context (web development) in which a method is utilized, 2) a framework for selecting techniques based on analysis of risk, 3) an analysis of perspectives on methods based on knowledge management theory, and finally 4) a conceptual framework for method utilization in development organizations making up nine perspectives on method utilization.

The contributions in the thesis are based on an interpretive longitudinal field study. The study followed the adaptation, adaptation and use of a method in a development organization over a period of three years. The field study consisted of an exploratory-, in-depth-, and participatory- phase each having different purposes and roles of the researcher.

The thesis consists of a summary and five published research papers. The summary provides details on the background of the research, the contributions, and research approach. Moreover, it relates the contributions from the five research papers to conceptual and empirical research on method utilization. The second part of the thesis consists of the five research papers in which contains the main answers to the research question.

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Part II: five published research papers

Paper A: Carstensen, P.H., and Vogelsang, L. "Design of web-based information systems – new challenges for systems development?" *Proceedings of the 9th European Conference on Information Systems*, Bled, Slovenia, 2001, pp. 536-547.

Paper B: Vogelsang, L. "User involvement in Development of Web Based Publishing," *Proceedings of the 11th European Conference on Information Systems*, CD-Rom, Naples Italy, 2003

Paper C: Jeenicke, M., Nielsen, P.A., Vainio, M., and Vogelsang, L. "Managing Networked Software Development," *the 26th Information Systems Research Seminar in Scandinavia*, CD-rom, Haikko Manor, Porvoo, Finland, 2003.

Paper D: Mathiassen, L. and L. Vogelsang (2005) "The Role of Networks and Networking in Bringing Software Methods to Practice", *International Journal of Business Information Systems*, Vol. 1(1/2), pp. 102-117.

Paper E: Vogelsang, L. and F. Kensing (2006) "Utilizing systems development methods - a conceptual framework", *Proceedings of the 14th European Conference on Information Systems*, Göteborg, Sweden.

Acknowledgements

I would like to thank my supervisor Finn Kensing for his support, comments, and guidance during my time as a PhD. student. I would like thank my co-authors for their cooperation and contributions to our papers.

I would like to thank the DIWA group for creating an inspiring research environment with interesting discussions and challenging interdisciplinary collaboration. I would like to thanks Pete Carstensen, Lars Kofoed, and Nana Below for their participation in the empirical work.

I would also like to thank the people at the IT-University of Copenhagen, especially the people in the DUIT department, for contributing with input to my research and for broadening my view on research.

I am also thankful to the people at Georgia State University for making my stay there so valuable and for asking the tough and relevant questions about my research. Here I would like to emphasize Lars Mathiassen for showing me another approach to writing papers and Richard Baskerville for looking out for me.

I will also like to thank the people at WebSystems for your time and interest in my project and for letting me and my colleges have access to your daily work. I am impressed how forthcoming you were and that we never got a “we can’t show you”-answer even when we asked to observe sensitive situations.

Finally, I would like to thank John King for introducing me to IS research and for helping me out at critical point in time during my stay at UC Irvine.

1. Introduction

This thesis deals with utilization of systems development methods. Methods have been developed for decades aiming at improving the quality of systems development processes, the quality of the software products, and achieve a standard process for software development (Avison and Fitzgerald 2002). Today, relatively few studies of methods in practice exist, although the need for more studies has been recognized for quite some time (Wynekoop and Russo 1993), and we still have more to learn about the methods in practice. The thesis provides entrances to understand method utilization in practice and how it takes place. This is achieved by providing 1) an analysis of a specific context in which the methods are utilized (web development), 2) a framework for utilizing techniques from methods, 3) an analysis of the perspectives on methods and finally 4) a conceptual framework for method utilization in development organizations. The thesis focuses on method utilization, which is defined as involving adoption, adaptation and the use of the method at an organizational-, a project- and an individual level in a development organization. The notion of method utilization is introduced to provide a broad and clearer view on methods in practice. The contributions in the thesis are based on an interpretive longitudinal field study. The study followed the adoption, adaptation and use of a method in a development organization over a period of three years.

The thesis contributes to the information systems (IS) research field and more specific to the research on systems development methods in practice. The IS field deals with the use and development of information systems. Information systems refer to a "... system providing information technology-based information and communication services in an organization" (p. 63, Davis 2000). The research on systems development methods in the IS field falls into two main types of research: the construction of methods and the understanding of methods and their use. The construction of methods deals with the creation of complete or fragments of new standard methods. Moreover, the construction of methods can lead to better understanding of methods in general although it is usually not its primary purpose. The understanding of methods seeks to conceptualize the methods and their utilization through conceptual and empirical research. The conceptual research is studies of the methods as they appear in text books and based on a theory from a reference discipline (King 1993). The conceptual research seeks to categorize and conceptualize the methods. The empirical research is based on field studies, experiments and surveys (Mathiassen 2002). The empirical research focus on different aspects of methods in practice, such as the actual use of a method (e.g. Bansler and Bødker 1993), and the extend to which the methods are in use (e.g. Fitzgerald 1998a), etc. This thesis contribute to our understanding of methods in practice based on a practice study (Mathiassen 2002). The contributions are briefly described in section 1.4 and elaborated in the five papers included in part II of the thesis.

1.1. Research question

The objective of the thesis is to provide new ways of understanding method utilization in practice and it provides answers to the following research question:

- *How can researchers and practitioners conceive utilization of systems development methods?*

1.2. Thesis structure

The thesis is a collection of papers and a summary. Part I is a summary and part II is the five published papers (briefly described in section 1.4) that I have either authored or co-authored. The main answers to the research question are in the five papers. The purpose of including the summary is to provide more details on the case itself, the research approach and on the related research that research papers often lack due to restriction on length. The summary, firstly, provides a chapter that offers more details on the setting in which the empirical study took place. It is included to provide an overview of the setting and the projects that were studied. Secondly, there is a chapter on the research approach taken in three different phases of the research. I divide the field study into three phases and characterize each phase and my research approach in general. Thirdly, I present the research related to the thesis topic and relate my contributions to this research. Finally, the fifth chapter summarizes and concludes the thesis.

1.3. The DIWA project

The research reported in this thesis has been conducted as part of the research project named "Design and Use of Interactive Web-Applications" (DIWA - see (DIWA 1999)). I joined the project in the summer 1999 as a research assistant, when the project started and later became a Ph.D. student in the project. The DIWA project had the following four objectives:

- To examine how the scope, content, and organization of IS development processes change when information services become ubiquitous and software development coalesce with media design;
- To analyze the implications for the division of labor, skills, and knowledge in IS development;
- To identify key organizational and technical factors that facilitate or impede successful implementation of interactive WIS; and
- To develop concepts, methods and tools to guide both the development of interactive WIS and the development of new, distributed and networked, organizational forms.

Furthermore, several assumptions on the design and use of web applications were stated explicitly in the project. The following is from the DIWA project research proposal (DIWA 1999 original emphasis):

- The Web is fundamentally a *new medium of human communication* - not a technology for information processing or computation. As a result, software design will coalesce with media design.

- Web-based information services will be available at any time and at any place. This *ubiquity of services* will lead to new kinds of organizations and new ways of interacting within existing organizations.
- The *rate of change* in technologies is unprecedented. The pace at which new tools and techniques are invented is unheard of even in the fast-moving world of computing. This proliferation of new technologies creates an "interoperability nightmare" for application developers and users and makes it difficult to manage the development process.
- The traditional *division of labor* and definition of work roles in IS development breaks down. The distinction between designers, programmers and users becomes increasingly blurred and new types of specialists - such as graphic designers and communications specialists - enter the design process.

My work and contributions are primarily on development and especially development of methods. At some point my focus changed from web development to methods in general, because the key findings relates to methods in general and not only to web development. This is reflected in the five papers, which are briefly described in the next section.

1.4. Included papers

This section briefly describes the papers I have authored or co-authored and chosen to include in my thesis. The first paper (Paper A), "Design of Web-based information systems – new challenges for systems development?", by (Carstensen and Vogelsang 2001) deals with challenges in web development as we perceived them in 2001. The second paper (Paper B) "User involvement in Development of Web Based Publishing" by (Vogelsang 2003) deals with the involvement of users in the development of web applications for information publishing. The paper introduced the distinction between internal and external users. Paper B goes into detail on the challenge of managing the relation between developers and users, which was described in Paper A. Together, paper A and B deal with the context in which the investigated method was adopted, adapted and used. The remaining three papers deals with method utilization. In Paper C (Jeenicke et al. 2003), "Managing Networked Software Development", we provide a framework to reduce risk in software development. The framework provides managers a tool to manage risk in software development through diagnosis of social capital and task uncertainty. The framework can be used to analyze and deal with the relations between users and developers described in Paper B. Paper D "The Role of Networks and Networking in Bringing Software Methods to Practice" by (Mathiassen and Vogelsang 2005b) brings an analysis of the dynamics of perspectives on methods based on two knowledge management perspectives, networks and networking. Paper E "Utilizing systems development methods - a conceptual framework" by (Vogelsang and Kensing 2006) provides a framework that enables researchers and practitioners to analyze and guide method utilization. Furthermore, paper E defines method utilization. The papers in full length are included in part II of the thesis.

1.4.1. Paper A: Challenges in web development

The paper deals with the challenges found in web development. It is based on a study that took place in year 2000. The paper investigates how web applications and their new ways of using information systems has challenged the way development is organized, how development is approached, how new competencies and roles are required etc. The paper characterizes web development and discusses some of the major challenges faced in web development. The paper seeks to understand the differences between web development and traditional systems development. We found several challenges in web development. Firstly, how to handle the new roles and expertise involved in the development. Secondly, how to handle the new organization of the development work that occur to ensure a better interaction among the different groups of expertise. Thirdly, how to change the attitude to rigidity of the processes conducted during development. Fourthly, how to improve concepts and tools for interaction, collaboration and coordination among very heterogeneous groups of designers and developers. And, finally, how to improve concepts and tools for interaction between developers, users and customers. The paper is a contribution to the research that investigates the difference between web development and traditional development.

1.4.2. Paper B: User involvement in web development

Paper B deals with the involvement of users in development of web applications used for publishing information to users outside of the organization. The paper introduces a distinction between internal and external users in order to describe the accessibility of different users in the specific development context. The internal users are located in the user organization (the organization that want to publish information) and the external users are the ones to which the information is published (i.e. users that are not located in the user organization). The paper draws on Grudin's (1991) three paradigms of software development and concludes that development of web application for information publishing is a hybrid of the three paradigms (contract, product, and in-house development). Furthermore, the paper discusses three issues in development of web applications for information publishing: that it is more about branding a company than selling a product, it is more about charactering users instead of involving them, and that branding is more than a usability issue.

1.4.3. Paper C: Managing networked software development

This paper deals with risk management in systems development from a social capital perspective. It proposes a framework intended for managers of software development to diagnose social networks and take action. The framework consists of two dimensions: social capital and degree of task uncertainty. The social capital dimension distinguishes between a coherent group of workers that trust one another and a group where trust is replaced by formal control. The task uncertainty dimension distinguishes between the well-defined and the ill-defined task. The main assumption is that improving trust in the social network and reducing task uncertainty will lead to a reduction of risk. The paper provides a set of techniques and principles found in the literature to deal with social networks and reducing task uncertainty. We analyzed four cases with the framework. Two of the cases are based on my empirical studies.

1.4.4. Paper D: Managing knowledge in method utilization

The paper provides an analysis of the relationship between methods and practice in three projects. The analysis is based on two complementary knowledge management perspectives, networks and networking (Swan et al. 1999), on organizational implementation of technology. The analysis reveals that the perspectives are present in all three projects and complement each other. Furthermore, the analysis shows that the emphasis on the networks and the networking perspective can change considerable over time. The analysis also reveals different relationships between the method and practice. In the first case the method was adopted as a solution to problems in the development process. In the second case the method was perceived as support for the development process and finally in the third case the methods were perceived as a repository for storing and retrieving knowledge about the development process.

1.4.5. Paper E: Conceptualizing method utilization

The paper provides a framework that conceptualizes aspects of method utilization in development organizations. The framework consists of two dimensions. The first dimension has three organizational levels, the individual, the project, and the organizational level (inspired by (Fitzgerald et al. 2003)). The second dimension is three aspects of method utilization, adoption, adaptation, and use. Together, the two dimensions make up nine perspectives on method utilization. The nine perspectives can guide an analysis of method utilization by providing a terminology. Furthermore, they provide an understanding of method utilization and what it takes to bring methods into use.

2. The setting

The purpose of this chapter is to give relevant background information about SoftPharm, the IT Company in which the field study took place, and WebSystems, the web development department in SoftPharm. The chapter is included to provide a more complete description of the setting in which the field study took place than the space in the research papers allows.

2.1. SoftPharm

SoftPharm is the IT development organization in which the field studies took place. SoftPharm has a long history of developing applications used for production and administration in the pharmaceutical industry. Most projects in SoftPharm involve development or maintenance of IT for MedProc, the company in which SoftPharm used to be the internal IT department. MedProc is one of the major Danish producers of medicine and related products. When the empirical studies were initiated in January 2000, SoftPharm had just become an independent company. The independence of SoftPharm was part of a large reorganization of MedProc into two separate companies with focus on two different areas of production, and a holding company. The reorganization was completed in the year 2000, while we were conducting the first phase of the field studies.

In the year 2000 there were approximately 400 employees in SoftPharm. The employees were distributed between five departments (the primary work area in parenthesis):

- Consulting and Business Development (sale and organizational development)
- IT Business Services (development of mainframe systems)
- IT Customer Service (IT-support)
- Desktop Solution Center (web and Lotus Notes development)
- IT Operation (IT-infrastructure e.g. computer networks and phones)

Besides developing software, SoftPharm also supports and maintains the main part of the IT infrastructure in MedProc.

The medical industry requires software of high quality. There are rules for the medical industry, enforced by the US Food and Drug Administration (FDA), which have to be complied with. If the rules are not followed, the production of medicine can ultimately be shut down, which of course is damaging to revenue and profits and perhaps even worse for a medical company, its reputation. The rules are significant in terms of requirements on software used in medical production. An example, given by SoftPharm, was concerning software used to print labels on the boxes in which you pack the medicine: An error in the system that prints the labels can have deadly consequences and therefore has to be tested thoroughly.

Striving for high quality is not just a necessity. SoftPharm used to be a part of a company that has high requirements to the quality of the medical production. This has created a culture that value and understands the importance of quality. The quality that goes into

the systems development in SoftPharm is not just related to the products, but also to the development process and its products. The process needs to be carried out with some order and with specific activities to ensure a high level of quality in the IT systems and the products have to be tested to create software without errors etc.

Traditionally, SoftPharm is employing engineers to develop software. The culture has been centered on technology and an engineering approach. However, this changed when SoftPharm began developing web applications and established a web department (WebSystems. A pseudonym) to do this distinct sort of development. The next section is about WebSystems and its history.

2.2. WebSystems

WebSystems is the web development department in SoftPharm (both names are pseudonyms). WebSystems' main goal is to develop web applications. The department started out in the mid 90's as a group of employees that had development of web applications and maintenance of desktop applications as their specialty. As web applications became more and more important, WebSystems was transformed into a department in SoftPharm. It grew and when we, the researchers, entered the organization in January 2000 there were about 60 employees working in the department, a number that had doubled from 1999 to 2000. There were approximately 140 employees at WebSystems during our studies in 2002 and 2003.

In the year 2000 the importance of web development was growing and the applications build were much more advanced and critical to the business. WebSystems was, at this point, mainly a web development department although some desktop work still took place in the department (primarily Lotus Notes development). New types of web applications, such as applications for support of large projects, content management systems and eCommerce, were demanded by the customers. These types of applications were all large and business critical applications compared to the web applications that used to be developed by WebSystems. As a result of this, WebSystems was split into two organizational units each focusing on different sizes of web development. One of the units worked with the small projects and the other with the large projects. Our studies took place in the unit that worked with the larger applications. We talked with the people in the small application unit about following specific project, but decided to focus on a few projects instead of many and thereby get an in-depth understanding of a few projects. The changes in the organizational structure reflects the organizational change the web department went through during the three years we conducted the field studies, i.e. WebSystems went from an organization structured for development of small, simple and non-business critical web application to large, complex and business critical applications that required much more care for quality and structure in the development process.

2.3. The Projects

The following sections provide background information about the four projects studied in SoftPharm. The four projects are the Method Project, the Try-out Project, the Use Project, and the Extension Project. All four project names are pseudonyms and related to the type of method utilization that took place in the projects. Table 2.1 shows the time

periods where the projects took place. Each of the following four sections contains a table with key information about each of the projects (table 2.2, 2.3, 2.4 and 2.5).

<i>Project</i>	<i>Start date</i>	<i>End date</i>
The <i>Method</i> Project	January 2000	October 2000
The <i>Try-out</i> Project	April 2000	November 2000
The <i>Use</i> Project	September 2002	December 2002
The <i>Extension</i> Project	March 2003	June 2003

Table 2.1. The projects in the field study.

2.3.1. The Method Project

The primary purpose of the Method Project was to examine available methods and adopt one of them in WebSystems. The project was initiated in January 2000 and lasted for 10 months. The idea was that a new method could remedy some of the challenges faced in WebSystems in the year 2000. The challenges faced was related to 1) developing with object oriented technology, which had not been used in SoftPharm before, 2) new tasks such as creating graphical design and information architecture, 3) new competencies involved in the development to undertake these tasks, 4) a systems development method perceived as not being useful for web development, and finally 5) a tendency to ad hoc development due to 'non-business-critical' nature of the web application that had been build in WebSystems (Carstensen and Vogelsang 2001).

One of the solutions considered to overcome some of the challenges was to use a method in the development. The systems development method in use in the beginning of year 2000 at WebSystems was perceived to be too cumbersome for web development. Year 2000 was pretty much the year where the web hype was peaking. During that time the web developers in WebSystems perceived web development as being special and as a different kind of development than "traditional" software development. They thought that a new method would help them doing web development in a less ad hoc fashion and at the same time that their current traditional waterfall based method would not fit web development. The motivation for less ad hoc development was an increasing complexity in the web applications they were developing (e-commerce, portals, support for collaborative work, etc.) and a realization of a need for a more standardized and understood development process. Furthermore, they argued that the new technology and the way the development took place were different. In our interview related to the development project which took place 2 1/2 years later this perception of web development had fundamentally changed. Now, the difference between 'traditional' software development and web development is not conceived as being different in kind or nature anymore. However, in the year 2000 that perception was the case and the Method project was initiated to cope with some of these challenges.

A specific method for adoption was not selected at the outset of the Method Project. The project started out by finding potential methods for implementation in WebSystems. Microsoft Framework and Rational Unified Process (RUP) were considered as potential methods to be adopted in WebSystems. Microsoft Framework was considered because WebSystems primarily were using Microsoft products in their development process. RUP

was considered because the project participants had heard about other software development organizations, which they respected, were using RUP. The project participants felt that they needed more knowledge about and experience with RUP. They initiated a couple of daily workshops where two of the project participants were discussing and trying out parts of the method. RUP was initially not tried out in a real development context. Never the less, the project participants' impression of RUP was sufficiently good to make them suggest trying out RUP in a real development project. The Try-Out Project was chosen as a pilot project for trying out parts of RUP (see next section for more details on the Try-Out Project). The idea with trying out parts of RUP in the Try-Out Project was to get experience and find out how the RUP would actually be utilized and fit to the setting in WebSystems. It was decided to try out iteration and Use Cases. Iterations and use cases are two key elements in RUP and were expected to provide the Method Project participants with reasonable insights about to which extend RUP could be used in WebSystems. The results and experiences from the pilot project were sufficient to convince the project participants and the management in WebSystems to start implementing RUP in WebSystems. In other words, RUP was adopted based on the experiences in the Method Project and the Try-Out Project. It was announced at the last meeting in the Method Project that the top management in WebSystems had decided that RUP should be introduced and used in WebSystems. It was also considered to establish a department that should take care of the implementation and maintenance of the method. This process department was established soon after the last meeting in the Method Project and the implementation of RUP was initiated (see the section on the Use Project for more details on the actual RUP use).

The Method Project consisted of 5 project participants. Four of them were experienced developers who were in the process of switching to positions in WebSystems that involved more management and organizational development. The fifth person in the project was a person from the quality assurance department in SoftPharm. The quality assurance person had worked on creating and maintaining the “old” method in the mid nineties. He was allocated to the project to supply experience to the Method project with creating and introducing methods. The project participants held weekly meetings (with a few exceptions) during the first 8 months of the project. The last two months were used for evaluation and planning future work and a seminar. Fewer meetings were held in this period.

The meetings in the Method Project were not only used for selecting and adopting a new method, but also to find out how the service license agreements could be changed, evaluation of projects, and other subjects. In general, the Method Project was used to discuss, assess, and in some cases change the daily work in WebSystems. The selection of the method was a significant part of the project. However, even without being able to adopt a new method, the Method project would have resulted in some important changes in WebSystems.

<i>Type of project</i>	- Adoption of a new Method in WebSystems
<i>Tasks involved</i>	- Examining available methods in the market - Try out the method(s)
<i>Duration</i>	- 11 months with weekly or bi-weekly meetings
<i>Participants</i>	- 4 project managers - 1 from quality assurance.
<i>Complexity</i>	- Challenges and solutions had to be defined - Experimentation undertaken the method (the solution) required to assess it.
<i>Main challenge</i>	- To decide which method to use and find a strategy to integrate and share it in WebSystems
<i>Method utilization</i>	- The method was utilized as a solution to provide a more structured development process in WebSystems
<i>Data collection technique</i>	- Observations, document analysis and interviews

Table 2.2. The Method project

2.3.2. The Try-Out Project

The purpose of the Try-Out project was to develop a web site for MedProc. The web site consisted of a main web site with a number of sub-sites and a web based content management system. The sub-sites address different groups of users or target groups, such as investors, the press, students, and customers. WebSystems was responsible for preparing a call for tender during a two months period. Based on the tender material, WebSystems made Use Cases, the information architecture, and a specification for the technical equipment. Three companies made a bid on the project and WebSystems won the project.

WebSystems had responsibility for the design and the development of all aspects of the web site, i.e. the information architecture, the user interface, the technical infrastructure, programming, testing, etc. The whole project including the call and creation of the tender material lasted ten months. The web site was launched on time and the Try-Out Project was considered a success by WebSystems, although some features were not implemented due to delay in the design process and common delay in the project. After the launch of the site, WebSystems has developed to sell products through the web site and is currently selling one third of its products through the web site. The "branding" on the web site has not been changed significantly since the web site was launched which is another indication of a successful project.

The Try-Out Project lasted ten months and between 8 and 18 people was allocated to the project during this period. Most of them worked full-time. The project had two project managers, one from WebSystems and one representing MedProc. The rest were organized in four groups: Information Architects, Graphical Designers, Developers, and hardware architects (see table 1). Each group consisted of 3-5 persons and was formed after WebSystems was given the project. The people in the groups had quite different educational backgrounds. The information architects typically had a background in the humanities and some training in the basic web technology (i.e. HTML). The graphical designers had backgrounds like psychology and graphical design. The developers and hardware architects all had a technical background in computer science or engineering. The information architects created the structure of the web site. They did this by dividing the users of the web site into target groups, finding and categorizing the content for each of the target groups, and creating sketches for the navigation through the content. The structure of the web site was created in cooperation with some of the employees from MedProc and the project manager from MedProc. The developers and hardware architects implemented the technical part of the web site, i.e., programmed and configured the software and hardware for the system. The graphical designers outlined guidelines for the web site, i.e. colors, fonts, form of images etc. and the exact placement of the elements on the web pages. The graphical designers created the guidelines in cooperation with the MedProc project manager. There were no guidelines the graphical designers could base their work upon since MedProc became an independent company the day the web site was launched. Consequently, MedProc needed a new "look and feel" for the web-site to represent MedProc. The new "look and feel" had to be designed almost from scratch.

<i>Group</i>	<i>Main activity</i>	<i>Tools used</i>	<i>Educational background</i>
<i>Information Architects</i>	Gathering and structuring of information	Developed their own diagramming technique	The Humanities
<i>Graphical Designers</i>	Creation of the graphical design	Screen dumps, Graphical Program	Graphical Design, Psychology
<i>Developers</i>	Technical implementation	Application platform	Computer Science, Engineering
<i>Hardware Architects</i>	Decide server type and architecture	-	Engineering

Table 2.3. Groups involved in the Try-Out Project.

Due to the many types of expertise involved in the project a number of different tools and techniques were used. The information architects created their own type of diagrams to describe the structure of the web site. The diagramming technique was simple but sufficient for the information architects to express the relation between the web pages on the web site. The information architects used their diagrams and created some sketches of the interface, including the rough location of elements on the screen and short

descriptions of the functionality. This was in order to communicate the structure of the web site to the graphical designers, so the graphical designers would be able to create the graphical appearance of the web site. The graphical designers used this information to create the visual appearance, which was created in a graphical program and the result was a number of bitmap-files showing location of pictures, colors, and location of elements like buttons, navigation panels, etc. The developers used the information architects' diagrams and sketches, the graphical designers' bitmap-files, and the Use Cases from the tender material as information sources to build the system.

<i>Type of project</i>	- Development of a large web-site
<i>Tasks involved</i>	- Programming - Creation of an information architecture - Project management - Quality assurance
<i>Duration</i>	- 8 months
<i>Participants</i>	- Programmers - Information architects - Graphical designers - Project managers - Quality assurance - Hardware architects.
<i>Complexity</i>	- Solution and method for creating it fairly clear although the participants lacked experience with the specific type of web development (e.g. how to "brand")
<i>Main challenge</i>	- To build a system that could brand MedProc
<i>Method utilization</i>	- Method fragments from the method were tried out in the project. The purpose of the method utilization was to learn to about the method to find out whether it should be adopted or not in WebSystems.
<i>Data collection technique</i>	- Interviews, document analysis and limited observation

Table 2.4. The Try-Out Project.

2.3.3. The Use Project

The purpose of the Use Project was to redevelop a web application that enabled doctors around the world to collect patient data related to a specific medical product. The idea behind gathering the patient data was to explore new areas in which the medical product could be used. The development phase of the Use Project was initiated in the fall of 2002 and lasted for about 5 months.

The Use Project was a redevelopment of a web application. The first version of the web application had problems with structuring the collected patient data which made it difficult to calculate the desired statistics. Furthermore, the first version also had usability issues which made the web application difficult to use. The work with the redevelopment consisted of describing the tasks related to the web site in use cases, creating the information architecture, a restructuring of the underlying database, coding the web application, some graphical design, and testing the web application. The Use Project was a typical development project in WebSystems and was considered to be fairly straight forward to carry out by the project participants. The main success criterion in the project was to meet the deadline. The main problem with achieving this was having people on leave, working on other projects, on holidays and being sick. However, the project met the success criterion in a satisfactory way.

The main project participants in the Use Projects were the project manager, an information architect, a graphical designer, and 3 developers (and 3 additional developers at the end of the project). There were other employees who contributed to the project as well. Moreover, a process engineer helped the project manager and the lead developer in tailoring the method. Finally, a quality assurance person contributed with knowledge on meeting the quality assurance demands in SoftPharm.

<i>Type of project</i>	- Development of a web-application for gathering patient data.
<i>Tasks involved</i>	- Creation of an information architecture - Programming - Graphical design - Testing - Project management
<i>Duration</i>	- 5 months
<i>Project participants</i>	- 2-4 developers - an information architect - a graphical designer - a project manager.
<i>Complexity</i>	- Well known problem (second version of system) and participants had experience with building similar systems
<i>Main challenge</i>	- To finish the project on time. The project was considered to be trivial.
<i>Method utilization</i>	- The method played an important role in the project as a mean for communication, collaboration, coordination, project management, etc.
<i>Data collection technique</i>	- Observation, interviews and document analysis

Table 2.5. The Use Project.

2.3.4. The Extension Project

The Extension Project was undertaken to create a method fragment (a part of a method) based on a work practice of sketching user interfaces and add it to the method adopted in the Method Project. The work practice resulted in sketches of user interfaces called White Boxes. The White Box technique had emerged as a work practice among information architects in WebSystems and had not been a formalized part of the method in use. The motivation for creating the method fragment was to ensure a more uniform work practice among the information architects and make deliveries homogeneous. Furthermore, the method fragment was intended to be added to the method used in the web department. The project took place during the spring of 2003 and lasted for four months.

The White Boxes were in use at WebSystems before RUP was introduced. The White Box technique was never made in to a method fragment and included in the “old” method, although it was a work practice which took place on a regular basis in the development projects. Initiatives to create a method fragment for White Boxes (and other usability and information architecture issues) had occurred during the 3-4 years before the Extension Project was initiated, but that never resulted in a method fragment. The White Boxes were one of the central artifacts in the Use Projects, which had been used for several years in WebSystems. There had been some talk in the Design and Communication department about standardizing the White Boxes and having interested researchers in this phenomenon made it a good occasion to make a formal standard for the White boxes.

The Extension Project included three information architects and a researcher (the author of this thesis). The information architects had been using White Boxes on a daily basis for 3-4 years. I observed the use of White Boxes quite intensively in the Use Projects and analyzed it. We (Below and Vogelsang 2003) found that there were problems related to communication and coordination that might be remedied by standardizing the White Boxes. It seemed that the White Boxes were a central artifact in the coordination and communication processes involved in the development projects. However, especially the programmers had problems interpreting the White Boxes created by the information architects. We suggested that this problem could be remedied by standardizing the White Boxes, so there would be more consensus about what the different diagrams and symbols on a White Box expressed. We suggested this and that was part of the motivation for initiating the Extension Project.

We held four meetings in the Extension Project. The first was an introductory meeting where the project was initiated, named and planned. The second meeting was used to examine some of the White Boxes created in former projects. Similarities and variances between the used white boxes were identified. A third and fourth meeting were held to examine which areas of the White Box work practice that could be standardized into a method fragment and what had to be left out.

Some of the work practice related to the White Boxes was difficult to standardize. Web pages have dynamic content. This was hard to express on static white boxes and the information architects had used different techniques to solve the problem. Some

explained the dynamics in text while others used several pages to show the different stages of the dynamics on a particular web page. There was discussion about to what extend this could be standardized. We perceived it as being too complex an issue and the project too diverse and containing too many differences to come up with a standard solution. Consequently, it was decided that each information architect had to find a solution to these problems individually when they occurred in the development projects. The problem of formulating a White Box standard might be due to the fact that the selected Visio tool for creating White Boxes is designed to create static diagrams and not to show dynamic content, which almost all web applications contains. Furthermore, that some of the web pages are highly complex in terms of relations between elements on the web pages, e.g. that one check box can affect how other elements are shown on the page. One of the information architects gave an example of a web site having a several pages long word document describing rules for different states of the page, thereby influencing what should be shown. The site had hundreds of different states and it would be a waste of resources to create a White Box for each state. Other examples involved only 3 or 4 states, which was within reach to make a page for each of the states. It was decided that such problems had to be solved on a project to project basis, because we could not come up with a standard that provided sufficient structure to be a standard and at the same time supported the work practice in a flexible way.

The output from the Extension Project was a template for creating white boxes and a description of how the White boxes could be used. Both the template and the process description were added to the revised version of RUP at the end of the Extension Project and were in use from the summer of 2003.

<i>Type of project</i>	- Creating a method fragment based on the White Box work practice
<i>Tasks involved</i>	- Creating a standard work practice for White Boxes - Create templates and descriptions of the work practice to be added to the method - Selecting a default tool to create the White Boxes with
<i>Duration</i>	- 3 months
<i>Participants</i>	- 3 information architects - a researcher
<i>Complexity</i>	- Problem and solution clear in some areas and not found in the project in others.
<i>Main challenge</i>	- To create a conform work practice for the white boxes
<i>Method utilization</i>	- The method was utilized through its guidelines on creating new method fragment
<i>Data collection technique</i>	- Participant observation and document analysis

Table 2.6. The Extension Project.

3. Research approach

The purpose of this chapter is to present key issues on the research approach taken in the field studies and the data analysis. Firstly, three main approaches in IS research are presented: Positivism, critical, and interpretive research (Orlikowski and Baroudi 1991). Then reflection on my main approach, an interpretive, are presented by reflecting on the seven principles for interpretive research formulated by Klein and Myers (1999). This is followed by a presentation of the three phases in the field studies. The field studies are grouped into three phases in order to ease the presentation of the research goals, the data collection, and the researcher's role in each phase. The three phases are named: Exploratory-, in-depth-, and participation- phase. Moreover, the research approaches, action research, experiments, and practices studies, described by Mathiassen (2002), are used to characterize the purpose and the researcher's role in the three phases.

3.1. Basic assumptions

The three main research philosophies used to describe IS research are: Positivist, interpretive, and critical research (Orlikowski and Baroudi 1991; Myers 1997; Lee 1999). Drawing on Chua's work (Chua 1986), Orlikowski and Baroudi (1991) uses three "sets of beliefs" to describe positivistic, interpretive, and critical research. The three sets of belief are: Belief about physical and social reality (ontology), belief about knowledge (epistemology), and belief about the relationship between theory and practice. The basic assumptions are important because they frame the goal, the approach, and the assessment of the research. In other words, the basic assumptions guide what the researcher tries to achieve, how he tries to achieve it and how he assesses the results. I characterize my research as interpretive and therefore go more in-depth with the interpretive assumptions than the positivist and critical assumptions.

3.1.1. Positivistic research

The positivistic ontology assume that the social world is objective and that it relatively easy and un-problematically can be observed and measured (Orlikowski and Baroudi 1991). The researcher is perceived to play a passive role, i.e. the researcher does not influence the collected data and therefore the observations are perceived as objective. The epistemological believe is concerned with empirical testability of theories through a hypothetic-deductive approach (Orlikowski and Baroudi 1991). The hypothetic-deductive approach is characterized by assuming the existence of theories from which expected behavior or results can be deduced. Positivist researchers work in a deductive manner, i.e. they deduct expected results from the theories and test it against the data they collect. Theory is assumed to be a representation of the practice. Positivistic research aims at discovering universal laws or principles from which lower level theories can be deduced. Consequently, there is a strong coupling between explanation, prediction and control in this type of research. In the attempt to create high level universal laws, the positivistic researcher tends to reduce the complexity of the setting where the data is collected. As a result the activity aiming at prediction in the research framework is reduction. An important characteristic of a good theory, in positivistic terms, is that it is falsifiable. A falsifiable theory can in theory be proven wrong, i.e. it is possible to imagine an outcome

of an experiment that would prove the theory wrong. In contrast, a non-falsifiable theory includes all outcomes of an experiment. In other words, the non-falsifiable theory can not be proven wrong by experiments, because is it impossible to get a result from the experiment that proves the theory wrong.

3.1.2. Interpretive research

Interpretive researchers emphasize the importance of subjective meanings and does not presume, as in positivistic research, that that organizational structure and social relations are objectively known or unproblematic (Orlikowski and Baroudi 1991). Interpretive research is distinguished from positivistic and critical research ontologically by rejecting the possibility of describing an objective social world. Instead the assumption is that the social world is relative and socially constructed. Klein and Myers (1999) state that IS research can be "classified as interpretive if it is assumed that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools, and other artifacts" (p. 69). The purpose of interpretive research is not to measure and establish relations between social structures independent of human beings, but to understand the meanings the individuals apply to a phenomenon. Furthermore, the interpretive researcher acknowledges that the researcher is part of the construction of data and cannot be a neutral collector of data. Lee (1999) takes this a step further and describes the researcher as the instrument for observation. If the 'tool' for observing the social world is the researcher himself/herself, it becomes important to get insights on how the data was collected and how the researcher thought about the investigated topic in order to assess the quality of the research. In interpretive research knowledge is not unproblematic to obtain and is socially constructed. Therefore, theory in interpretive research is not a representation of the world, but one view on the world among others. Furthermore, the theory provided by interpretive research can present several views or approaches to practice based on different perspectives on the investigated phenomenon.

3.1.3. Critical research

According to (Orlikowski and Baroudi 1991) the critical researcher attempts to "...critically evaluate and transform the social reality under investigation" (p. 19). The critical researcher assumes that a constrained world can be changed through his research. By attempting to make people recognize potentials in the world, critical research goes a step further than interpretive and positivistic research that primarily seek to understand and predict the social world by striving towards changing a social context. In critical research the social reality is assumed to be produced and reproduced based on social and historical practices, but objective in the sense that the social can be changed and improved.

3.2. *Three phases in the field study*

I have divided the field study into three phases: An exploratory phase, an in-depth phase, and a participatory phase (see table 3.1 for an overview of the studied projects and the three phases). The phases are distinguished by the purpose of the phase, the data collection technique, and the researcher role. The following section describes the purpose

of each phase and the data collection techniques. The Researcher role in each phase is described in the section “The role of the researcher”.

3.2.1. The Exploratory Phase

The exploratory phase was the first phase. It took departure in the goals put forward in the DIWA project (DIWA 1999) and focused on characterizing web development and method use. Web development was approached as a new phenomenon that needed exploration before new findings and theories could be fully established. The exploratory phase was primarily used to examine the assumptions from the DIWA project to ensure they were relevant from a research and practical point of view. Furthermore, the exploratory phase was used to identify challenges in web development and investigate method use. The idea was to establish an overview of web development and method use in that context. The ‘cost’ of the overview was lack of information on specific challenges in web development and on method use, which we dealt with in the In-depth phase that followed the Exploratory Phase. The outset for our studies was the following assumptions and objectives formulated in the DIWA project research proposal (DIWA 1999):

- The *rate of change* in technologies is unprecedented. The pace at which new tools and techniques are invented is unheard of even in the fast-moving world of computing. This proliferation of new technologies creates an “interoperability nightmare” for application developers and users and makes it difficult to manage the development process.
- The traditional *division of labor* and definition of work roles in IS development breaks down. The distinction between designers, programmers and users becomes increasingly blurred and new types of specialists - such as graphic designers and communications specialists - enter the design process.

The DIWA project objectives:

- To examine how the scope, content, and organization of IS design and use processes change as information services become ubiquitous and software development coalesces with media design.
- To analyze the accompanying implications of this for the division of labor, skills, and knowledge in IS development and use.
- To develop and evaluate concepts, methods and tools for guiding both the design of interactive Web applications and the development of distributed and networked organizational forms.

We followed two projects in the exploratory phase: The Method Project which was undertaken to adopt a new method and the Try-out Project which was a development project that was selected by Method Project participants to try out parts of the method that was under consideration to be adopted. The studies in the exploratory phase focused on finding the aspects of web development that were different from other types of software development. One of our findings (Carstensen and Vogelsang 2001) was that new competencies and roles were introduced in web development to undertake new tasks,

especially “branding” (see also Vogelsang 2003). These findings had a big influence for our focus in the in-depth phase (see next section).

The data collection was qualitative in all three phases of the field study. The purpose of the exploratory phase was to understand the current practice and challenges in WebSystems. Consequently, the data collection was conducted without intention on intervening or changing the work practice in WebSystems. The main data collection technique in the Method Project was observation. I was attending in to weekly meetings without having an intention on intervening in the meetings. My role in the meeting was the passive observer because I wanted to learn about the current state in web development and focus my research agenda on problems faced in practice. I took notes during the meetings and wrote up my impressions of them as soon as they ended. These notes were my way of comprehending what took place during meetings and relate it to my research agenda. This helped me improve my understanding of what was going on in the meetings and to refine my research agenda. Furthermore, this was the first step in both the construction and the analysis of the data. I observed about twenty meetings. Except for one meeting, I was the only researcher present at the meetings. Five project participants were in the Method Project and it seemed that having more than one researcher observing the meetings was too intrusive in this context.

There were two reasons for doing observation. The first reason was that observation provides insights and understanding of what "actually" goes on in the social setting. By observing people and how they act, it is possible to get access to "... how people actually behave, not how they ought to behave" (Blomberg et al. 1993). A problem with interviews is that the subjects tell the researcher what they think the researcher would like to hear or gives an idealized version of the social context under investigation. By observing what 'actually takes place' these problems are to some extent prevented, although the researcher still brings his own view to the context. The second reason is more pragmatic. The people we observed and interviewed were busy people and taking time out of a busy schedule for interviews was difficult for them. Observation was less intrusive for the project participants. We were able to obtain our data and they were able to get the work done. From a pragmatic perspective, observation was a good data collection technique that complemented interviews and enabled us to collect more and richer data. The drawback of observation is that it is not possible to change or direct the action that takes place. As a consequence, the researcher gets what “is there” and can’t go into more detail on issues that come up and wants to go deeper into. However, this is where the interviews came in by complementing the observation, i.e. the issues we did not get sufficient data about through observation alone were brought up again during the interviews.

We conducted interviews in the beginning to get background information and to get an understanding of the current practice and challenges in WebSystems. The interviews were semi-structured in the sense that we had selected 3-4 themes based on our research agenda that we wanted to interview the subjects about. The themes were refined and changed as our understanding of the organization and the activities emerged. The main themes for the interviews were the subject's understanding of the challenges faced in web

development, the use of method, and collaboration with the other groups in the projects. The questions asked were open in order to allow the subjects to bring up issues they found important. The approach during the interviews was to ask initial questions and then try to pick up interesting remarks and examine these further until we felt we had sufficient understanding of the topic.

My intention was to use observation as the primary data collection technique in the Try-out Projects as well. However, there was not sufficient office space for me because it was already a problem to provide the project participants a work place in the two offices. This could be perceived as an excuse for not letting me observe what took place. However, after being in the office I realized that the reason was in fact practical, i.e. there just wasn't sufficient working space to include me. Instead of doing observation in the two project offices I observed 5 status meetings. The meetings were quite short (sometimes only 10 minutes) and hard to contextualize, because I did not have the background to fully understand the information discussed at the meetings. Moreover, the information was not very informative about activities and issues in the project. I decided not to do more observation in the Try-out Project and instead use interviews and document analysis for data collection. The interviews had a semi-structured format with open-ended questions. We conducted and transcribed nine interviews in the exploratory phase each lasting from one to two hours. The interviews were the main data collection technique for the Try-out Project and to obtain insights on web development. We interviewed subjects with different roles in the Try-out Project to include different perspectives on the development process. This was important because the project participants involved had different tasks, educational backgrounds, and experiences with web and software development.

The interviews were complemented with informal conversations that were more or less spontaneous and consequently not planned nor tape-recorded. Some of the conversations lasted more than an hour. The conversations introduced us to the organization, to the 'old' method in the SoftPharm, and significant topics. Some conversations took place in the project participants' offices and others took place during lunch or during transportation from one location to another. These informal conversations made it possible for me to ask questions in periods where I primarily did observations.

The third data collection technique was document analysis. We gathered print outs from the method used in SoftPharm, agendas from meeting, documents from project, e.g. use cases, white boxes, and tenure material. We used the documents to obtain knowledge about the organizational context and the specific projects.

Furthermore, we wrote a working paper about the studies, which we discussed with the project participants from the Method Project and the project manager from the Try-out Project (who was also a member of the Method Project). This was a way for us to get feedback and refine our understanding. The feedback should be considered a part of the collected data. Moreover, the studies and the working paper were discussed with the researchers in the DIWA project.

3.2.2. The In-depth Phase

This phase consisted of an in-depth study of specific aspects of web development. The Exploratory Phase had provided an overview of the state and challenges of web development, but did not go into detail on the challenges or made an attempt to explain or solve them. The In-depth Phase was undertaken to collect more detailed data on specific challenges and method use in order to bring forward more precise findings. It was focused on method utilization and especially on how the method supported collaboration and coordination among project participants with different tasks and competencies.

We primarily followed the Use Project in the In-depth phase. The purpose of the Use Project was to build a web application used to gather patient data from doctors. The idea was to use the patient data to research new use areas for a specific medical product. The web application was a new version of an existing web application and the project was undertaken to improve usability and collect more specific patient data.

The primary data collection technique was observation. We observed project meeting (weekly 1-2 hours status meetings and daily 5 minute long “stand meetings”), meetings with the customer, and work sessions. A new building had been build since the Exploratory Phase took place, so now there was sufficient space to have our own table in the project office.

A problem of “information overload” occurred to us in the In-depth phase. In the Method project it was quite straight forward to observe the project meetings. However, in the Use Project it was not obvious what we should observe or even where we should locate our self. Besides the planned meetings, it was difficult to predict the activities that took place in the project. Furthermore, the activities took place at different locations and at different times. People went to the meeting rooms, small 'labs'/studios, or worked at home, which made it difficult to conduct the observations in a systematic way. As a consequence we had to decide what to observe and what not to observe. It turned out that the interaction between the project participants gave valuable data because it provided more observable data than watching people working in front of their computers, where we would have had to ask them about what they were doing. We were at WebSystems one or two full working days a week. We took notes during our observations and made a timeline to document the chronology in the project.

The second data collection technique in the In-depth phase was semi-structured interviews. We conducted the interviews at the end of the Use Project because Nana Below (research assistant in the DIWA project) had conducted a field study with the same group of people at the web department just before we started and consequently she had a good understanding of the current situation at WebSystems. Therefore there was no need for interviewing project participants at the outset of the project. As in the Exploratory Phase, we selected 3-4 themes for each interview and prepared open-ended interviews. The main themes were the utilization of the method adopted in the Method Project and collaboration and coordination between the project participants. Emphasis was on the use of White Boxes and the method. The interviews were recorded

electronically but were not transcribed because notes and a coding with a time stamp in the recorded file were sufficient for being able to analyze the material.

The third data collection technique was document analysis. We printed out and examined the parts of the modified method in use. Moreover, we collected project documents and we found further information about the organization in brochures and on their web site.

A fourth activity introduced by Peter Carstensen and Kjeld Schmidt was debriefing. At the debriefings Nana and I described to Peter and Kjeld what we had experienced. Furthermore, we discussed the focus of our experiences and themes for the study. The purpose of the debriefings was to work with the data and to start the initial analysis early in the study, acknowledging that analysis already starts when the data collection takes place. Debriefing was a way to support the analysis process and to avoid ending up with a lot of data that we would have a hard time making sense of. The debriefings typically lasted two hours.

At the end of the study we wrote a working paper. The intention was to have the project participants read it, but that never happened because the project manager didn't receive the emails containing the working paper. However, our findings were presented and discussed at a one hour meeting that took place after the project had ended.

3.2.3. The participation phase

The idea behind the empirical work in the Participation Phase was to initiate activities that could shed light on the role of a method in practice. The motivation for starting the activities was some of the problems observed in the In-depth Phase. We had observed a practice for mocking up screen shots (White Boxes) and had observed how the project participants had difficulties with interpreting each others work. I suggested that the practice could be standardized so similar misunderstandings could be reduced in future projects. The idea was to standardize the current work practice into a technique and add the standardized technique as a method fragment to the method used in WebSystems. Moreover, I wanted to investigate the role of the method played in the process of standardizing a work practice into a technique that was intended (and finally was) added as a method fragment to the method. Furthermore, I wanted to find out how practitioners thought about and worked with standardizing software process development techniques. This should shed light on the role of the method in a context where it was not utilized for development, but for method work.

The idea was that I should participate in the construction of the method fragment. There were several reasons for me to suggest my own participation in the project. The first reason is pragmatic. I wanted to make sure that there were resources enough in the project so it actually was carried out. My experience in the former projects (especially the Method Project) was that the method work tended to have a lower priority than the development projects. People wanted to participate in and do method work but the development projects mostly received a higher priority due to financial reasons and customer relations in the development projects. By offering my own work for free I hoped that I could ensure that the project would progress. This was a main reason for the

head of the information architects to initiate the Extension Project, a project they had wanted to do for a long time, but hadn't had resources to undertake. The other main reason for starting the Extension Project, from WebSystems point of view, was to ensure a higher degree of homogeneity in products from the information architects. My second reason for participating in the project was to get even closer to the method in practice. The interviews and observation, which I used in the Exploratory Phase and the In-depth Phase, provided rich insight on the method in practice, but I wanted to push it a bit further and see what I could learn through "hands on" experience. I wanted to learn about the method but also to improve my skills as a researcher by gaining experience in doing participatory observation, i.e. involving myself in the practice. This was not without complication and I go into more details on this subject in the next section 3.4. The idea to establish a project to create the method fragment was approved by the head of the department and the Extension Project was established.

We had four meetings in the Extension Project. At the first project meeting the project participants were introduced to each other (including me). We used the meeting to formally establish the project by discussing purpose, planning activities, resources (primarily about how much time to use on the project), and defining the participants' roles (more on my role in the project below). We decided to write a project description, which I prepared for the next project meeting. At the second meeting we discussed the project description. I also presented themes based on the former empirical studies that shed light on some of issues in the current White Box work practice. In the remaining two meetings we worked on creating the method fragment and my role were more passive.

The outcome of the Extension Project was that some parts of the work practice were standardized and others were not. The method fragment was added to the method. I had a meeting with the project manager of the Extension project about the use of the method fragment two months after the Extension Project ended. He informed me that the method fragment and the major part of the practice agreed upon were in use and showed me examples of how the standardized parts of the White Boxes were used.

Besides helping with creating a method fragment, my interest in the Extension Project was also to collect data on method utilization. However, it was not possible for me to both participate in the project meetings and take the necessary notes during the meetings. Therefore I decided to tape record the meetings and make notes, as I did during observation in the two other phases, after the meeting.

	<i>The Method Project</i>	<i>The Try-out Project</i>	<i>The Use Project</i>	<i>The Extension Project</i>
<i>Phase</i>	Exploratory phase	Exploratory phase	In-depth phase	Participation phase
<i>Type of project</i>	Adoption of a new method in WebSystems.	Development of a corporation's new large web-site.	Development of web-application to be used for gathering patient data.	Creation of a method fragment based on a current work practice.
<i>Research purpose</i>	To understand the challenges faced in web development and get introduced to the organization.	To follow a web development project and the experimentation with a method.	To understand the use of the method in the project and the collaboration and coordination among project participants.	To understand the process and reasons for standardizing a diagramming technique.
<i>Focus in the study</i>	The focus was on the challenges faced web development and the purposes for experimenting with and adopting a new methods in WebSystems	The focus was on the challenges in web development projects and method utilization.	The focus was on the collaboration and coordination among project participants, and on the use of methods in the project.	The focus was on the reification of the White Boxes and how it became part of the method in WebSystems
<i>Research approach</i>	Exploratory field study	Exploratory field study	Interpretive field study	Interpretive field study, Researcher involved as collaborator
<i>Duration</i>	From January 2000 to December 2000	From May 2000 to November 2000	From September 2002 to February 2003	From March 2003 to July 2003
<i>Data collection techniques</i>	Interviews, observation, and document analysis.	Interviews, observation, and document analysis.	Interviews, observation, and document analysis.	Participatory observation.
<i>State of method utilization in WebSystems</i>	There was an on-going experimentation in the process of implementing methods in WebSystems	The development process seems unmanaged and chaotic.	The development process is to some extent managed and controlled	There is an on-going maintenance, improvement and extension of the method in use
<i>Documentation</i>	Working paper (Carstensen et al. 2000; Vogelsang 2000), research paper (Carstensen and Vogelsang 2001; Vogelsang and Kensing 2006)	Working paper (Carstensen et al. 2000), research papers (Carstensen and Vogelsang 2001; Vogelsang and Carstensen 2001; Vogelsang 2003; Vogelsang and Kensing 2006)	Working paper (Below and Vogelsang 2003), research paper (Carstensen 2004; Vogelsang and Kensing 2006)	(Mathiassen and Vogelsang 2005a; Vogelsang and Kensing 2006)
<i>Researchers involved</i>	Peter Carstensen, Lars Kofoed, Lasse Vogelsang.	Peter Carstensen, Lars Kofoed, Lasse Vogelsang.	Nana Below, Lasse Vogelsang, and Peter Carstensen.	Lasse Vogelsang.

Table 3.1: The studied projects and the three phases.

3.3. *The interpretive approach taken*

I will characterize my research as interpretive. In the following sections I will use the seven principles provided by Klein and Myers (1999) to assess and reflect on my research.

Klein and Myers (1999) propose seven principles for interpretive research, which are based on hermeneutics. Klein and Myers state that the set of principles should not be taken as a prescription for interpretive research, but as guidelines for understanding and assessing the quality of interpretive research. This is in line with the interpretive assumption that rejects an objective social world. Consequently, I use them as guidelines for reflection on my research rather than a strict set of rules for conducting interpretive research.

Interpretive research includes different types of research based on different assumptions (Klein and Myers 1999; Lee 1999). The literature I base this thesis on takes departure in the hermeneutic approach. The principle of the hermeneutic circle lays out how we understand a phenomenon by iterating between the parts and the whole of the phenomenon.

<p>1) The fundamental principle of the hermeneutic circle. This principle suggests that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.</p>
<p>2) The principle of contextualization. Requires critical reflection on the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged.</p>
<p>3) The principle of interaction between the researchers and the subjects. Requires critical reflection on how the research materials (or “data”) were socially constructed through the interaction between the researchers and participants.</p>
<p>4) The principle of abstraction and generalization. Requires relating to the ideographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action.</p>
<p>5) The principle of dialogical reasoning. Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings (“the story which the data tell”) with subsequent cycles of revision.</p>
<p>6) The principle of multiple interpretations. Requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tells it as they saw it.</p>
<p>7) The principle of suspicion. Requires sensitivity to possible “biases” and systematic “distortions” in the narratives collected from the participants.</p>

Table 3.2. Seven principles for interpretive research (Klein and Myers 1999):

The first and main principle proposed by Klein and Myers (1999) is the hermeneutic circle. The remaining 6 principles are expansions of this first principle. The first principle

points out that the understanding of a complex “whole” is achieved by iterating between its parts and the whole. Klein and Myers state that the “parts” and the “whole” should be given a “broad and liberal interpretation” (p. 71). In my research an example of the “whole” is the perspectives on methods in practice and the “parts”, on which the interpretation of the “whole” is based, is the data from the field study (i.e. the projects, the statements by informants, etc.) and the research literature on methods in practice. The “whole” or the perspective changed over time and new perspectives appeared as I collected more data and read more literature. The “whole” changed over time because new “parts” were added to the “whole”. Furthermore, the “whole” changed over time because I changed my perceptions of the parts as my analysis progressed and the interrelationships between the parts became clearer. One of the early changes in the “whole” or the perspective on methods was that several complementary perspectives on methods existed in practice. My objective was to make an interpretation enabling us to make sense of how these perspectives were formed and their influence on methods in practice. It can be argued that each of the perspectives on method utilization presented in the papers are “whole” in their own right. However, they are also parts of the main perspective or whole. In this way they become in-between perspectives or constructed parts made up from the interpretation of the field study.

The second principle is the principle of contextualization. The purpose of this principle is to give the reader insights on how the current situation under investigation emerged through reflection on the social and historical background of the research setting (Klein and Myers 1999). The insight in the emergence of the current situation is sparse in the last three papers. Instead the first two papers can be seen as background and reflection on the context in which the method was adopted, adapted and used (Carstensen and Vogelsang 2001; Vogelsang 2002). The two papers provide an analysis of the current context and the challenges in the web department and the initial analysis of method utilization. Furthermore, the history and the context of the web department was investigated and documented in two reports presented and discussed in the DIWA project (Carstensen et al. 2000; Vogelsang 2000). This initial investigation and reflection provided an important background for the analysis of methods in practice. For instance, most of the web applications developed in the web department are used for medical related work and consequently the web department was used to strict requirements on the software development. These requirements were among other subjects explicated in a method. Therefore, having a method was not something new in the organization. Only the method was new. Another important element in the history is that the web application was developed during a time when the department was under establishment and the applications itself was “toy” applications that wasn’t under the same control as the applications used for medical purposes. However, this was starting to change during the time we entered the organization. The application required by the customers became business critical and it became apparent that the degree of ad hoc development was a problem and that a stricter development process had to be introduced. Finally, the web department was still new and immature and was working towards getting the same status as other departments in the organization. The three examples gave us a good insight on the situation in the organization and the motivation for adopting a new method. Not all of

the observations made it to the papers, primarily due to the limitation on length of research papers, but they were a part of the analysis of the field study.

The third principle is the interaction between the researcher and the subject. This principle "...requires critical reflection on how the research materials (or "data") were socially constructed through the interaction between the researchers and participants." (Klein and Myers 1999, p. 72). The interpretative approach suggests that "data" is constructed in the interaction between the researcher and the subjects and not just there to un-problematically be collected. Furthermore, the principle implies that subjects are interpreters as well as researchers and that the concepts and ideas brought forward by the researchers can affect the collected "data" (e.g. subjects' opinions). The principle implies that the researcher should be aware of what and how questions are asked. During the field study and especially in the interviews we were consciousness about asking open ended questions and tried to pick up "comments" from the subjects and addressed these instead of following a specific set of questions. By doing this we avoided too many preconceptions of what the subjects might mean. We tried to stay open minded although we had certain things we wanted to examine. Furthermore, our exploratory approach, especially in the beginning of the DIWA project, made it possible to ask open question and explore where the answers would lead us. Later in the field study our interests became much more focused and our interviews became less explorative. Sometimes we had to explain what we meant by a question, which could have lead to a certain answer by the subjects. This was one reason why we decided to conduct observations of relevant work to gather "data" where the researchers did not intervene or guide in the same way as it sometimes happened in the interviews. Finally, I also did participant observation in the last project studied. I go into more detail on my role as researcher in section 3.4 later in this chapter.

The fourth principle addresses generalization and abstraction. The principle "requires relating to the ideographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action." (Klein and Myers 1999, p. 72). The principle suggests that the reader should be able to follow how the researcher came from ideographic data to findings and theory. The documentation of this process is sparse in the papers. The first paper (Vogelsang and Carstensen 2001), however, does provide quotes from the interviews that shows what we based our interpretation upon. However, a part of this analytical process is documented in research reports, which were written as part of the DIWA project (Carstensen et al. 2000; Vogelsang 2000; Below and Vogelsang 2003). In these research reports we documented the relevant data collected and categorized it into relevant themes.

Principle four also includes theory used as a sensitivity device, i.e. the theory is used to form the researchers perception of a social context and thereby the way in which the data is constructed. Four of the five papers take directly departure in research literature and thereby explicate the "sensitivity device" that was used in the analysis. Two of the papers draw on work related to the topic of the papers, i.e. theories on the topic, and build upon these (Vogelsang and Kensing 2006). My fourth paper (Mathiassen and Vogelsang

2005a) draw on a reference discipline, knowledge management, to investigate perspectives on methods in practice and my fifth paper (Jeenicke et al. 2003) draws on theory about social capital.

The fifth principle is the principle of dialogical reasoning. The principle requires "...sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings ("the story which the data tell") with subsequent cycles of revision." (Klein and Myers 1999, p. 76). The researcher must become aware of his or her own preconceptions. This principle was something that I became aware of during the field study. There were several times that my preconceptions about the development process or the use of a method was challenged by what we were told or what we saw. For instance, I thought the development process would be more orderly than it appeared in the field studies. Furthermore, the method played a much more complex role than the discussions I had been involved in had suggested. These are examples of how my preconceptions was challenged and made me reconsider them, and as a result of this, my findings as well.

The sixth principle is the principle of multiple interpretations and requires sensitivity to possible differences in interpretations among the participants. These differences are typically expressed in multiple narratives or stories of the same sequence of events studied. The phenomenon is similar to multiple divergent witness accounts in cases where all witnesses were present at the same event.

Different interpretations were mostly present in the first round of interviews where our focus was primarily on web development. Furthermore, the study was exploratory, so we found more diverse perceptions and meanings on web development and method use. In the later interviews in the in-depth phase, we were more focused on getting a coherent interpretation of method use and our sensitivity to multiple interpretations was not as strong as in the beginning. This could also be due to the fact that there was a more coherent understanding among the project participants of what a method was and could be used for. In the participation phase, the multiple interpretations among the project participants were obvious and were reflected upon by me in order to interpret what took place.

The seventh principle is the principle of suspicion. This principle requires sensitivity to possible "biases" and systematic "distortions" in the narratives collected from the participants (Klein and Myers 1999).

An example is that the project participants in the Use Project talked about how they were using the method like it was more or less given how this took place. Through our observations, we found that the use of the method was not trivial to describe and not always as described by the project participants.

3.4. *The role of the researcher*

In this section I use a framework by Mathiassen (2002) to characterize and reflect on my role as a researcher in the three phases of the field study. Furthermore, I use the

researcher roles for action research described by Baskerville and Wood-Harper (1998) to characterize my role as collaborator in the participation phase of the field study.

The framework by Mathiassen (1998a; 2002) has three research approaches that can be part of collaborative and other IS research. The approaches are; experiments, practice studies, and action research. They differ "... with respect to how deeply the researcher is involved in practice and to what extent the researcher maintains control over the research project" (Mathiassen 2002, p. 330). Mathiassen focuses on the differences that are important when organizing collaborative practice studies. A collaborative study involves collaboration between researchers and practitioners aiming at understanding, supporting, and improving a practice. The following sections describe the three approaches, experiments, practice studies, and actions research, suggested by Mathiassen as part of a pluralist approach to collaborative practice studies.

Experiments aim at supporting practice by designing and evaluating different artifacts (Mathiassen 2002). The emphasis is on development of normative support through for instance guidelines, standards, methods, techniques, and tools. According to Mathiassen, an experiment can take place in the field or in a laboratory. The idea behind an experiment is to support practice by providing a design or an artifact in order to test it. None of the field studies I have conducted can be characterized as experiments. The Extension Project and the participation phase came the closest to being an experiment, but did not involve a test of a concrete design or artifact, but merely an abstract idea that had to be worked on before it could be tested.

Practice studies is a research approach without active intervention from the researcher (Mathiassen 2002). This type of studies aims at understanding practice. Practice studies are often based on interpretive assumptions (Vidgen and Braa 1997; Braa and Vidgen 1999) although understanding practice is not only achieved within the interpretive approach (Orlikowski and Baroudi 1991; Myers 1997). The typical techniques for data collection are observation, interviews and document analysis. According to Mathiassen (2002) the strength of practice studies is the focus on practice and the weakness is the separation of research and practice. Given the amount of research that has gone into the design of the methods there has been relatively few practice studies of method use. This despite that several researchers have called for more practice studies of methods (Wynekoop and Russo 1993).

Action research is concerned with problems that occur in practice and strives to improve practice through intervention and collaboration between practitioners and researchers. Action research is usually initiated to solve a problem at hand in a social context. The problem at hand can be related to the development process as well as the design of an artifact (Mathiassen 2000). Solving problems in their social context where they occur makes it difficult for the action researcher to control the research process because the problem can be abounded or changed by the practitioners. For instance if another problems get a higher priority or if the problem changes nature (Avison et al. 2001; Mathiassen 2002). In this case, the original problem in the social context cannot be investigated and the researcher's research agenda has to be changed. The action

researcher might be able to avoid some of these problems through some degree of formalization in the research process. For instance by making a contract with the practitioners about the terms on which the action research is carried out (Avison et al. 2001).

The exploratory and the in-depth phases were mainly carried out as practice studies. Both phases were initiated to understand the current practice. My colleagues' and my own role in this phase was to understand the current situation in web development and the use of methods and therefore not deliberately intervene or change the situation at hand. As described in section 3.3 (An interpretive approach), this does not mean that we did not affect the situation nor that reflection on our own role wasn't needed, but rather that our main intention was to understand and not to solve problems. However, defining problems is the first step to solving them, so practice studies can be seen as the first step to solve undefined problems. I believe we did provide useful insight for the organization although it wasn't the primary goal with our research. Our primary interest in providing these insights was to give something valuable to the organization in return for the time they had spent with us.

According to Baskerville and Wood-Harper (1998) the involvement of the typical researcher can be collaborator, facilitator, or expert. The collaborative action researcher is an equal co-worker with the subjects. The facilitative action researcher has the role of an expert among the study subjects. Moreover, the action researcher can be an expert where the action researcher has the burden of solving the problems at hand. The role of the action researcher is important in relation to the control he has on the project and what type of involvement he will have in the project.

My role in the Extension Project was collaborative and was agreed upon with the other project participants from the outset of the project. It was written down in the project description as suggested by (Avison et al. 2001). My role was to bring forward problems observed in our earlier field studies that I found qualified to be remedied by a method fragment. I emphasized introducing common terms, a common diagramming technique, and getting all parties to use the same tool. My inputs were especially valuable in the initial phase of the Extension Project. Later on in the project, where the concrete method fragment was created and the future work practice was discussed, my role became less significant. The information architects were the experts in their field and had years of experience with creating White Boxes, so they already had a lot of ideas and arguments about how the future work practice should be handled. Furthermore, it was their future work practice we were trying to define (and not mine), so in some cases it was more important that they achieved something they would be satisfied with than I got everything on my research agenda covered. There were also a few cases where I lacked knowledge about the current practice with the White Boxes and the organization in general, which made it hard to argue and provide new insights. I had made some White Boxes for a couple of web sites to get the feeling with the use of White Boxes but was not close to the others in experience, especially when it came to handing over the White Boxes to other persons so they could continue work based on the White Boxes. The previous Exploratory and In-depth phases helped a lot during the project because I had some

knowledge about the company and had analyzed former projects and could use this knowledge as input in the project.

According to Baskerville and Wood-Harper (1998) the primary goal of a field study, based on action research, can be organizational development, system design, scientific knowledge, or training. The primary goal of organizational development is to improve the human organization (Baskerville and Wood-Harper 1998). Organizational development implies improving the social conditions in an organizational context. Conditions, which for instance could be a higher morale, structural effectiveness, or better information flow (Baskerville and Wood-Harper 1998). System design involves a goal of creating or modifying an organizational system, e.g. an information system. Scientific knowledge refers to the creation of a generalized understanding of the problem and its solution which can be published in scientific literature and can be used by practitioners. Training refers to the education of the researcher in order to improve the researcher's understanding of a specific problem

The purpose of the Extension Project was to improve human organization and to some extend system design. The main reason for this is that the practical problems of standardizing the White Boxes quite quickly became the main concern. This is an example of the dilemma between solving the practical problem at hand and the research agenda (Rapoport 1970). I could have insisted on following the original idea of introducing the view points of the developers, graphical designers, project managers, and even customers into the project, but the problem at hand would have increased significantly in complexity. In this case I decided not to introduce more complexity to the project because I knew I could interview and observe the developers, the graphical designers, project managers, and customers after the project has ended. I did not follow up on the collaboration and communication between the main groups, because I had to leave the country. But if I had done more follow up work on our work in the Extension Project, this would have been the first iteration in an action research process that would strive towards improving collaboration and communication between the groups and establish and improve a general theory about this.

4. Related research

The purpose of this chapter is to relate my work to the work of other researchers on method utilization. The first part of this chapter defines and reflects on the definition of information systems, systems development, and systems development methods. The second part is about the conceptual work on development methods and provides concepts about the methods and their intended use in practice. The third part is about empirical work on methods in practice which investigates the methods' influence on practice by investigating adoption, adaptation, and use of the methods in practice.

The first part of this chapter defines information systems, systems development, and systems development methods. The purpose of defining these concepts is to discuss key definitions in the IS literature that are related to this thesis. Information Systems is defined because it is the product and goal of systems development. There are several definitions and perceptions of information systems, which influence the way in which we think about and do systems development. Systems development is a central phenomenon investigated in this thesis and it is therefore important to define and reflect on the definition of systems development. Furthermore, systems development methods are supposed to influence systems development in a positive way, and therefore it is essential in the discussion of methods and their utilization to state assumptions about systems development. The main phenomenon investigated in this thesis is systems development methods.

The second part of the chapter goes into the conceptual work on systems development and systems development methods. Conceptual work is a stream of research, which is explicit about its empirical base and primarily based on literature reviews and theories from reference disciplines. The conceptual work contributes with views on methods, which can help us frame our understanding of method utilization in practice. The conceptual work provides vocabulary and perspectives on methods, but is not based on empirical work. The conceptual work is driven by theory and provides intellectual structures. The conceptual work provides a vocabulary, which can be used to investigate method utilization in practice. The conceptual work presented in this chapter is the four paradigms of systems development by (Hirschheim and Klein 1989), a framework for categorizing methods by Iivari, Hirschheim and Klein (2001b), and the amethodological approach to systems development by (Baskerville et al. 1992; Truex et al. 2000).

The third part of this chapter is on empirically based research of method utilization. Practice studies (Mathiassen 2002) show that methods are not as widely used as expected based on a positive perception of methods' influence on systems development (Fitzgerald 1998a). Methods are adapted (Bansler and Bødker 1993; Fitzgerald 1997; Fitzgerald et al. 2002), methods can play several roles in systems development and development organizations (1998b; Fitzgerald et al. 2002), methods are used among other tools and approaches (Bansler and Bødker 1993). Finally, besides (Orlikowski 1993; Lyytinen and Rose 2003) there seems to be a limited number of studies of methods in practice

(Wynekoop and Russo 1993) and there are only a few longitudinal studies of methods in practice and therefore we lack knowledge about how methods evolve over time.

4.1. Definitions

This section discusses the definitions of information systems, systems development, and systems development methods. There are multiple definitions of the three terms, so the chapter also includes reflection on the definitions. The purpose of defining the three terms is to clarify what the three terms are referring to in this thesis. The definition of information systems by (Buckingham et al. 1987) is broad in the sense that it emphasizes both technical and social aspects of information systems. This reflects my use and understanding of information systems in this thesis. Similarly, the definition of systems development by (Avison and Fitzgerald 2002) emphasizes both technical and social aspects of the resulting information systems.

4.1.1. Information systems

The main purpose of systems development is to produce information systems. There are several definitions and perspectives on information systems with different emphasis on technical and social aspects. An information system can be thought of in narrow technical terms, in broader social terms, or both. It is important to define information systems because the discussion on use of methods in practice is related to the definition of information systems. Systems development methods can have a narrow technical focus and almost solely focus on technical issues and challenges. With a broader definition that includes both social and technical aspects of information systems, the method is designed to deal both with the technical challenges and the social challenges related to the development and introduction of the information system. A definition that pictures the way I have thought about information systems in the papers and this thesis is the following broad definition:

"(an information) system ... assembles, stores, processes and delivers information relevant to an organization (or to society), in such a way that the information is accessible and useful to those who wish to use it, including managers, staff, clients and citizens. An information system is a human activity (social) system which may or may not involve the use of computer systems" (Buckingham et al. 1987) quoted in (Avison and Fitzgerald 2002)

This is a broad definition of information systems rather than a narrow one in the sense that it includes social aspects and includes information systems that are not computer based. This thesis focuses on the development of *computer based* information systems and thereby emphasizes the importance of social aspect of information systems. I have picked this definition to depict the way I perceive information systems, because the information systems that were developed in the projects I have followed in the field studies had social aspects that had a significant influence on the development process. For instance, the Try-out Project had a significant challenge in branding a company (Carstensen and Vogelsang 2001; Vogelsang 2003), which is not a technical challenge. The Use Project also had a social challenge with helping the customer to find out what data to collect and how it had to be searched. The two method projects, the Adoption and the Extension,

both had to find solutions, in the form of a method or a method fragment, to deal with social issues in the development projects.

4.1.2. Systems development

The focus in this thesis is on systems development methods, which are primarily constructed to be used in the development of information systems. Information systems development can be defined as:

"... the way in which information systems are conceived, analyzed, designed, and implemented" (Avison and Fitzgerald 2002, p. 19).

In other words, systems development is defined by Avison et al (2002) as a fairly specific set of activities that are directly involved in the development of information systems. There are several activities that indirectly influences systems development, for instance methods work, but are not, by the above definition, to consider as systems development as such. Method work is the activities that adopt and adapt a method in order to support systems development. Mathiassen provides a broader definition that includes method work by mentioning software process improvement. His definition is:

"Systems development is a specific kind of human activity which aims at changing organizations through the use of IT. It includes activities such as analysis, design, programming, implementation, and maintenance. It also includes activities such as project management, quality assurance, and software process improvement" (Mathiassen 1998b, p. 4.).

In this thesis the definition of systems development by Avison and Fitzgerald (Avison and Fitzgerald 2002) is used, because it enables an analytical separation of methods used for systems development and methods used for method work. Thereby, I can make a clearer distinction between the activities in systems development and the activities that support systems development (method work). This is motivated by my observation in the field study, where the method was utilized for both development of information systems and to adopt and adapt methods. The findings reported in this thesis point out that method utilization is broad, in the sense that "method use" is more than method used for systems development, and that method utilization is diverse, in the sense that methods are used in different ways for different purposes. The narrow definition of systems development enables me to point out when I am investigating the methods utilized for information systems development and when the methods are utilized for adopting or adapting the methods.

As stated in section 4.1.1 ("information systems"), there are different views on information systems. The diverse views of information systems are similar to diverse views on information systems development. Therefore, we also find different views on how information systems can and should be developed. The diverse understandings and assumptions on developing information systems are reflected in the systems

development. For instance, some perceive systems development as a narrow technical discipline and focus almost exclusively on the development of technology and leave out social aspects. That would be activities such as choosing architecture for the software, programming, testing and some aspects of maintenance. Few systems development projects are aimed purely at technical solutions. Usually a development project also has an aim at changing a social or organizational context. This can be to change existing work practices, supporting virtual communities, etc. My focus on systems development is fairly strict on the systems development process and its product. I am aware that other aspects, such as political, economical, power, etc. can play an important role in how methods are utilized, but I have chosen to focus on methods as a means to develop information systems and not as or political tool or something similar.

4.1.3. Defining Systems Development Methods

The purpose of constructing and using systems development methods is to create better products, improve the systems development process, and to standardize the systems development process (Avison and Fitzgerald 2002). The basic characteristics of a systems development method are: 1) a method is constructed for a specific domain, 2) the method has a certain underlying theory or perspective on software development, 3) the method usually includes techniques and tools to support the development, and 4) the method have some principles for organizing the development process (Andersen et al. 1986). Avison and Fitzgerald (2002) defines an information systems development method as follows:

"A collection of procedures, techniques, tools, and documentation aids which will help the system developers in their efforts to implement a new information system. A methodology will consist of phases, themselves consisting of sub phases, which will guide the systems developers in their choice of the techniques that might be appropriate at each stage of the project and also help them plan, manage, control, and evaluate information systems projects" (p. 20).

Hirschheim, Klein and Lyytinen defines a systems development method at a more abstract level:

"... an organized collection of concepts, methods (or techniques), beliefs, values, and normative principles supported by material resources" (Hirschheim et al. 1996).

Avison and Fitzgerald (2002) states that a method is based on a *philosophical view* that can aim at for instance the human aspect of development, a scientific approach, or automate as much work as possible. There are different philosophical views which results in a diversity of assumptions on how to improve the product (i.e. the software), improve the systems development process, and to what extend the development process can be standardized in the methods and in the research literature. Andersen et al (1986) states that choosing a method at the same time implies a certain perspective on organizations and use of computer based technology:

"When you choose and apply a specific method, the perspective of this method also makes you choose a specific fundamental way of looking at the organization, and at the application of computer technology" (Andersen et al. 1990, p. 61).

My research does not contradict with the assumption that each method has a perspective. However, my field study shows that the users of the method can have different interpretations of a method. The result of this is different perspectives on what the method is and what it can do. Furthermore, the interpretations of the method and how they are utilized are not necessarily as described in the method. I focus mostly on this finding in (Mathiassen and Vogelsang 2005b). We worked out three metaphors for the main perspectives on the method in three of the four projects in the field study. The metaphors were: the method as a solution, the method as support, and the method as a repository. This shows that an off-the-shelf method might have a perspective on information systems, systems development, and its own role (i.e. how to support systems development), but this perspective is interpreted to fit into the situation in which it is going to be used.

There are hundreds of methods today, which are based on different assumptions about systems development and on the method's role in systems development (see the next section on conceptual research). The methods are for the most part created by researchers in academia, by companies that sell the methods, or internally in the development organizations. As it is with information systems, methods also have different emphasis on technical and social aspects and how they cope with technical and social issues. Social issues can be a concern or be almost absent in the methods. In some methods, the focus is primarily on getting the technical part of the information system 'right' and the social aspects are assumed to be unproblematic or not in the domain of systems development. The other 'extreme' is to focus on social aspects and perceive the technical development as unproblematic. The emphasis in that case is on understanding and changing work practices in the user organization or on business aspect like providing new services. Rational Unified Process, which were adopted in WebSystems is an object oriented and iterative method that focuses on best practices in systems development in a fairly specific way. It defines the process, roles, techniques, and principles to be followed in systems development. Most of them concern the development of the information system in a technical sense and not for instance organizational development or restructuring of work practices.

4.2. Conceptual research related to methods-in-practice

This section presents conceptual research on the fundamental assumptions in systems development and in systems development methods. The conceptual research provides ways of understanding systems development and systems development methods. The conceptual research is primarily developed from theory and it seldom refers to any experience basis. The theory used for developing the different understandings of systems development and systems development methods are brought in from reference disciplines, a common thing to do in the interdisciplinary IS field (King 1993).

A stream of the conceptual research aims at clarifying basic assumptions that underlies systems development (e.g. Hirschheim and Klein 1989; Russo and Stolterman 2000) and to categorize systems development methods (e.g. Iivari et al. 2001a). This section contains a detailed descriptions of two examples of intellectual structures for methods and their use. The first is Hirschheim and Klein's (1989) four paradigms of information systems development, which lay out some different and fundamental view on systems development. The second example is a framework for categorizing systems development methods by Iivari, Hirschheim and Klein (2001a). The four paradigms presented by Hirschheim and Klein are used in a framework by Iivari, Hirschheim and Klein (1998) for classifying information systems development method. The presentation and discussion of the four paradigms and the framework is followed by a section on amethodology (Truex et al. 2000). Truex et al. (2000) provides another approach to understand systems development methods and their potential use in practice. Truex et al. (2000) use deconstruction to advance our understanding of system development methods and their potential use. Through the deconstruction (more on that approach below in this chapter) Truex et al. find a deferred meaning of systems development methods which they name amethodology. The amethodological conception of systems development methods is complementary to the main assumption on systems development methods. I use the three examples of conceptual research to reflect on my own findings.

4.2.1. Basic philosophical assumptions in systems development

Hirschheim and Klein (1989) propose four paradigms in systems development. The four paradigms proposed by Hirschheim and Klein are: functionalism, social relativism, radical structuralism, and neohumanism. The four paradigms are based on Burrell and Morgan (1979) four sociological paradigms, which are distinguished by different views on ontology and on epistemology. A paradigm is

"the most fundamental set of assumptions adopted by a professional community that allows its members to share similar perceptions and engage in commonly shared practices" (Hirschheim and Klein 1989, p. 1201).

A paradigm consists of epistemological and ontological assumptions (Orlikowski and Baroudi 1991) shared in a community (Hirschheim and Klein 1989). Hirschheim and Klein use two dimensions to distinguish systems development and systems development methods: an epistemological and an ontological. On the epistemological dimension they distinguish between objectivism and subjectivism. They describe objectivism as follows:

"The essence of the objectivist position is to apply models and methods derived from the natural sciences to study of human affairs. The objectivist treats the social world as if it were the natural world" (cited in (Hirschheim and Klein 1989, p. 1201) from (Burrell and Morgan 1979, p. 7)).

In the objective understanding of the world, the relations between objects are given a priori and can be investigated.

In subjectivism the focus is on understanding how the individual creates, modifies and interpretate the world. The social world is not perceived as given a priori. The social world is socially constructed and individuals apply their own meanings to the social world. Hirschheim and Klein (1989) describes subjectivism as follows:

"The subjectivist position denies the appropriateness of natural science methods for studying the social world and seeks to understand the basis of human life by delving into the depths of subjective experience of individuals" (Hirschheim and Klein 1989, p. 1201)

An a priori understanding of the social world is not possible and cannot be applied and tested in a setting (Orlikowski and Baroudi 1991). Therefore is it not possible to establish a universal approach to systems development. The objective and subjective distinction is in line with positivism and interpretivism research approach described in the "Research approach"-chapter in this thesis.

The other dimension in the framework is ontology where Hirschheim and Klein distinguish between order and conflict. Within the order ontology it is believed that the social world is characterized by order, stability, integration, consensus, and functional coordination (Hirschheim and Klein 1989). The order ontology emphasizes understanding and improvement of a current order. Within the conflict ontology the social world is believed to consist of change, conflict, disintegration, and coercion (Hirschheim and Klein 1989) and the emphasis is on remedying the conflicts in the social context.

The two dimensions lay out a framework that can be used to capture basic assumptions in systems development and systems development methods. The two dimensions make up framework consisting of a two by two matrix, which Hirschheim and Klein, fills out with the following four paradigms:

	<i>Objectivism</i>	<i>Subjectivism</i>
<i>Order</i>	Functionalism	Social relativism
<i>Conflict</i>	Radical structuralism	Neohumanism

Table 4.1. Four paradigms by Hirschheim and Klein (1989).

For each of the four paradigms Hirschheim and Klein provided a story to "envision" different perspectives on systems development. The following sections briefly describe the four paradigms.

The systems developer who works within the *functionalistic* paradigm aims at explaining status quo, social order, and rational choices (Hirschheim and Klein 1989). It is possible to find and establish a description of true requirements for an information system. In the functionalistic paradigm the systems developer's primary task is to transform the true requirements into a working information system. The focus is primarily on the technical implementation of the information system. The task of creating the information system is primarily perceived as a technical challenge. Therefore the systems developer is perceived as a *systems expert* and the systems developer's primary function is to provide and use his/her technical knowledge. Systems development is perceived as a technical

process and the main challenge is to create the technical parts of information system (i.e. the information system understood in a narrow technical sense).

The systems developer who works within the *social relativist* paradigm aims at explaining the social world within the "individual consciousness and subjectivity" in the given context (Hirschheim and Klein 1989, p. 1205). The reality is socially constructed and a product of the human mind. In other words, there is no given "reality", only perceptions of it (Hirschheim and Klein 1989, p. 1204.). These perceptions of the world can be confusing. The systems developer's primary task is to try to make sense out of the confusion that originates from the different perceptions of the social world. The systems developer is seen as a *facilitator* who helps management to find a system that makes sense based on the different perceptions of the world in a given situation. The information systems are not by nature (a priori) good or bad in the social relativist paradigm. Instead there are different perceptions of the information systems. A "successful", or in Hirschheim and Klein's word a "legitimate", information system, is a system which is approved by the people who uses the system.

In *radical structuralism* the systems developer's aim is to "...transcend limitations placed on existing social arrangements" (Hirschheim and Klein 1989). A fundamental social conflict is assumed to exist between management and labor on economical issues and the systems developer has to choose side in this conflict. If the systems developer chose the management side of the conflict, the aim in systems development becomes rationalization of work, replacing workers, etc. If the systems developer chooses the workers' side the aim is to enhance the laborers' traditional skills (e.g. the UTOPIA project). In the latter case the systems developer is seen as a *labor partisan*.

In the *neohumanism* paradigm the systems developer's emphasize radical change and aims at overcoming barriers. The systems developer is seen as a *therapist*, who helps with change and overcoming barriers. The epistemology of the neohumanist paradigm is positivist in the understanding of technical control and anti-positivist in seeking mutual understanding of social issues. The systems developer has the *emancipator's role*.

The four paradigms are simplified stories of complex systems development (Hirschheim and Klein 1989), but still provides some basic, but also very general ways, of understanding systems development and the role of the systems developers. The framework is proposed to categorize and understand systems developers and the purpose for involving them in systems development. The four paradigms can also be used for categorizing systems development methods. The four paradigms are used in (Iivari et al. 2001a) as part of their framework for categorizing systems development methods.

My work provides metaphors and stories (in the Hirschheim and Klein sense of the word) about methods that build on interpretations of the practical utilization of methods in social context. My interpretation, in the light of my findings, of the four paradigms provided by Hirschheim and Klein (Hirschheim and Klein 1989) is that the paradigms should be perceived as complementary and not exclusive. It is possible to analyze methods in practice with the four paradigms as we did in (Mathiassen and Vogelsang

2005b) with the two knowledge management notions, networks and networking, that are related to the functionalistic paradigm (networks) and the social relativist (networking). I assume that the analysis of my data, with respect to the functionalistic paradigm and the social relativist, would turn out quite similar to what we have reported in our paper: that the paradigms are complementary. The paradigms are complementary in the sense that the paradigms can coexist and doesn't exclude each other. The paradigms are tools to analyze and understand methods both the standard methods and the methods in practice.

The participants' perception of the method was not influenced to the same extend in all the projects by a single perspective. The networks perspective (functionalistic paradigm) played a significant role in the method work projects (the Method Project and the Extension Project), where the project participants worked towards establishing a solution for future systems development. The networking perspective (the social relativist) played the most significant role in the systems development projects (the Try-out Project and the In-use Project), where the method was used. Practice seems to be a mix of approaches and understandings of systems development and systems development methods. The paradigms can be ways to understand the formal methods and the methods in practice, but the stories are, as it is also stated by Hirschheim and Klein (1989), not out there in the pure form.

I would also like to point out that it was the same method or incarnations of the same method (a functionalistic method) that was used in the four projects. Although the method has a fairly clear functionalistic approach to systems development the way in which it was utilized was not purely functionalistic. At least the functionalistic and the social relativist paradigms were present at the same time during the utilization of the method. It seems that the fundamental assumptions the methods are constructed upon by the method constructors are not necessarily obtained by its users. Instead they interpreted the method and made their own assumptions about what the method was and what it could do for them. This raises a question of the relevance of putting methods in categories from a practical perspective.

4.2.2. A framework for categorizing methods

The framework by Iivari et al (2001a) consists of four connected tiers: paradigms, the approaches, methodologies, and techniques. The framework is proposed to be used for categorizing the many available methods and provides a frame for understanding methods and their intended use. The first tier consists of the four paradigms developed by Hirschheim and Klein (1989) described above.

The second tier consists of the systems development approaches. A systems development approach is a class of methods that "...share a number of common features" (Iivari et al. 2001a, p. 186). Systems development approaches are used to categorize methods into classes based on their ontology, epistemology, research method, and ethics (Iivari et al. 1998; Iivari et al. 2001a). Each approach can have several instances of methods in its category. Approaches are more concrete than paradigms and more abstract than methods. Approaches do not necessarily have method instances and approaches can be derived from both paradigms and methods (Iivari et al. 1998). Iivari et al. (1998) use the

framework to analyze the following five approaches: the interactionist approach, the speech act based approach, the soft systems methodology approach, the trade union approach, and the professional work practice approach. Iivari et al. (2001a) provide six additional approaches: structured, information modeling, decision support systems, socio-technical design, infological, and object-oriented. They found approaches within each of the four paradigms for instance the structured approach within the functionalistic paradigm, non-functionalistic approaches such as the trade union approach (radical structuralism), the speech-act approach (neohumanism), the Soft Systems Methodology approach (social relativism) (Iivari et al. 2001a). This shows the diversity in the goal that is intended to be achieved by basing the methods on one of these approaches. The eleven examples of approaches in the framework (Iivari et al. 1998; Iivari et al. 2001a) show how different the perception of methods, their goal and intended use are.

The third tier in the frameworks is the method tier where the actual methods are found. Each method belongs to a specific approach and the approach belongs to one of the four paradigms. The placement of the method under a certain paradigm and approach indicates a set of characteristics of the method. The framework is not only for categorizing methods, it can also be used to create new methods based on assumptions none or only a few other methods are based on. The third tier in the framework consists of the methods and it is therefore possible to find out where method based on a certain paradigm and approach doesn't exist already. In such case, it is possible to explore the possibilities for a new method based on the set of characteristics from a specific paradigm and an approach.

The fourth tier of the framework is the technique tier. A technique is "... a well-defined sequence of elementary operations that more or less guarantee the achievement of certain outcomes if executed correctly" (Iivari et al. 2001a, p. 186). The method is concerned about the "what to" do and a technique is concerned about "how to" do systems development (Fitzgerald et al. 2002). The same techniques can often be found in several methods. The technique tier is the most applicable tier (Iivari et al. 2001b) of the four tier when it comes to guiding systems development (Iivari et al. 1998). Each technique is connected to the methods they are part of. The four tiers in the layers are connected as follows. The techniques are connected to the methods they are part of, the methods are connected to approaches they are categorized under, and the approaches are connected to one of the four paradigms they are categorized under.

The four paradigms of systems development developed by Hirschheim and Klein (1989) and the framework by Iivari et al. (Iivari et al. 2001a) are attempts to uncover deeper structures in the intellectual core of systems development methods. The four paradigms and the framework are examples of intellectual 'tools' that can help us advance our understanding of systems development methods by providing overviews of the jungle of methods. The aim with the framework is not to understand the methods-in-practice, but to provide a framework to categorize and navigate the 'jungle' of available methods.

We provide a framework in (Vogelsang and Kensing 2006). Where the framework by Iivari et al. (2001a) is based on an analysis of the methods and derived from theory, our

framework is primarily based on my empirical studies. Despite the two different origins, the two frameworks have things in common. Both frameworks are intended to shed light on the methods. Iivary et al. (2001a) framework is intended to enable the construction of new methods that fill out the places in the framework without a current method. Our framework can also be seen as a tool to develop methods, but also to improve practice. The framework can be used by method constructors to test the scope of the methods, i.e. to check that the methods cover the nine perspectives or at least consciously chose not to cover them. The practitioners can use it to analyze and guide areas in which they can look into for adopting, adapting and using the method. The three levels in the organization broaden the scope of the method utilization and puts terms on method utilization that enables them to talk about the method utilization and act. The distinction between adoption, adaptation and use broaden the scope of method utilization. Utilizing a method takes an effort in each of the three aspects of method utilization.

Investigating and categorizing the methods from different theoretical perspectives does not uncover all aspects of the methods, especially the aspects which are not made explicit in the methods or in the theories. Truex et al (2000) approaches systems development methods with the deconstruction technique to establish another position than the most assumed in the literature. They call the new position, amethodology. The next sections go into the concept of amethodology.

4.2.3. Amethodology and emergence

Truex et al. (2000) introduce the term amethodology, which refer to the deconstructed meaning of the main stream assumptions in the research literature on systems development methods. They define the main stream meaning of method as orderly, predictable and universal, i.e. objective and orderly in Hirschheim and Klein (1989) terms. Truex et al. make a deconstruction of the presumed meaning (or discourse) in the text to find a marginalized text, i.e. the text which is 'left out' or ignored by the main text. They name the main discourse the *privileged* text to emphasize that other discourses are *marginalized*. Deconstructing the privileged text creates a new position, which Truex et al. name amethodical systems development (Baskerville et al. 1992; Truex et al. 2000). Amethodical systems development rejects structure, but does not imply anarchy. Amethodical systems development implies a managed development process, but not predefined sequences, control, rationality, or claims of universality. Each development is assumed to be unique and unpredictable.

The motivation for doing the deconstruction is based on the claim that organizations have changed from being hierarchical and static to more flat and emergent. The organization of today is constantly changing and non static. This is challenging the main stream assumption of finding a stable and universal requirement for the information system and a universal approach to systems development (i.e. a method). Aiming at creating stable requirements, which is intended to prevent huge amount of maintenance after the information system is finished, is not suitable because today's organization change so fast. Truex et al. (1999) describe today's organization as an emergent organization. An emergent organization is an organization which is undergoing a constant change. The organization is constantly trying to stabilize itself although the stable organization never

occur (Truex et al. 1999). Truex et al (1999) suggest that the emergent organization changes the goals for systems development. Instead of long analysis and design to prevent maintenance after the project is finished, Truex et al. (1999) suggest aiming for continuous analysis of the situation in the emergent organization. Furthermore, user satisfaction as a success criterion for systems development should be replaced with dynamic requirement negotiation. Finally, it should be accepted that requirements are incomplete and ambiguous although still useful specifications. Instead of aiming at finishing a project, the aim should be continuous systems development. A redevelopment of a system should not denote a failure, because organizations change and so must the information system do. Systems development is no longer (and might never have been) an activity with a start and an end or in other words, a project that can be finished. The claim of a changed organization is in line with the findings in Fitzgerald (2000) who finds that the current methods are based on assumptions on the organizational context that existed in the period from 1967 to 1977. Fitzgerald states that the organizational context has changed and organizations and applications become increasingly more complex. He suggests that new technologies and work practices are needed to meet this challenge. Baskerville and Stage (2001) describe a method as an emergent phenomenon where the environment and the method are in constant change and that this situation can be approached by a better understanding of work practice through ethnography. Bansler and Havn (2003) conducted a field study that shows that systems developers find themselves in complex and less stable situation than assumed in most IS research on methods. They conclude that we must abandon a rational and methodological process and instead develop alternative perspectives on methods. These suggestions change some of the basic goals in systems development and the approach to systems development. Amethodology is a different and complementary perception and approach to systems development. The idea behind amethodology is not to reject the traditional view on systems development and systems development methods. Amethodical systems development is a complementary construct to methodical systems development (Truex et al. 2000).

Truex et al. (2000) provides four main stream positions from the IS field and four positions deconstructed from the four main stream positions to distinguish the methodological and amethodological approach. The first main assumption is that systems development is a managed process. The systems development process is controlled through reduction of the problem area until it becomes manageable. The marginalized view, which is the amethodical position, is that systems development is random and opportunistic as described above. The assumption is that systems development takes place in a complex setting with uncontrolled events. The systems development method only has a minor or even irrelevant role in the development process. The problem is that the components made through reduction do not reflect the reality. The amethodological position is that there is no need to fix the in-avoidable disrepresentation between reality and imaginary components, because reality is too rich and complex to be captured. Anomalies are not to be fixed, but part of the development process.

The second main stream assumption is that development process is linear. Systems development has a progressive nature. One step is a precondition for the next step in the

systems development process. The role of the method is to organize activities to avoid irrational activities. In the amethodical perspective, the development process is assumed to be simultaneous, overlapping and fragmented. Stages can be skipped and critical activities are taken up as early as possible. The progress in the development is partial and incomplete and goes into dead ends and needs backtracking. There is no given sequence and the opportunities that are at hand are taken up.

Thirdly, the main stream research assumes that the systems development process is replicable and universal. A method can be applied in a variety of organization through adherence to the method. Adherence to the method also leads to dependable solutions. The amethodical position perceives the development process as a unique and ideographic process. There is no universal logic in systems development. There is only local logic. If the method has to be used at all, it has to be reinvented for the specific setting.

Fourthly, the presumed meaning is that the development process is rational, determined, and goal-driven. The development process is assumed to be driven towards pre-defined organizational goals. It is possible to agree on and make goals explicit. Furthermore, the steps towards the goal can be determined and followed. From the amethodological perspective the development process is negotiated, compromised and capricious. A limited agreement about the goals is achieved to make room for individual interpretation and disagreements among participants. The goals are discovered and reinterpreted throughout the development process and the process is not necessarily rational and predictable. Each development project must find its own unique approach.

The methodological and amethodological view on systems development and systems development methods are complementary. It is not a discussion about which one is right or wrong. My field study shows aspects of both a methodological and an amethodological approaches are present in practice. For instance, the analysis with the networks and networking knowledge management perspectives in the (Mathiassen and Vogelsang 2005b) paper, show that both perspectives were present and co-existing in the three projects we analyzed. The methodological and amethodological approaches are similar to the networks and networking approaches in terms of the fundamental perception of what technology can do and problems be solved. Both the methodological and networks approach seeks a “technological” solution in an understandable and orderly social world. The amethodological and networking approach do not seek a solution, but tries to deal with an ever changing situation through negotiation and social networks. The participants in the projects were seeking a structure for their work and at the same time made sure to leave room for adaptation to the situations at hand. The Extension Project skipped bringing in the method to WebSystems as it was off-the-shelf, but choose to adapt terms and select the needed parts for WebSystems. The Use Project had the method as a reference in the development process. The method provided a common reference, but was also adapted to the project and not strictly followed when situations occurred where it did not make sense. The best example of the structure vs. non-structure, was in the extension project, where the practitioners themselves made a method fragment they had to use in their own work afterwards. They were very conscious about what work practices they standardized and what work practices that had to be arranged for each individual project.

Most of the arguments in all three projects were pragmatic, i.e. they structured what they believed could work in practice and more or less left the rest to people to figure out when problems occurred. In other words, the practitioners were seeking a structure to follow in their communication, coordination and work in general and did at the same time acknowledge the need for being able to change and skip parts of the structure even though it sometimes resulted in break downs and problems. It is not possible in general to assess whether this is a good or bad approach to systems development as this is based on a single case. But it seems that the method had a significant influence on, but was not the only thing that influenced, the improvement in the systems development process that took place over the 3 years my study took place.

4.3. Empirical Research on Methods-in-practice

The purpose of this section is to present and discuss empirical research on method utilization in practice and relate it to my own work. The amount of research on how methods are utilized is sparse compared to the amount of research and resources that has gone into the creation of methods (Wynekoop and Russo 1993). It is generally assumed that systems development methods have a positive influence on systems development (Fitzgerald 1996). This is for instance supported by Chatzoglou (1997), who finds in a survey that the use of methods are beneficial in terms of economy and process improvement. Despite that, the empirical research has found that the methods are not used as intended, not in their entirety and not widely (e.g. Stolterman 1992; Bansler and Bødker 1993). Therefore there is an attempt to close the gap between the methods and practice. This is both done by developing new methods on new assumptions and with new approaches, but also by investigating how methods are utilized in practice. This section goes into the research on methods in practice. The section is structured into three subsections that follow our definition of method utilization by dividing utilization into adoption, adaptation, and use (Vogelsang and Kensing 2006).

4.3.1. Adoption of methods

Some developers and development organizations decide to bring systems development methods into use in their organization. This decision to bring in the method is called adoption (Rogers 1983; Rogers 2003). An adoption of a method is the decision to bring a specific method or a specific method fragment into use in a specific context (Vogelsang and Kensing 2006). Method adoption is one of the three aspects of method utilization that we brought up in Vogelsang and Kensing (2006). If the developers or the development organization decide not to use a systems development method, it is called a rejection of a systems development method. Several researchers have studied the adoption of methods. Some of them are presented in the following.

Most of the research on adoption of methods is based on surveys and attempts to find factors that influence the rate of adoption of methods. Parts of the research focus on the individuals as a factor for adoption of methods, others focus on organizational factors, and some on both. The following section is structured around the areas the studied factors are influencing, e.g. the organization, the individual in the organizations or both. This thesis investigates the adoption of methods internally in an organization and only

peripherally how a method is adopted from the organization's surroundings (e.g. text books, method industry, or academia) and into the organization.

Leonard-Barton (1987) studies individual factors that have a positive influence on the adoption of systems development methods¹. Leonard-Barton found that programmers are more likely to use methods if supervisors, influential peers, and their clients support use. Sharmaa and Rai (2003) studied factors effecting adoption of CASE tools. They found that positional power and job tenure of the systems development leader are negatively related to adoption of CASE tools. Premkumar and Potter (1995) propose a research model consisting of several factors influencing the adoption and implementation of CASE tools. In their survey they found that the following five variables were important to differentiate adopters and non-adopters: existence of a product champion, strong top management support, lower IS expertise, perceiving that CASE tools has an advantage over other technologies, and that CASE tools are cost effective. The non-distinguishing factors for adoption and non-adoption were complexity, organizational- and technical compatibility. Fitzgerald (1997) finds that methodology usage is correlated to the developers' experience. Developers with low experience use the method as a template for the development (high usage), but eventually finds out that the methods are not universally applicable (low usage), and ends up with a tailored version of the method (middle/average).

Zmud investigates organizational factors influencing adoption. Zmud (1982) investigates the centralization and formalization as factors influencing the initiation, adoption and implementation of software practices (e.g. methods). Furthermore, Zmud (1984) investigates push-pull theory (push meaning available as driving factor and pull meaning need recognized driving factor) and found that the theory was not validated for method adoption. Instead he found that the type of innovation influences and to some extent changes the organizational process of facilitating innovation. Fitzgerald (1998a) found in a survey that larger organizations are more likely to use methods. There seems to be a high use within in-house development, on projects with over five developers and which lasted longer than nine months. He also found a polarization in the use, i.e. the organizations who use methods seem to use it more and more and the ones that do not use a method are unlikely to start using one.

Sherif and Vinze (1999) investigates the barriers to adoption of software reuse both at an organizational and at an individual level. They found that barriers at the individual level were caused by barriers at organizational level. Kozar (1989) found adopters to be younger, to have spent less time in their organization and in systems work, not to have a current method in use, and to be more optimistic about actually fit the method into the organization.

It is generally assumed that methods have a positive influence on systems development (Fitzgerald 1996). Chatzoglou (1997) who found that the use of methods are beneficial in terms of economy and process improvement. If methods has such a positive influence on systems development then systems development methods should be widely adopted

¹ This section is based on text from Mathiassen, L., and Vogelsang, L. (2005).

among development organization. However, surveys have shown that methods are not that widely use and not in their entirety. Fitzgerald (1998a) made a survey to identify circumstances in which developers use methods, and to which extend they follow them rigorously. 60 percent of the organizations stated that they were not using a method and only 6 percent answered they were followed them rigorously. Furthermore, 79 percent of the non-users of methods answered that they were not planning to use a method.

Some of the described factors for method adoption can be related to my empirical study. My research is qualitative so I do not provide general factors that influence the adoption of methods or numbers on how widely methods are adopted. This thesis goes into answering how and why a specific method was adopted. Premkumar and Potter (1995) found that organizational- and technical compatibility was a non-distinguishing factor. The main argument for a new method in the Adoption Project was that the old method was not compatible with the technology in use and to the activities that took place in web development, i.e. a distinguishing “factor” for adopting the method was a compatibility issue. Kozar (1989) found adopters to be younger and more optimistic. This is confirmed by my study. The people in WebSystems and WebSystems itself were young and optimistic about bringing in the method. The quality assurance person who had created and worked with the ‘old’ method was less optimistic and in some ways perhaps more realistic about the method use, because he had more experience. He still though that a method was a good idea to adopt, but did not buy all the other Adoption Project participants’ ideas about what the method could do for them.

Chatzoglou (1997) found in a survey that the use of methods are beneficial in terms of process improvement. The method did improve the process in WebSystems, but not necessarily as it the method proposed it to happen. Several people in WebSystems said that the method was best at bringing up issues that could be taken care off. I also think they gained a lot from the terminology in the method and to some extend the techniques that were brought in. But the best practices described in the method had a less important role to play than described in the method in the actual systems development.

As Fitzgerald (1998a) found that the influence of prior experience in the organization was very influential. In WebSystems, the organization chose to go for a “same but different” solution, i.e. the fundamental approach to solving or overcoming the problems was still with a method, just another and more compatible one. The prior experience with methods had a big influence on how the method was brought into WebSystems, especially in terms of adaptation of the method, which section 4.3.2 goes into.

There seems to be few studies of adoption of methods over time and none of these studies focus on changes of the methods over time. Lyytinen and Rose (2003) found that several diffusion of innovations (Rogers 1983) factors such as past experience, own trials, ease of use, learning by doing, and standards strongly affect the adoption of IS process innovations (e.g. a method). Lyytinen and Rose focus on the factors influencing the decision on adopting an IS process innovation (such as a method) but not to what extend the IS process innovation is actually used after the adoption. Furthermore, Lyytinen and Rose focus on several IS process innovation and the reasons for adopting them, but not

on how one a particular IS process innovation changes over time. Orlikowski (1993) found that it is important to understand that the implementation of CASE tools involves organizational changes over time. Orlikowski focus on the approach to implement CASE tools (i.e. radical and incremental) and not how the CASE tools change over time. My studies show that a method and the perceptions of it change over time in order to be valuable in a changing development organization.

4.3.2. Adaptation of methods

Adaptation of a method means that the method is changed in order to be used in a specific situation. Practice studies of method use shows that they are not used in their entirety or rigorously (see 4.3.3). This is to some extend a result of adaptation. Adaptation can change of methods by adding method fragments not already in the method, by not using certain method fragments, or by changing method fragments.

Fitzgerald et al. (2003) describe a *tailoring strategy* used at Motorola. I use adaptation instead of tailoring in this paragraph but both terms refer to changing a method to fit a specific context. Fitzgerald et. al. (2003) describe the adaptation can take place at different levels. Fitzgerald et al. (2003) investigates the adaptation of methods in Motorola. They found that adaptation can take place at what they have termed an industry level, an organizational level, and at a project level. At the industry level we find methods and other components that are available to all organizations i.e. in the method industry. The methods at the industry level are methods that are developed by academia or by organizations that sells methods. It is also at the industry level that we find industry standards for software development such as IEEE 1074 and ISO 9001. The methods and other components are generic in the sense that they are supposed to be used in many different organizations. The organizational level is where the adaptation of the methods and components from the industry level is adapted to fit the organizational context. The adaptation is at a macro level, so the method at the organizational level is generic for the specific organization and cannot necessarily be used in other organizations. Fitzgerald et al. (2003) found that the method and IEEE 1074 standard in use at Motorola was adapted to different division within Motorola to fit their particular development context. The organizational level also includes adding new components to the method. The adaptation at the project level is the adaptation of the organizational method to the specific projects. The outset for this adaptation is the method found at the organizational level. Fitzgerald et al. (2003) argue that the *tailoring strategy* overcomes fundamental problems in method engineering and the contingency approach. Firstly, the tailoring approach has some pre-tailoring of the method at the industry level, which shortens the period of tailoring for each development projects. Thereby the tailoring process is shortened and the tailoring of methods becomes more realistic. Secondly, by having a method that already is tailored to the organization means the individual developer doesn't need to know more methods than the appropriate and already macro-tailored method used in the organization.

As described in Vogelsang and Kensing (2006), the main difference between our framework and the framework and levels provided by Fitzgerald et al (Fitzgerald et al. 2002; 2003) is that we emphasize the activities involved in utilizing a method Fitzgerald et al. focus on the origin of the method and where it is changed and used. Our framework

is process centric and their framework is method centric. The framework by Fitzgerald et. al. provides an understanding of the enactment of methods and our framework provides an understanding of the activities involved in adopting and adapting methods in development organizations. The two frameworks have different focuses, but are not contradictory. They are complementary in the sense that they provide two different approaches to understand methods in practice.

Method engineering and the contingency approach are two approaches that deal with adaptation of methods. Method engineering is a situational method, i.e. the method is intended to be adapted to a specific situation (usually a development project). The idea is to create a method based on method fragments that fits a specific situation (Welke and Kumar 1991; Brinkkemper 1996). Method engineering is based on the assumption that systems development practice and the context where it takes place are diverse (e.g. different types of application, tasks, people/developers, etc.). Method engineering copes with changing systems development practice by having a meta-method for configuration a situational method, support tools, and language.

The main assumption in the contingency approach is that some techniques or aspect will work in some situations and not in other situations. Consequently, the right approach had to be found for each situation. The idea behind the contingency approach is that the systems developers can choose the method or method fragments from their toolbox of methods and selects the ones that fit the situation at hand. Avison et al (1997) states the problem the contingency approach deals with in the following way:

"For most practical purposes, ... the problem for practitioners is about which methodology or combination of methodologies to use in particular problem situations" (Avison and Taylor 1997, p. 73)

The contingency approach has been criticized as being unrealistic with the argument that most systems developers do not have a variety of methods to choose from. Instead, the developers have a few if more than one.

A significant part of both method engineering and the contingency approach provide guidelines for adapting the methods themselves. In that sense does both method engineering and Multiview provide guidelines for methods work. Method engineering is, with its focus on "engineering" the method by putting the right method fragments together approaching systems development with the assumption that it is possible to get the method for a specific situation right. Thereby method engineering has moved from a primarily rational and universal approach to a more situational and specific approach. This move can be seen as a step towards an approach similar to the amethodological approach. However, method engineering focus on getting the method right and not on continues adaptation of the method while during systems development or the long term adaptation in the development organization. The lack of continues adaptation conflicts with the amethodological and emergence of methods and organizations puts the method engineering some where in between the methodological and the amethodological.

The above text is about deliberate adaptation of methods where methods are adapted with some degree of formalization in the adaptation process. But there is also an adaptation that takes place that are less formalized and intended. It occurs when a method does not fit the situation at hand and developers and other method users have to adapt the method to make it fit the situation. We name this unplanned adaptation in (Vogelsang and Kensing 2006). The unplanned adaptation happens when the method is not suited for the situation and the users of the method have to invent new method fragments or adopt other method fragments. The result of unplanned method adaptation can be a fairly ad hoc and chaotic development process as I found it in the Try-out Project in my field studies. The degree of unplanned is highly related to the design of the method and the use situation at hand. Therefore I cover unplanned adaptation in the next section on use of methods.

4.3.3. Use of Methods

This section goes into how the methods are used in practice for systems development where use should be understood as methods used strictly for systems development. As stated earlier, an important part of methods is to provide very concrete guidelines in the form of techniques and higher levels guidelines in the form of principles and basic assumptions about how systems development takes place. Many methods have been constructed, but there have been relatively few studies of the actual method use in practice (Wynekoop and Russo 1993; Wynekoop and Russo 1995).

Fitzgerald (1997) reports from a field study carried out in eight organizations. He found that none of the eight organizations were using a method rigorously, i.e. the methods were not used as it prescribes. A similar observation is made by Bansler and Bødker (1993). Bansler and Bødker investigated the use of Structured Analysis in three organizations and found that the method was not used as intended. There can be several explanations for not using the methods rigorously and not as intended. The primary reason for not using a method in its entirety is, both Fitzgerald's and in Bansler and Bødker's study, that the method prescribes too much work, which means doing unnecessary activities and too much paper work. Therefore, Fitzgerald argues that methods are not used in their entirety for pragmatic reasons, and not out of the developers' ignorance and lack of knowledge. Bansler and Bødker found problems with the basic assumptions in structured analysis, which made the method undesirable for the systems developers to comply with the method. Bansler and Bødker provide four reasons that could explain why structured analysis is not used in their entirety. The first three has to do with the context in which the method is used and the forth is about the method itself. The first reason for using the method partially is that the projects in the studied organizations could be too small to use Structured Analysis (structured analysis doesn't provide benefits for small projects). The second reason is weak training and weak management support (i.e. people did know how to use structured analysis and had no insensitive to use it) and the third reason is political conflicts in the development organization (leave out aspects of the method and make it easier to argue for new acquisitions). Fourth, the problem could be the method itself. Bansler and Bødker provide several examples. One of them is that Structured Analysis prescribes the use of data flows diagrams to communicate with users. The developers found data flow diagrams unsuitable for communicating with users.

Bansler and Bødker concludes that:

"it [is] more correct to say that the designers in our study use data flow diagrams, the Data Dictionary and mini-specifications as tools - for various purposes and in combination with other tools such as E/R diagrams, screen layouts, prototypes, organization charts, and plain text - rather than to say they employ Structured Analysis as the method for analyzing and designing information systems. In other words, when a company states that it uses Structured Analysis, it can mean many different things" (Bansler and Bødker 1993, p. 185)

In other words, there is a difference between the intended and actual use and the actual use it not given, i.e. the actual use of the same methods various in different situations. The difference between the intended use of methods and the use in practice has resulted in a distinction between the formal method and the method-in-action (Fitzgerald et al. 2002). The formal method is described as a:

"... commercial, brand-named methods, and also those methods which have been developed internally within an organization, but which are formally documented. Formalized methods should not be confused, however, with formal methods, ... that draw on mathematically-expressed formalism as a basis for system specification and design (Fitzgerald et al. 2002 , p. 5-6).

The method-in-action is the developers' enactment of the formal method (Fitzgerald et al. 2002). The idea behind the distinction between the formal method and the method-in-action is that the method is not enacted as prescribed by the method. Fitzgerald et al. state it as follows:

"...methods are never applied exactly as originally intended. Different developers will not interpret and apply the same method in the same way; nor will the same developer apply the same method in the same way in different development situations. Therefore, on any development project, the method-in-action is uniquely enacted by the developer." (Fitzgerald et al. 2002, p. 13. Original emphasis.)

The distinction between the formal method and the method-in-action draws on Argyris and Schön's work on espoused theory and theory in use (Argyris and Schön 1974). Espoused theory is what we state we are doing. The theory-in-use is how we actually do things. The theory-in-use is not always possible to make into an espoused theory and espoused theory is not possible to put into theory-in-use. In systems development method terms, the formalized method is the espoused theory, which is not always turned into the theory-in-use. But the espoused theory shapes the theory-in-use, so the formal methods, from an Argyris and Schön perspective, are shaping the method-in-action. Furthermore, Argyris and Schön argue that the smaller the gap between the espoused theory and the theory-in-use is, the more effective the work becomes. If we apply the same logic to methods, we should find that the closer the formal method is to the method-in-action, the more effective systems development becomes. This is in line with most of the work on

methods in practice that strives to find a description or understanding of methods on which we can construct useful methods. Stolterman (1992) concludes that methods of today neglect the reality of systems designers too much which make methods become 'academic' i.e. without relation to reality. In general, practice studies show that the current methods are not applied entirely and as rigorous as originally intended for pragmatic reasons. Furthermore, it seems that methods are uniquely enacted in the development situations and a distinction between method-in-action and formal method is relevant to make.

A method has one or more roles in the development organization, in the projects and seen from the individuals. A role is how a method is intended to be involved in and influence systems development. The methods have different assumptions about systems development and how systems development positively can be influenced by a method. Avison and Fitzgerald (2002) have three generic roles for the methods: to create better products, improve the systems development process, and to standardize the systems development process. This section is about the roles of methods-in-practice. Fitzgerald (1998b; Fitzgerald et al. 2002) finds that a method can play two diametrically-opposed roles, an overt (rational) role and a covert (political) role. The roles can co-exists and the role of the method does not change from one role to the other, because the roles are related to the purposes of development and politics.

Bansler & Bødker studies Structured Analysis which is based on instrumental rationality and found that the actual role was different than the method prescribes. Bansler and Bødker find that methods are one element among others, which shows that the importance of the role of a method is a bit exaggerated. Fitzgerald (1998a) found that methods are not seen as panacea for problems in systems development and that methods are not applied in rigorously nor in uniformly fashion.

In our paper (Mathiassen and Vogelsang 2005b) we found three metaphors for the role of the same method in three projects. The three metaphors are solution, support and repository. These three metaphors show how different the intention behind bringing in a method can be.

The following quote sums up the role of the methods in practice pretty well: "Systems development methods and tools play important roles in shaping and improving practice, but their impact is limited. (p. 68) (Mathiassen 1998a). In other words, the methods have a role to play in systems development, but they are, as stated by Fitzgerald (1998a), not a panacea. Furthermore, the methods influence the situations in different ways depending on the perception of the methods or the role the method are given. It does not mean the methods can have whatever method they are given. Finally, the methods seem to be used as dynamic entities in order to remain usable for systems development.

5. Conclusion

This dissertation presents the research I have conducted as part of my Ph.D. study. The main contribution is to provide entrances to understand and guide method utilization in practice. The thesis answers the following research question: *How can researchers and practitioners conceive utilization of systems development methods?* It does this by providing frameworks and perspectives on utilization of systems development methods in practice. Furthermore, the thesis provides characteristics of web development and its context.

The primary contributions are in the five research papers included as part II of the thesis. Part I of the thesis contributes with reflection on my research approach and relates the contributions on methods in practice to other research on this topic. My Ph.D. study has resulted in other papers and reports. The complete list of papers and reports can be found in appendix A.

Part I of the thesis contains a chapter that relate my work on method utilization to others' work on the topic. I relate my work to some of the definition of information systems, systems development and systems development methods. I generally use a broad definition of these terms, i.e. a definition that takes social aspects into account. I also relate my contributions to the conceptual research on systems development methods. Firstly, I relate paper D to the four paradigms of systems development by Hirschheim and Klein (1989) and confirm that the paradigms are stories and not found in their pure form in practice. Secondly, I relate the utilization framework from paper E to a framework by Iivari et al. (2001a). The two conceptual frameworks both seek to shed light on methods. The framework by Iivari et al. seeks primarily to support the development of new methods based on assumptions that have not been used before. Our utilization framework primarily seeks to provide a tool to analyze and guide action in relation to method utilization and the construction or development of methods. Thirdly, I relate the findings in paper D to the amethodological view on methods (Truex et al. 2000). I argue, by relating networks and to methodological and networking to amethodological, that both the methodological and amethodological view on methods were found in the field study and that they are complementary and not opposite. This is in line with what (Truex et al. 2000) argues.

The thesis also relates the contributions to the empirical research on methods in practice. Firstly, I go into the adoption of methods. Most of this research on adoption is based on quantitative studies and seeks to establish factors that influence the adoption and/or rejection of methods. My own research has mainly contributed with a qualitative study of the reasons why a method was adopted and to what extent. Secondly, I relate my work to the practice studies of adaptation of methods and emphasize the difference between the utilization framework in Paper E and the levels of adaptation in (Fitzgerald et al. 2002; Fitzgerald et al. 2003). Thirdly, I relate research on methods use to my findings. The former findings on method use in practice are similar to my findings in respect to the role of the method, i.e. methods are not used in their entirety, they are adapted, and not

applied in their entirety. In other words, methods are dynamic entities that are interpreted and applied in different ways with different purposes.

The thesis provides a chapter on the research approach taken in the empirical studies. The research is conducted with an interpretive approach in the studies of practice. The empirical studies are categorized into three phases. The first phase was an exploratory phase undertaken to gain insight on methods in practice and the state of web development. The in-depth phase went into more detail on key issues found in the exploratory phase. The main issues investigated are the method in practice and its support for communication and coordination in development. The third phase is the participation phase where I participated in a project that standardized a current practice and created a method fragment covering the work practice. The idea behind participating in the project was to understand the role of the method under the creation of a method fragment and the role of the method in general. A summary of the data collection techniques used in each phase are provided. The main data collection techniques are: semi-structured interviews, observation, participant observation, and document analysis.

Part II of the thesis consists of five research papers that provide contributions and conclusions in four areas. Firstly, the thesis proposes a framework for reducing risk in systems development. We propose the framework in Paper C (Jeenicke et al. 2003). The framework consists of two dimensions. The first is the social capital dimension which distinguishes between a coherent group of workers that trust one another and a group where trust is replaced by formal control. The second is the task uncertainty dimension, which distinguishes between the well-defined and the ill-defined tasks. The framework is applied to four cases to illustrate how it can be used. The purpose of the framework is to understand how risk can be reduced by improving trust and increase task certainty. We provide a set of techniques and principles found in the literature to deal with the risk on the two dimensions.

Secondly, paper D provides an analysis from a knowledge management perspective on method utilization and metaphors for the utilization. The analysis is based on two complementary knowledge management perspectives, networks and networking (Swan et al. 1999), on organizational implementation of technology. The analysis reveals that both perspectives were present in all three projects. Furthermore, the emphasis on the networks and the networking perspective changed considerably over time, although both perspectives were present in all three analyzed projects. We also found that the two perspectives complement each other. Based on the three projects we choose three metaphors that cover the main intention behind bringing the methods into use in each of the three projects. The first project worked on bringing in the method at an organizational level as a *solution* to the problems faced in the development process in the organization. The second project brought in the method to a development project as *support* for the development process. The third project perceived the method as a *repository* for storing and retrieving knowledge about the development process. The study and the analysis show that the relation between practice and a method is complex and changes over time.

Thirdly, paper E proposes a framework for method utilization. The framework broadens methods utilization by focusing on three aspects of method utilization: adoption, adaptation, and use. Traditionally the “use” has covered the three aspects in an inconsistent way. The framework also proposes three levels of utilization, the organizational, project and individual (inspired by (Fitzgerald et al. 2003)) at which the utilization can take place. Together, the three aspects and the three utilization levels create nine perspectives on method utilization that can be used to analyze and act. The idea behind creating the framework is to nuance, broaden and make the discussion on methods in practice more precise. In other words, provide a terminology to specify what we are dealing with.

Fourthly, the thesis deals with the challenges and context of web development. Paper A described several challenges in web development, such as new roles, expertise, approaches to and organization of the development, which we found in our empirical study undertaken in the year 2000. Paper B goes into more detail on the challenges of involving users in the development of applications for information publishing. Some of the challenges described in the 2001 paper were to some extent significantly remedied when we entered in the next two phases of the field study in year 2003. Furthermore, some of the challenges might only apply to that single organization. The context of web development for information publishing does seem to apply and be relevant today.

5.1. Future work

It is not possible to do everything in a thesis. This section goes into some of the things I would have liked to do or could do in the future.

Firstly, my data comes from a longitudinal study. The findings I have presented in this thesis are mostly based on some “snap shots” of a method in practice, but do not go much into the transitions between the snap shots. However, my findings do not go deeply into the dynamics and changes to a method and the practice in between these snap shots. It might be valuable to look more into how a method is changed over time, i.e. a process view. Such an analysis might reveal more about the dynamics of a method in practice and reveal other facets and important aspects of method utilization.

Secondly, I would like to try out the two frameworks in practice, especially the utilization framework (Paper E (Vogelsang and Kensing 2006)). Currently the utilization framework is a suggestion based on a practice study rather than action research (Mathiassen 2002). The framework is based on my empirical data and has been created with an interpretive approach, so the framework is an interpretation more than a tested approach. The framework has not been tried out and it has not been investigated how it actually can and will guide practice. Therefore, the claim that the framework can be used for diagnosis and guidance of method utilization in practice is an assertion. It would be interesting to do action research, where the framework could be tested out and revised. Trying out the framework might change and add new aspects or whole new dimension added to the framework. Furthermore, it would also be possible to make more specific guidelines on method utilization.

A dimension that would be interesting to add to the utilization framework is the distinction between method and methodology. A method provides guidelines for systems development, i.e. doing a specific task based on guidelines. Methodology is “about” methods and refers to the knowledge about methods and the work that is done to adopt and adapt them. This distinction would divide the use into two categories and make it more precise. Right now method and methodology are both included as part of method use, i.e. both methods use for method and methodology are considered to be use. This does make sense because some methods also have a method for adopting and adapting the method, i.e. a methodology in these terms.

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Appendix A: List of papers

Research papers:

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