

The Interaction between an Enterprise System and a Knowledge- Intensive Project Organization

A Case Study of Project Staffing

Merja Mattila



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Publisher School of Economics**Unit** Department of Information and Service Economy**Series** Aalto University publication series DOCTORAL DISSERTATIONS 59/2012**Field of research** Information Systems Science**Abstract**

Knowledge-intensive project organizations compete in an increasingly dense global web of customers and suppliers. In this global web, organizations seek new ways to deliver projects and services more efficiently. One way to increase efficiency is restructuring in order to become more customer oriented through flattening organizational structure and distributing work across the globe. This kind of decentralized organization relies heavily on distributed teams and several IT tools, such as global Enterprise Systems (ES, and their primary form Enterprise Resource Planning, ERP) and different collaboration devices.

In this dissertation I take an exploratory approach on the interaction between a knowledge-intensive project organization and an enterprise system. In the case study I follow how a large project organization transforms from a silo organization into a more integrated matrix model. This case study extends over a period of two and a half years. During the same period, the company implements new ES functionalities in order to support its strategic change relating to a new operating model. I demonstrate the interaction between the ES and the organization by using a part of the new operating model, a project staffing process, as an example of organizational processes that are supported by new enterprise system functionalities. The project staffing process exploits traditional HR data such as competence catalogues and employees' workload data to optimize resource use. By applying grounded theory I investigate research questions that emerged from the empirical data.

Despite the growing literature regarding the interplay between the enterprise system and organization, this complex interaction is not thoroughly understood. I employ theories and models relating to neo-institutional theory, organizational change, sociomateriality, human and machine agencies, affordances, loose coupling, system usage, boundary objects and boundary spanning.

In the four research papers forming the body of this thesis I provide new perspectives on the interplay between the enterprise system and knowledge-intensive project organization in managing resources in project business. The main contribution of my study is that the knowledge-intensive project organization sets special challenges for the assimilation and use of new ES functionalities. Particularly, the complexity of the company's professional services and projects creates different managerial implications and organizational responses within the company. In addition, the new HR-related ES functionalities set some specific challenges for the system assimilation and use in the knowledge-intensive project organization.

Keywords case study, enterprise systems, human resources systems, knowledge-intensive project organization, matrix organization, neo-institutional theory, system usage

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Tekijä

Merja Mattila

Väitöskirjan nimi

Yrityksenlaajuinen tietojärjestelmän ja tietointensiivisen projektiorganisaation välinen vuorovaikutus - tapaustutkimus projektimiehitysmallista

Julkaisija Aalto-yliopiston kauppakorkeakoulu**Yksikkö** Tieto- ja palvelutalouden laitos**Sarja** Aalto University publication series DOCTORAL DISSERTATIONS 59/2012**Tutkimusala** Tietojärjestelmätiede**Tiivistelmä**

Tietointensiiviset projektiorganisaatiot kilpailevat jatkuvasti tihentävässä kansainvälisessä asiakkaiden ja toimittajien muodostamassa verkostossa. Tässä verkostossa organisaatiot etsivät uusia, entistä tehokkaampia keinoja tuotteiden ja palveluiden toimittamiseksi. Parempaan tehokkuuteen pyritään siirtymällä asiakassuuntautuneeseen organisaatorakenteeseen, jossa projektityötä jaetaan eri puolille organisaatiota. Välineinä tässä työssä organisaatiot käyttävät hajautettuja tiimejä ja erilaisia tietojärjestelmiä kuten yrityksenlaajuisia tietojärjestelmiä (enterprise system, ES, aik. toiminnanohjausjärjestelmä, ERP) sekä eri ryhmien välistä yhteistyötä tukevia tietojärjestelmiä.

Etsinnällistä, laadullista tutkimusotetta soveltaen tunnistan ja analysoin uusia tutkimusongelmia organisaation ja järjestelmän vuorovaikutuksessa. Väitöskirjatutkimukseni empiirisen aineiston olen kerännyt kahden ja puolen vuoden aikana suuresta projektiorganisaatiosta. Matriisirakenteeseen siirtymisen lisäksi yritys otti käyttöön strategisesti tärkeän projektitoimitusmallin, jonka yhtä osaa, projektimiehitystä, käytän esimerkkinä tietojärjestelmän uusien toiminnallisuuksien tukemista prosesseista. Projektimiehitysmallissa hyödynnetään tietojärjestelmän sisältämiä mm. henkilöstön osaamiseen ja työkuormitukseen liittyviä tietoja. Tutkimusmetodina käytän ankkuroitua teoriaa (grounded theory).

Vaikka kiinnostus organisaation ja ES:n vuorovaikutuksen tutkimiseen on lisääntynyt huomattavasti, tätä monimutkaista vuorovaikutusta ei vielä täysin ymmärretä. Vuorovaikutuksen ymmärtämiseksi sovellan väitöskirjassani erilaisia teorioita ja käsitteitä kuten neo-institutionaalista teoriaa, affordanssiteoriaa, organisaatiomuutoksen teorioita, sosiomateriaalisuutta sekä ihmisen ja koneen vuorovaikutusta, järjestelmän käyttöä, löyhiä sidoksia, rajakohteita ja välittäjiä tutkivia teorioita.

Työni rungon muodostavien neljän tutkimusartikkelin avulla kuvaan järjestelmän ja tietointensiivisen projektiorganisaation välistä monimutkaista vuorovaikutusta uudella tavalla. Väitöskirjani keskeinen tulos on, että tietointensiivinen projektiorganisaatio asettaa erityisiä haasteita järjestelmätoiminnallisuuksien omaksumiselle ja käytölle. Näihin johtamishaasteisiin ja niiden ratkaisemiseen vaikuttaa erityisesti yrityksen tuottamien palveluiden ja projektien monimutkaisuus. Lisäksi henkilöstöresurssien käytön tehokkuutta parantavat järjestelmätoiminnallisuudet asettavat omat haasteensa järjestelmän omaksumiselle ja käytölle tietointensiivisessä projektiorganisaatiossa.

Avainsanat henkilöstöresurssien hallinnan tietojärjestelmät, järjestelmän käyttö, matriisiorganisaatio, neo-institutionaalinen teoria, tietointensiivinen projektiorganisaatio, tapaustutkimus, yrityksenlaajuinen tietojärjestelmä

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Helsinki, May 1, 2012

Merja Mattila

PART I: Overview of the dissertation

Table of contents

1	Introduction	1
1.1	Background and motivation.....	1
1.2	Objectives and research questions	4
1.3	Structure of the dissertation	6
2	Positioning of the dissertation	7
2.1	Research framework	7
2.2	Enterprise system	8
2.3	Knowledge-intensive project organization.....	12
2.4	Guiding theories and models	18
2.4.1	Neo-institutional theory and organizational transformation	18
2.4.2	Sociomateriality and human and machine agencies	20
2.4.3	Loose coupling and system usage.....	21
2.4.4	Boundary spanning	23
3	Methodology	25
3.1	Philosophical assumptions.....	25
3.2	Research process	27
3.2.1	Context	27
3.2.2	Data collection.....	29
3.2.3	Empirical analysis	33
3.3	Reliability and validity	35
4	Review of the findings	38
4.1	Paper 1: Role of ES in organizational transformation	39
4.2	Paper 2: Implementation of ES in matrix model.....	40
4.3	Paper 3: Differences in system usage in the organization	42
4.4	Paper 4: ES as a coordinating tool.....	44
5	Discussion and conclusions	48
5.1	Professional service intensity in the case company.....	48
5.2	Theoretical contribution.....	52
5.3	Practical contribution.....	55
5.4	Limitations and suggestions for further research	57
	REFERENCES FOR PART I	59
	APPENDIX 1: Interview data	68
	APPENDIX 2: Sampling of interviews	70
	APPENDIX 3: Outline of the interviews	71
	APPENDIX 4: Example of data and construct alignment	78
	APPENDIX 5: List of abbreviations	79

List of figures

Figure 1 Theoretical positioning in studying the interaction between the ES and organization	8
Figure 2 Positioning of research papers into ES research (modified from Grabski et al. 2011)	10
Figure 3 Relationships among characteristics, managerial implications, and organizational responses (von Nordenflycht 2010)	13
Figure 4 Organizational transformation process 2009-2011	28
Figure 5 An overview of the four research papers	38
Figure 6 Dual role of enterprise system	40
Figure 7 Coupling of system usage at Neon	44
Figure 8 Theoretical contribution	53
Figure 9 Appendix 2 - Sampling of interviews	70
Figure 10 Appendix 4 - Example of empirical data analysis process	78

List of tables

Table 1 Autonomy of knowledge-intensive firms (von Nordenflycht 2010).....	15
Table 2 Outline of research process	30
Table 3 Professional service intensity and organizational responses in Neon	50
Table 4 Appendix 1 - Interview data, Phase 1	68
Table 5 Appendix 1 - Interview data, Phase 2.....	68
Table 6 Appendix 1 - Interview data, Phase 3	69

PART II: List of original research papers

Paper I: Mattila, M., Nandhakumar, J., Hallikainen, P., and Rossi, M. (2010) “Reorganizing Projects through Enterprise System, Emerging Role of Enterprise System During Radical Organizational Change”, *Proceedings of the 43rd Annual Hawaii International Conference on System Sciences (HICSS-43)*, Hawaii, U.S.A. ISBN 978-0-7695-3869-3/10

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*Best research paper award, HICSS-43

Paper II: Mattila, M., Hallikainen, P., and Rossi, M. (2010) “Challenges in Implementing Enterprise System Functionalities in a Matrix Organization”, *Proceedings of the International Conference on Research Challenges In Information Science (RCIS 2010)*, Nice, France. ISBN 978-1-4244-4840-1/10

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Paper III: Mattila, M. (2011) “Why does the system usage differ between organizational units?

– A case study in a knowledge-intensive project organization”, *UK Academy for Information Systems Conference Proceedings 2011*. Oxford, U.K. Paper 30. AIS Electronic Library.

*Best student paper award, UKAIS 2011

Paper IV: Mattila, M., Nandhakumar, J., Rossi, M. and Hallikainen, P. (2012) “Enterprise System as a Coordinating Tool in Large Scale Distributed Development”, *to be published in the Proceedings of the 20th European Conference on Information Systems (ECIS 2012)*, Barcelona, Spain. Paper 354. AIS Electronic Library.

PART I: Overview of the dissertation

1 Introduction

1.1 Background and motivation

Knowledge-intensive project organizations compete in an increasingly dense global web of customers and suppliers. In this global web, organizations seek new ways to deliver projects and services more efficiently. One way to increase efficiency is restructuring in order to become more customer oriented through flattening organizational structure and distributing work across the globe. These post-bureaucratic organizational forms face problems in coordination and effective utilization across different groups and spatial and temporal boundaries. Particularly project delivery companies have handled these problems through forceful outsourcing and the replacement of middle management by advanced reporting and work management systems. These kinds of decentralized organization rely heavily on dispersed teams and several global IT tools that allow coordination across different groups and boundaries. This allows for a flexible organization, but if executed poorly, might hinder the knowledge transfer across locations, thereby causing inefficiency and poor quality of work. Further, a lack of formal organizational boundaries does not necessarily mean that the collaboration between organizational units is effective. Moreover, distinctive characteristics of knowledge-intensive project organizations such as knowledge-intensity or professionalized workforce may set challenges for the IT assimilation and use. In conclusion, these flat and more interconnected organizational forms raise novel questions about the mechanisms for achieving effective coordination of company resources and collaboration between scattered set of employees.

To respond to the challenges of work coordination and project staffing, many project delivery companies are developing their global Enterprise Systems (ES). In this dissertation ES is seen to include the former enterprise resource planning (ERP) system functions and all the other applications providing an integrated information system for most functions of a company. According to Davenport (1998) an ES seamlessly integrates all

the information flowing through the company (e.g. finance and accounting, human resources, supply chain management, and customer relationship management) into a centralized database. Enterprise systems also allow the allocation and coordination of resources across time zones and geographical locations, while keeping the data available and centralized. By integrating and standardizing the core business processes and information resources (Davenport 1998) they seek to achieve various kinds of benefits, such as better customer service, improved resource coordination, and performance control (Shang and Seddon 2002). If the implementation of the ES is successful it may lead to large efficiency gains, but the reported failure rates are high.

In the exploratory case study I follow, for two and a half years, how a large, European, high-tech company operating in project business transforms from a silo organization into a more integrated matrix model by implementing new internal mechanisms, such as a new global project delivery model (GPDM) operating model and ES functionalities. My aim is to provide new perspectives on the interplay between enterprise system and knowledge-intensive project organization in managing project resources. I achieve this by analyzing the ES during the case company's strategic change relating to the new operating of a project staffing model. I use the project staffing process as an example of an organizational process that is supported by new enterprise system functionalities. In this dissertation I consider project staffing process to be a part of HR processes as it exploits traditional HR data such as competence catalogues and employees' workload data. In understanding the interaction between the organization and the ES I highlight "the last mile" of staffing decision-making when the ES is not utilized and employees utilize their own networks.

Despite the growing literature regarding the interplay between enterprise system and organization, this increasingly complicated interaction is not thoroughly understood (Boudreau and Robey 2005, Dery et al. 2006, Leonardi 2007). In particular, exploration of the complex reciprocal causality between enterprise system and organization in the long-term is required (Wagner and Newell 2011). Further, although previous literature recognizes that knowledge-intensive organizations operate in an environment that requires distinctive theories of management (Hinings and Leblebici 2003, Malhotra, Morris and Hinings 2006, von Nordenflycht 2010), there is a lack of research focusing on the relationship between enterprise system and knowledge-intensive project organization. It is not known how the features of knowledge-intensive firms (KIFs) such as knowledge intensity, low capital intensity, and professional workforce (von Nordenflycht 2010) influence ES assimilation and use. As other

organizations are turning more knowledge-intensive (e.g. von Nordenflycht 2010), understanding the impacts of the features of KIFs on ES assimilation and use seem to be increasingly relevant to other organizations. Moreover, although information technology is seen to be very important in supporting knowledge work in organizations (e.g. Niederman 1999, Hustad and Munkvold 2005), there is a lack of previous ES research focusing on the streamlining of human resources processes by using enterprise systems.

As researching the interplay between knowledge-intensive project organization (KIPO) and the ES in managing project resources requires a breadth of knowledge spanning several fields, I draw upon and continue the research on interaction by employing theories and models relating to neo-institutional theory (Scott 2003), organizational change (Greenwood and Hinings 1996), sociomateriality (Barley 1986, Boudreau and Robey 2005, Orlikowski and Scott 2008), human and machine agencies (Rose and Jones 2005), affordances (Zammuto et al. 2007), loose coupling (March and Olsen 1976, Orton and Weick 1990), system usage (Burton-Jones and Straub 2006), and boundary objects (Kellogg et al. 2006).

The main theoretical contribution of this dissertation is increasing the understanding of the nature, resources and barriers of interaction between the ES and the KIPO. I participate in the discussion on the interplay between enterprise system and organization (Boudreau and Robey 2005, Dery et al. 2006, Leonardi 2007) in the long-term by opening the “black box” of ES and by combining material characteristics of the ES with distinctive features of KIPO. Further, I enhance the discussion to the impact of distinctive features of KIPO on ES assimilation and use in managing HR-related project resources. In order to illustrate the interaction between the ES and the organization I use the project staffing process as an example of an organizational process that is supported by new enterprise system functionalities. In this case, a project staffing process is seen to be a part of HR processes as it exploits traditional HR data such as competence catalogues and employees’ work load data. In order to analyze the variations in the case company’s different professional services and organizational responses, I employ the concept of professional service intensity (von Nordenflycht 2010).

Each research paper contributes to this main theme by providing new perspectives on the interaction. In the first research paper I contribute by showing how the ES acts as an instrument to enable and inhibit organizational transformation in a KIPO. I present how the ES is used for restructuring, allocating and controlling resources, and decision-making. However, it is too straightforward to consider that the ES merely “enables” or “inhibits” change, and understanding of a complex interaction between

the organization with unpredictable and unshaped outcomes is essential (e.g. Orlikowski 2000). Therefore, in the second research paper I contribute a deeper understanding of this interaction by describing a wide variety of internal and external factors and dynamics that have an influence on the implementation of new ES functionalities and the constitution of everyday work practices in a matrix organization. According to the research findings the case company operates in a hybrid structure, in which the implementation of new ES functionalities is highly dependent on the material characteristics of the ES and organizational features. Therefore, in the third research paper I focus on these organizational features and the reasons why they cause differences in system use in the KIPO. I contribute by illustrating why the system use differs in the KIPO due to work assignment, organizational unit, individual characteristics, and target customer. I also show the challenges in using the system for integrating competencies, skills and availabilities and recommend selective system usage in the organization. In the fourth paper I further develop these findings. I contribute by suggesting that the ES can only partially support information sharing between organizational groups. By opening a “black box” of the enterprise system I illustrate how different mediators included in the ES, the system usage itself and other organizational instruments influence the sharing of staffing knowledge. In conclusion, my research is a journey during which various research questions regarding the interaction between the ES and the KIPO emerged from the data and formed the research innumerable ways.

1.2 Objectives and research questions

This dissertation aims at increasing our understanding of the nature, resources, and barriers of the interaction between a knowledge-intensive project organization and an enterprise system during an organizational change. By examining and observing the complex interaction between organization and enterprise system, this research explains this phenomenon. In this doctoral thesis I elaborate my approach on describing how organization and enterprise system are shaped and how they are mangled together in the case company.

The main fieldwork phase of this dissertation lasted two and a half years; from December 2008 to February 2011. The research is composed of three research stages looking at the interaction between organization and enterprise system during an organizational change. These three stages are the basis for four scientific research papers of which three are jointly

authored and one is sole authored. The initial aim of this research was to gain insights into the primary objectives of the ES, the user's experiences and usage usefulness perceptions, and their attitudes towards the ES features in the post-implementation phase (Markus et al. 2000, Seddon et al. 2003). This phase often includes making continuous improvements and maximizing the benefits of the installed enterprise system (e.g. Davenport and Brooks 2004, Hunton et al. 2003, Poston and Grabski 2001). However, the simultaneous implementation of a new steering model and a matrix organization structure supported by new ES functionalities caused the interviewees difficulties to separate the use of ES from the impacts of ongoing transformation. Due to this, I revised the research plan by focusing on the emerging role of the ES in the case company's transformation. By employing grounded theory all four research questions in the research papers focusing on managerial issues emerged from empirical data. Each of the four research papers have their own theoretical templates.

The first research paper analyzes the role of enterprise system in shaping a company's transformation process. By drawing on the framework of neo-institutional theory and the model for understanding organizational change it seeks to understand how the ES facilitates the discarding of the old ways of doing things and the simultaneous forming of new institutional arrangements. The second research paper focuses on factors and dynamics that have an impact on the implementation of the ES functionality in the new matrix organization. By employing the sociomateriality approach, the concept of agency, and the lens of affordances, it highlights how the outcome – the global project delivery model – is highly dependent on the interaction between organization and enterprise system. The third research paper seeks to understand why the system usage differs between organizational units. By employing neo-institutional theory and combining the concept of coupling with the elements of system usage, it analyzes how the use of new ES functionalities is influenced by features of the organizational unit, features of work assignment, individual characteristics, as well as target customer. The fourth paper studies whether the ES is able to act as a coordinating tool in the new staffing process. By utilizing theories of boundary objects and boundary spanning it shows that the ES can only partially support knowledge sharing between organizational groups. The four research questions are as follows:

1. *What kinds of roles do the ES adopt during the organizational transformation process? (Paper 1)*
2. *What kinds of factors have an influence on the implementation of the new ES functionalities in the matrix organization? (Paper 2)*

3. *Why does the system usage differ between organizational units?*
(Paper 3)
4. *What is the role of ES in coordinating knowledge-intensive work?*
(Paper 4)

These research questions are thoroughly discussed in following sections.

1.3 Structure of the dissertation

The dissertation consists of two parts. In the first part I present the key points of the whole dissertation. This introductory part can be seen as a research report, which reflects the interpretations and ideas presented in the four research papers, and connects these pieces of work into one coherent whole. Chapter one introduces the field of this research and my motivation to study the interaction between organization and enterprise system. In addition, the objectives of the study, together with the research questions are presented. In the second chapter I position each research paper into the framework of interaction between the ES and organization. I also provide a brief introduction to the ES research literature and position the dissertation into the current ES research domain. Moreover, I define the concept of knowledge-intensive project organization. Finally, I introduce the guiding theories and models utilized in each research paper. In Chapter three I discuss the philosophical assumptions and the research context. Furthermore, I describe the nature of data and its collection process. I also introduce the phases of the empirical analysis process. Finally, I discuss my own role as a researcher as well as the reliability and validity of this research. The review of the findings can be found in chapter four. In essence, this chapter includes essay summaries by emphasizing the contributions of each research paper. Chapter five discusses and concludes the dissertation. In this chapter I discuss the professional service intensity in the case company and propose both the theoretical and practical contribution of the dissertation. I also note some limitations of this study and propose suggestions for further research.

The second part of this dissertation consists of the original research papers.

2 Positioning of the dissertation

In this chapter I examine the literature relevant to my research. First, as all my research papers study one way or another the interaction between a knowledge-intensive project organization and enterprise system, I position each research paper into this framework of interaction. Second, I provide a brief introduction to the ES research literature and the notion of a knowledge-intensive project organization. Finally, I present the guiding theories and models utilized in each research paper. I also elaborate on a set of competing theories or models that were of importance during my learning process.

2.1 Research framework

Constructing a literature review in IS discipline is challenging because it requires drawing on theories from a variety of fields (Webster and Watson 2002). As this dissertation is inspired by several major research areas, my aim is to produce a coherent literature review by presenting guiding theories or models relating to each research phenomenon only. The most significant literature of each research paper is presented in a figure below.

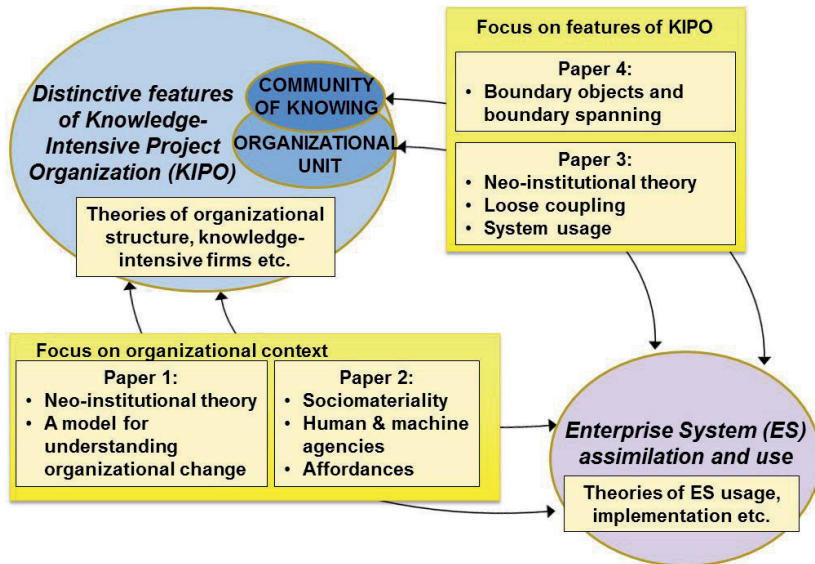


Figure 1 Theoretical positioning in studying the interaction between the ES and organization

This dissertation picks up four issues of interest that seem particularly relevant for this area of study. Paper 1 takes an organizational look at the role of the ES during a case company's organizational transformation process. Paper 2 also focuses on the organizational context by examining a specific type of interaction – the interaction between the ES and the matrix organization during an organizational transformation process. Paper 3, in turn, focuses on the distinctive features of a KIPO by defining why ES usage differs in different parts of the organization. Finally, Paper 4 examines the role of the enterprise system in coordinating knowledge-intensive work in the organization. These papers use a number of different theoretical lenses through which I have sought to illuminate issues of interest.

2.2 Enterprise system

A company's infrastructure consists of a variety of artefacts, such as matrix organization structure, facilities, communication channels, hardware, software tools or training, and support systems (e.g. Land 1992). The enterprise system can be seen as a part of company's infrastructure. The concept of enterprise system has been defined in many ways in prior research (e.g. Davenport 1998, Dery et al. 2006, Lee and Lee 2000, Shanks et al. 2003, Shields 2001). In this dissertation ES is seen to include the enterprise resource planning (ERP) system functions and all the other applications providing an integrated information system for most functions

of a company. According to Davenport (1998) an ES seamlessly integrates all the information flowing through the company (e.g. financial, accounting, HR, SCM, and customer information) into a centralized database. Thus, an enterprise system provides a technology platform that enables a company to integrate and coordinate business processes and to share information across the company (Lee and Lee 2000). Enterprise systems also allow the allocating and coordination of resources across time zones and geographical locations, while keeping the data available and centralized. Thus an ES aims to organize information processing in an organization around standardized processes or best practices and offers uniform tools to access the data (Davenport 1998, Benders et al. 2006). And because ES creates a standard data structure, it is valuable in eliminating the problem of information fragmentation caused by multiple information systems in a company. Enterprise systems integrate and standardize the core business processes and information resources (Davenport 1998), and are claimed to create various kinds of benefits, such as lower costs, better customer service, improved resource management, and performance control (Shang and Seddon 2002). If the implementation of an ES is successful it can lead to large efficiency gains, but the reported rates of failure are high (e.g. Griffith, Zammuto and Aiman-Smith 1999).

Early ES research literature focused mainly on descriptive studies of companies implementing enterprise systems by emphasizing the ES implementation process (e.g. Al-Mudimigh et al. 2001, Grabski and Leech 2007, Scheer and Habermann 2000), with little attention on the interaction between the ES and the organization over time (e.g. Dery et al. 2006). It has concentrated on, for example, critical success or failure factors (Chung et al. 2008, Motwani et al. 2005, Nicolaou 2004), project success factors (Ferratt et al. 2006), or best practices, in order to improve ES implementation process. The factors affecting an initial ES implementation are assumed to influence the implementation of the new ES functionality during the post-implementation phase by decreasing the risk of project failure. Subsequently, implementation studies were replaced by a diverse set of new ES research questions.

According to Grabski et al. (2011) current ES research can be divided into three major ES research areas: critical success factors, the organizational impact, and the economic impact of enterprise systems. I position my research papers into these ES research areas as follows:

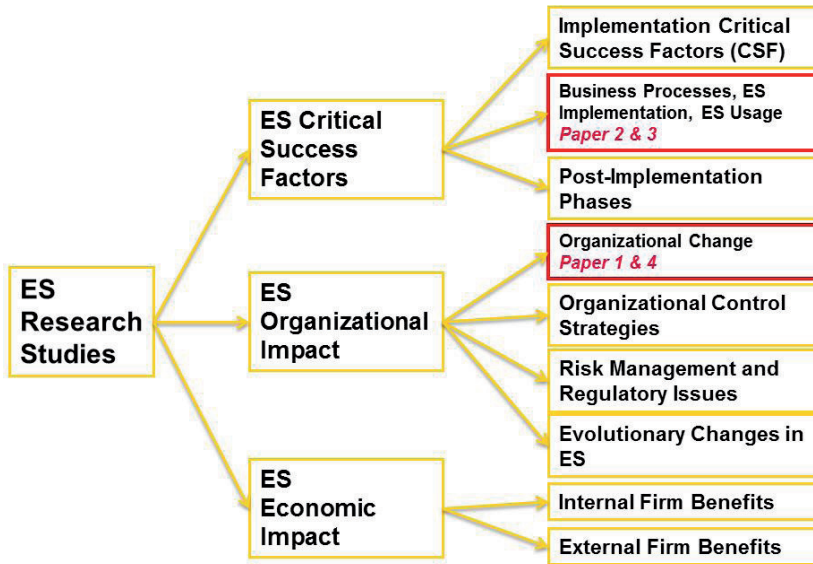


Figure 2 Positioning of research papers into ES research (modified from Grabski et al. 2011)

In this dissertation, I study the enterprise system in the post-implementation phase (Markus et al. 2000), otherwise known as the second wave of ES (Seddon et al. 2003). This phase often includes making continuous improvements and maximizing the benefits of the installed enterprise system (e.g. Davenport and Brooks 2004, Hunton et al. 2003, Poston and Grabski 2001).

As the ES implementation was traditionally seen as a process in which technical, organizational and financial resources are linked together (e.g. Fleck 1994), this research adopts a broader scope by emphasizing historical reasons, organizational structure, and the roles and relationships of different employee groups. In the dissertation the ES implementation is treated as an organizational intervention (Gash and Orlikowski 1991), designed and implemented to achieve the desired changes and objectives.

Generally, the ES includes business process reference models, which are mapped to an organization's business (Lee and Lee 2000). These reference models are seen to represent structures and best practices from outside the organization as designers' own thoughts and interests impact them (e.g. Wagner and Newell 2006). During the ES implementation external system deliverers, consultants etc. also have an influence on configuration decisions regarding an organization's structures and processes. In this way the business models inscribed in the ES and external actors contribute the institutionalization of dominant "best practices" in the organizations by leaving the organization's specific, unique, and often local characteristics

out of the examination. Enterprise systems are also seen to bind a company to a certain way of doing things (Gosain 2004).

According to Dery et al. (2006), the reasons for limited ES use are related to organizational, operational, and individual level factors. Organizational factors include alternatives to the systems, if users have no reliance upon the ES or it does not deliver the data or processes required. Operational factors include e.g. the amount of time available to study the ES. Individual level factors include personal benefits of the ES. For example, if the user is not able to see benefits of the ES use or the system is too complex, they use workarounds. Additionally, users may resist the ES use due to for example their own internal factors, or because of poor system design (Markus 1983).

The main characteristics of the enterprise systems – integration and standardization – may have different influences in companies and they do not necessarily suit all kinds of organizations. Previous research of organizational fit of ES (Hong and Kim 2002, Morton and Hu 2008) has argued that certain organizations have a higher degree of fit with ES characteristics and possibly has a positive impact on the ERP implementation success. However, an ideal organizational form for enterprise system is difficult to define. Further, an organization may have different parts with different fit with ES characteristics.

While providing shared information across all functional levels and management hierarchies, an enterprise system may enable a company to organize around what can be done with information (Zammuto et al. 2007). For example, a company may be able to implement a more integrated matrix structure in order to increase coordination and control within the organization. However, success depends on the combination of the ES features with the organizational arrangements and practices that support the ES use (Zammuto et al. 2007).

Although enterprise systems are seen to increase organizational efficiency (Newell et al. 2003), this depends on the context and whether the associated changes in business processes or efficient control can be achieved (Dechow and Mouritsen 2005, Grabski and Leech 2007). The benefits of ES are linked with, for example, the experience cycle (Markus and Tanis 2000, Shanks et al. 2003), where the majority of possible benefits are supposed to be captured on the later phases of the ES utilization (Davenport and Brooks, 2004, Poston and Grabski 2001). Holland and Light (2001) argue that the benefits may realize only after some advanced modules, such as customer resource management, are implemented. Organizational change either before or during the implementation is seen as beneficial for the implementation.

The case study included in this dissertation illustrates how the case company's accounting system formed the core for its early enterprise system. Also previous ES literature identifies the same issue (Deshmukh 2006). Although information technology is seen to be very important in supporting knowledge work in organizations (e.g. Niederman 1999, Hustad and Munkvold 2005), there is a lack of previous ES research focusing on the rationalization of human resources (HR) processes using enterprise systems. Hustad and Munkvold (2005) studied the potential benefits and challenges related to implementation of IT-supported strategic competence management, but otherwise there are practically no studies regarding HRM modules in the ES. This scarcity of previous studies is surprising as major ES vendors such as SAP and Oracle have provided human resource management modules (HRM) for years.

2.3 Knowledge-intensive project organization

During the last decades, researches have been interested in the selection of the best possible organization structure. The idea of the optimal organizational structure has varied from the bureaucratic form to a more adaptive, receptive and generative form of organizing (Greenwood et al. 2009). Bureaucratic organization structures have seen to be suitable for proceeding with routine work assignments, while a more flexible, less hierarchical, and less formalized organization structure has seen to be suitable for less routine work (Comstock and Scott 1977). Generally, such an ideal organization structure has strong employee involvement and relies on self-organizing autonomous teams (e.g. Greenwood et al. 2009). In a flat organization structure, authority relations are based upon individual capability and expertise rather than position (ibid.).

Present literature relating to organizations argues that professional service firms (PSFs) qualify for an optimal organizational structure (e.g. Greenwood et al. 2009). These optimal organizations include, for example, management consulting firms or computer software development and technology integration companies. These knowledge-intensive organizations rely on intellectual capital and expertise (Starbuck 1992, Alvesson 1993) as well as horizontal collaboration between diverse groups. They consist of multiple communities of knowing with specialized expertise, while knowledge work generates "new understandings of nature, organizations or markets and applies them in valued technologies, products, or processes" (Boland and Tenkasi 1995). As PSFs are seen to be different from other types of organizations, it has been suggested that they

require distinctive theories of management (Hinings and Leblebici 2003, Malhotra, Morris and Hinings 2006, von Nordenflycht 2010). Further, as other organizations are turning more knowledge-intensive, the distinctive features of PSFs seem to be increasingly relevant to other organizations (e.g. von Nordenflycht 2010). Based on recent PSF literature von Nordenflycht (2010) identifies three distinctive characteristics of knowledge-intensive firms (KIFs): knowledge intensity, low capital intensity, and a professional workforce (Figure 2.3 Relationships between characteristics, managerial implications, and organizational responses, von Nordenflycht 2010).

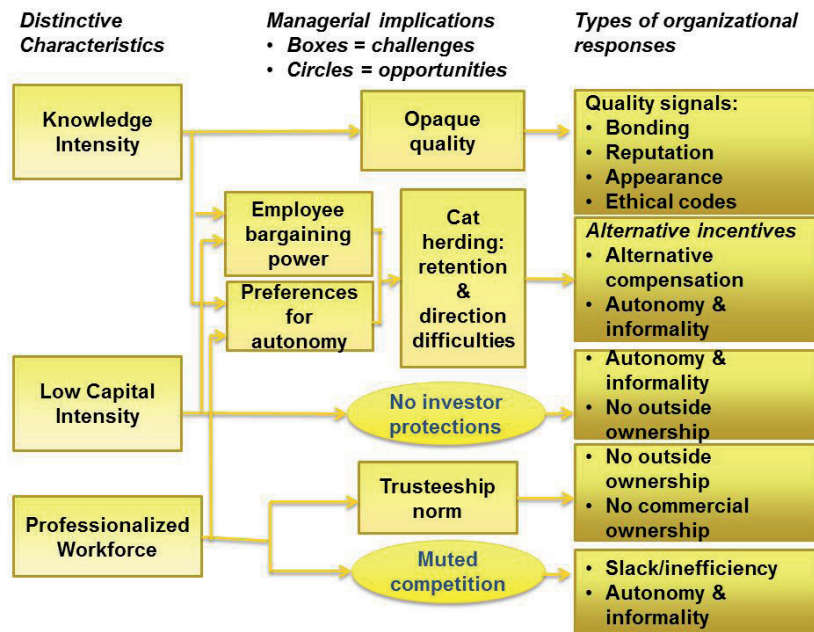


Figure 3 Relationships among characteristics, managerial implications, and organizational responses (von Nordenflycht 2010)

In this dissertation knowledge is seen as a stock of expertise rather than a flow of information; emphasizing that a knowledge-intensive company should have exceptional and valuable expertise (Starbuck 1992). Respectively, knowledge intensity means that “production of a firm’s output relies on a substantial body of complex knowledge” (von Nordenflycht 2010). This definition excludes knowledge embedded in equipment, products or organizational routines, focusing on knowledge embodied in individuals (e.g. Starbuck 1992, von Nordenflycht 2010). By using this conceptualization I seek to omit from the examination a large body of firms (such as McDonald’s) that could be considered knowledge-intensive

because of the knowledge embedded in their routines (Starbuck 1992, von Nordenflycht 2010).

Knowledge intensity results in two key managerial challenges: cat herding and opaque quality (von Nordenflycht 2010). Cat herding indicates that employees with complex and scarce skills and knowledge have a strong bargaining power as they have strong outside options. Besides these retention difficulties there are direction difficulties, because these highly skilled individuals prefer autonomy to authority and formal organizational processes (Starbuck 1992, Greenwood and Empson 2003, von Nordenflycht 2010). According to von Nordenflycht (2010) KIFs have two ways to respond to cat herding challenges: alternative compensation (e.g. bonuses or stock options) and autonomy and informality in organizational structure (e.g. fewer formal rules, participation in firm-level decisions, or looser reporting relationships).

Opaque quality refers to situations where the quality of employee's work is difficult or sometimes even impossible for non-experts (such as customers) to evaluate even after the work assignment has been done (von Nordenflycht 2010). von Nordenflycht (2010) introduces four mechanisms to signal quality: bonding, reputation, appearance, and ethical codes. Bonding mechanisms mean organizational features that create penalties for producing low quality. Reputation includes developing and maintaining a firm's or its employees' reputation (e.g. Greenwood et al. 2005), while appearance refers to the firm's employees' social and personal characteristics, which customers are able to evaluate (Alvesson 2001). The fourth mechanism to signal quality is the establishment of ethical codes, which are seen to be one of core features of professionalism. von Nordenflycht (2010) notes that a firm facing opaque quality may need to remain comparatively undiversified as specialization has been claimed to be a signal of competence (Starbuck 1992, Greenwood et al. 2005).

The second distinctive characteristic of KIF is low capital intensity that means the lack of non-human assets or even intangible non-human assets such as patents and copyrights. According to von Nordenflycht (2010) low capital intensity increases employees' bargaining power as employees' skills become relatively more important, employee can easily start up a rival firm, and firm-specific human capital is unlikely to be generated. However, low capital intensity also creates opportunities as there is reduced need to raise funding and organize in ways to protect outside investors, and a firm may be able to adopt organizational features that respond to cat herding challenges.

The third distinctive characteristic of KIF - professionalized workforce - can be characterized by using three key features of a profession (von

Nordenflycht 2010). These features are a particular knowledge base, regulation and control, and ideology (Torres 1991). In essence, a particular knowledge base means that there are highly skilled employees with complex knowledge. Self-regulation refers to strong control over the practice of occupation by employing, for example, certificates or regulation, which mute competition. A professional ideology refers to a set of professional norms such as a preference for autonomy, or trusteeship norm. Trusteeship norm means that professionals protect the interests of customers, and/or society in general. According to von Nordenflycht (2010) variation in the professionalized workforce depends on regulatory mechanisms and professional codes. Greater professionalization of the workforce has three influences: higher intensity to employ alternative incentive mechanisms, a possible decreasing level of outside ownership, and an increasing level of organizational slack.

By using these distinctive characteristics of KIFs von Nordenflycht (2010) builds a taxonomy of four types of knowledge-intensive organizations whose varying degrees of professional service intensity generate different managerial challenges and opportunities as well as different organizational outcomes (Figure 2.3 A taxonomy of knowledge-intensive firms).

	Classic PSFs	Prof Camp	Neo-PSFs	Tech Dev
Characteristics				
Knowledge Intensity	x	x	x	x
Low Capital Intensity	x		x	
Professionalized Workforce	x	x		
Challenges and Opportunities				
Cat Herding	√√√	√√	√√	√
Opaque Quality	√	√	√	√
No Investor Protections	√		√	
Trusteeship Norm	√	√		
Muted Competition	√	√		
Organizational Responses				
Alternative Compensation	√√√	√√	√√	√
Autonomy & Informality	√√√√√√	√√√	√√√	√
No Outside Ownership	√√	√	√	
Slack	√	√		

Table 1 Autonomy of knowledge-intensive firms (von Nordenflycht 2010)

According to the taxonomy, knowledge-intensive organizations are classified as Classic PSFs, Professional Campuses, Neo-PSFs, and Technology Developers. Classic PSFs, such as law and accounting firms, have the highest degree of professional service intensity qualifying in all

three characteristics of knowledge-intensive firms, while Professional Campuses, such as hospitals are more capital intensive. According to von Nordenflycht (2010) the label Neo-PSFs captures the PSF literature's shift of emphasis from professionalism to knowledge intensity more extensively. This category includes, for example, management consultancies and advertising agencies and they differ from previous categories by having a non-professionalized (or weakly professionalized) workforce. Technology Developers, such as biotechnology firms or R&D laboratories, represent the lowest degree of professional service intensity by sharing knowledge intensity, but neither of the other characteristics. As the workforce of these firms is composed of engineers and scientists they share with others the challenges of cat herding and opaque quality.

At present customers search high-value products and services instead of standardized products. This causes a strategic shift from coordinating processes and resources toward managing intangible knowledge capabilities (Starbuck 1992, Yoo et al. 2006). In order to define the most appropriate organizational structure for companies engaged in project business and having the challenge of managing intangible knowledge capabilities, the project-based organization (PBO) has been presented (e.g. Davies and Hobday 2005). The project-based organization is seen to fit ideally to managing increasing product complexity, especially when a company competes in fast-changing markets in which there is need for cross-functional business expertise and customer-focused innovation (Davies and Hobday 2005). This is particularly valid for high-value, complex capital goods.

A project is usually defined as an activity that has a defined set of resources, goals and time limit. A PBO commonly refers to a large body of organizational forms that have temporary systems in order to handle these project tasks. Although the PBO is commonly linked with traditional industries (e.g. shipbuilding, construction, and major capital projects), it is widespread in industries that have been regenerated through new technologies (e.g. aerospace and telecommunications), in newly emerging industries (e.g. information and communication technologies), and many other areas of business-to-business, high-technology, high-value capital goods. In contrast to the functional, matrix or other forms, the project-based organization is one in which the project is the primary unit for production organization, innovation, and competition (Davies and Hobday 2005). According to Davies and Hobday (2005) the PBO is not seen to suit the mass production of consumer goods, while some large multi-product companies such as Nokia and Ericsson represent both PBO and functional divisions (or strategic business units) to handle different technologies or

markets or different types of products. This complexity of the company's projects has been seen to influence organization and management structures as well as capabilities (Davies and Hobday 2005, Gann and Salter 2000, Yoo et al. 2006).

Within a pure PBO some major projects represent most of the business functions normally carried out by different departments (Davies and Hobday 2005). This kind of pure PBO can be seen as an alternative to the matrix structure as core business processes are organized within projects rather than functional organizational units. As a matter of fact, a project can be seen to create a temporary organization form in the project based organization because a project is responsible for communication, coordination of resources, project decision-making, financial results of the project, customer or subcontractor relationships, or the knowledge and skills of project members. The PBO can also be seen as inherently flexible and reconfigurable (Davies and Hobday 2005).

Human resource management (HRM) can be seen as one of the core processes in the PBO as it influences the way the organization allocates human resources, and how employees experience working for the company (e.g. Huemann et al, 2007). In particular, the temporary nature of work processes and the dynamic nature of the work environment create challenges for HRM in a project-based organization (Huemann et al. 2007).

The importance of the interaction between organizational structure and technological choices has been presented early on the organizational literature (e.g. March and Simon 1958). It is also worth noting that although an organization commonly aims to achieve stability, a certain degree of instability is required to be able to respond to changes in the business environment. This dissertation notes that a company's organizational structure and technological choices should both support environmental changes and produce a certain amount of stability in order to support control and allocation of the organization's resources. Furthermore, it is not known how the distinctive features of KIFs such as knowledge intensity, low capital intensity, and a professional workforce (von Nordenflycht 2010) influence ES assimilation and use. Besides, although information technology is seen to be very important in supporting knowledge work in organizations (e.g. Niederman 1999, Hustad and Munkvold 2005), there is a lack of previous ES research focusing on the automation of human resources processes by using the ES in a knowledge-intensive project organization.

In conclusion, although it can be argued that all organizations are becoming more knowledge-intensive in different industry or governmental sectors, knowledge work can be easily connected with project companies

that take advantage of state-of-the-art technologies. However, the implementation of a lateral organizational structure, such as a matrix model, supported by new technological tools does not necessarily mean that organizational boundaries do not exist or that collaboration between organizational units is effective.

2.4 Guiding theories and models

2.4.1 Neo-institutional theory and organizational transformation

As the initial aim of my dissertation research was to examine how the everyday practices and usage of an enterprise system became stabilized, I found concepts of neo-institutional theory beneficial. According to neo-institutional theory (Powell and DiMaggio 1991) institutions are defined as “social structures that have attained a high degree of resilience” (Scott 2001). They also are “multifaceted, durable, social structures, made up of symbolic elements, social activities, and material resources” (Scott 2001). These institutional elements move from place to place and time to time with the help of four types of carriers; symbolic systems, relational systems, routines, and artifacts (Scott 2003). As presented previously in IS literature (Barley 1986, Orlikowski 1992, Gosain 2004, Berente 2009) this dissertation considers technology, i.e. the enterprise system, as a fourth carrier of institutional logics. An enterprise system in use can be seen to be encoded in the scripts (Barley and Tolbert 1997). These scripts become in use during the socialization process. Gradually, the usage of ES becomes taken-for-granted, and finally users may not even realize that their behavior is in fact partially shaped by ES.

Organizational transformation implicates a major change in the way an organization does business. Strategic change in an organization involves changing “current modes of cognition” and results in “alteration of existing value and meaning systems” (Gioia and Chittipeddi 1991). Previous literature has a wide variety of approaches to explain organizational transformation, including stage models, evolutionary processes, institutional analysis, multilevel system models, and complexity theory (Poole and Van de Ven 2004). Theory development in this domain is based on three major aspects: people, space, and time (Poole 2004). The first aspect “people” refers to the role of human agency in organizational transformation. As organizational transformation involves multiple agents and units, the role of agency in large scale transformation is often confused. According to Poole (2004), every theory and model makes assumptions

about the nature of human action and how it connects to transformation. The second aspect “space” refers to the levels of analysis in organizational transformation. And finally the third aspect, “time”, refers to critical understanding of how transformation is manifested over time and how time and timing affects it. In this dissertation these three aspects: human agency, levels of analysis, and time, are continuously discussed throughout the research.

The relationship between organizational transformation and information technology has been widely recognized (Gurbaxani and Whang 1991, Leavitt and Whisler 1958, Markus and Robey 1988, Robey and Boudreau 1999, Wagner and Newell 2006). In order to understand how the enterprise system has an influence during organizational transformation, the first research paper adopts the model for understanding organizational change (Greenwood and Hinings 1996). According to this model, organizational transformation is defined by applying concepts of radical and convergent change, and revolutionary and evolutionary change. Radical organizational change involves moving away from an existing orientation and the transformation of the organization. In contrast, convergent change fine-tunes the existing orientation. Revolutionary and evolutionary changes are defined by the scale and pace of upheaval and adjustment. Whereas evolutionary change occurs slowly and gradually, revolutionary change happens swiftly and affects virtually all parts of the organization simultaneously. Greenwood and Hinings’ (1996) model combines market and institutional context with intra-organizational components such as interest dissatisfaction, value commitments, power dependencies (roles) and capacity for action. The framework is thoroughly described in a research paper (see Paper 1, Part II).

While socially constructed by the actions of e.g. designers or users, once developed an enterprise system tends “to become reified and institutionalized, losing its connection with the human agents that constructed it or gave it meaning to be part of the objective, structural properties of the organization (Orlikowski 1992)”. However, as the development and the use of ES represent logics of certain organizational units (e.g. Orlikowski 1992), the rationalities of other organizational units may be in conflict with the ES usage (see Paper 3, Part II). Enterprise systems also represent institutional commitments by constraining the action of users (e.g. Gosain 2004). As illustrated above, enterprise systems are subject to various institutional forces during a non-linear institutionalization process that set the rules of rationality (Currie 2009).

Other theoretical frameworks were also evaluated at the outset of this research. One of these theories was structuration theory, which argues that

technology is not a stable, predictable and static artifact and does not represent certain stable structures (e.g. Jones and Karsten 2008). Structuration theory (Giddens 1984) avoids technological determinism and considers structure as a combination of resources and action. According to this view, the actions of human beings determine how technology is used. Despite these promising elements, structuration theory was rejected due to the fact that technology was usually omitted in structural analysis and as an IT researcher I could not accept this. During the learning process I also considered the use of actor-network theory. However, the theory emphasizes the symmetry between human and non-actors by arguing that material world is a simple reflection of human will. As I could not accept these philosophical assumptions, I rejected this theory too.

2.4.2 Sociomateriality and human and machine agencies

During the second phase of my dissertation research I realized that an enterprise system should not be regarded simply as a part of the institutional infrastructure that can be taken for granted, but rather a socio-technical system that evolves constantly. While enterprise systems influence the actions of its user, the ES itself is an outcome of user's actions (e.g. Gosain 2004). Being in direct contrast to technological determinism I find the social constructivist approach (Orlikowski 2000, Orlikowski and Barley 2001, Dery et al. 2006) valuable for my dissertation. I consider that different persons or social groups in the company associate different meanings with enterprise systems (e.g. Briers and Chua, 2001). In spite of the relatively mandatory use of ES, different organizational units are able use the ES relatively freely in different ways. In addition, certain features of ES seem to set opportunities or boundaries for an organization. A similar enterprise system may also be configured, used and evaluated in rather different ways in different companies. Due to this, the ES builds capacity for action but it can also set certain limits or even prevent the establishing of a new operating model. Further, the ES does not have a pre-given, fixed meaning (Pinch and Bijker 1984) either. As the ES continuously transforms in interaction with the organization, the organization should commit itself to continuous change.

As the second research paper focuses on challenges in implementing enterprise system functionalities in matrix organization, I employ the concept of sociomateriality (Orlikowski 2007, Orlikowski and Scott 2008), human and machine agencies (Rose and Jones 2005), and the lens of affordances (see Paper 2, Part II).

The concept of sociomateriality has interested researchers in different disciplines, such as organizational studies, sociology of science and technology, and feminist studies. It seeks to understand the interplay between social (organization) and material (technology, i.e. the ES) in everyday organizational practices. In this research, the enterprise system and the human agents in the organization are seen as interdependent systems, which are shaped in the dynamic and often unpredictable interaction over time (Barley 1986, Boudreau and Robey 2005, Leonardi and Barley 2008, Orlikowski 2007, Orlikowski and Scott 2008). The ES is seen as both a technical and a social artifact with a set of enablements and constraints, which shape human action and human action is shaped by it (e.g. Orlikowski 1992). As the ES, employees, and social practices are closely coupled together the system exists if it is thoroughly used for everyday work assignments. According to Orlikowski (2007) “technology-in-practice” describes the interaction between humans and technology, while “technological artifact” refers the situation, when technology is not used at all.

In order to capture the interplay between the implementation of new ES functionality and organization, this dissertation adopts the term of “affordances” (Gibson 1977, Hutchby 2001, Nandhakumar et al. 2005, Zammuto et al. 2007, Leonardi 2011). Affordances are based on the assumption that “new combinations of technology and organizational features continually create possibilities that affect organizational form and function” (Zammuto et al. 2007). In essence, this means that the ES provides an opportunity, an affordance, for e.g. integration and standardization of information, but it depends on the use of ES how these affordances are utilized in the company. For example, the company’s business environment, history or operative practices may inhibit or support the use of affordances in practice. It is also argued (Zammuto et al. 2007) that these affordances can create the potential for new forms of organizing by supplanting hierarchy’s role in coordinating and controlling activities.

2.4.3 Loose coupling and system usage

Traditionally, companies have relied on their formal organizational structures, authority relations, routines, rules and procedures in order to gain success. However, in practice these formal organizations have usually been only loosely combined together as their structural elements and activities have been loosely coupled with each other (March and Olsen 1976, Weick 1976, Powell and DiMaggio 1991). This concept of organizations as loosely coupled systems is widely recognized (Orton and Weick 1990). In

order to understand why system usage in a loosely coupled, knowledge-intensive project organization differs between organizational units, this dissertation combines the concept of coupling (March and Olsen 1976, Weick 1976, Orton and Weick 1990) with the elements of system usage (see Paper 3, Part II).

The concept of coupling defines tightly coupled systems as highly integrated and responsive to each other, while decoupled systems are seen as separate and indifferent to whatever occurs in other parts of the system. Loose coupling includes the presence of both tight coupling and decoupling (e.g. Berente 2009). Because disturbances in one part of a system do not necessarily cause disturbances in other parts, loosely coupled organizations are currently seen to survive longer (Czarniawska 2008). This dissertation also recognizes recent literature on coupling in organizations (Fitz-Gerald and Carroll 2006, Volkoff et al. 2007, Berente 2009, Marabelli and Newell 2010).

Similar to the way that an enterprise system is a combination of different modules, a company consists of subsystems (Comstock and Scott 1977, Lawrence and Lorsch 1967, Weick 1976), which vary in their degree of coupling with each other. In this dissertation subsystems consist of organizational units, which are loosely coupled with the other parts of the company in order to achieve innovation, agility or flexibility. Enterprise system use in these subsystems, i.e. organizational units, varies and the use of enterprise system may combine differently coupled organizational units together.

Previous literature recognizes the importance of loose coupling associated with enterprise systems (Berente et al. 2008). As enterprise systems can be designed to open certain social options and close others, it seemed to be essential to understand how users choose to adopt and to use them. In order to understand these issues, this dissertation employs an approach that system usage is an activity with three elements: *a user, a system, and a task* (e.g. Burton-Jones and Straub 2006). Recognizing the complexity of system usage and that the business value of ES is rarely linked with the features of the ES itself (e.g. Davenport 1998, Peppard and Ward 2005, Zammuto et al. 2007), this dissertation leaves the system in the background, and focuses on the user, herein enhanced to cover the organizational unit, and the task, herein the work assignment. By analyzing organizational unit coupling and work assignment coupling, the dissertation also participates in the discussion of appropriateness of ES in the organizations (Berente et al. 2008, Berente 2009).

2.4.4 Boundary spanning

The implementation of more open and interconnected organization structure poses challenges for organizations. In practice, both “official” organizational boundaries and different norms, interests, and meanings of organizational members create boundaries in the organization. Coordinating work across these boundaries in laterally structured organizations requires communication within and between different organizational groups; i.e. communities of knowledge (Boland and Tenkasi 1995). At the same time, employees may belong to several different communities. Boland and Tenkasi (1995) argue that producing knowledge in these kinds of organizations requires developing perspectives inside a community, perspective making, and taking the perspectives of others into account, perspective taking. Creating knowledge within a community happens through communication and two models of communication can be identified: the conduit model and the language game model. These models are thoroughly discussed in the Paper 4 (see Paper 4, Part II).

Organizational members and groups can make their work visible and legible to each other by using cross-boundary coordination practices (Kellogg et al. 2006). According to Kellogg et al. (2006) by using these coordination practices organizational members enact a coordination structure that affords cross-boundary coordination. Organizational members may engage in cross-boundary coordination in several ways. Coordination may be aided by the processes of transferring, translating, and transforming (Carlile 2002, Kellogg et al. 2006). However, Kellogg et al. (2006) found coordination practices in a dynamic environment to be different from those mentioned above. They identified the following practices: 1) making work visible (“*display*” practices) 2) making work legible (“*representation*”), and 3) assembling products, such as client presentations, from loosely linked items produced by different communities (“*assembly*” practices).

As the enterprise system produces and transforms information about key activities of the company, the ES may turn to boundary spanning device (Jonsson et al. 2009). Key activities of the KIPO, such as staffing of customer project teams, are inherently a social process and structured during time. The social process includes knowledge creation, circulation, distribution, and reproduction (Nicolini et al. 2003). In order to study how the ES acts as a coordinating tool during global project staffing, this dissertation employs cross-boundary coordination practices as well as the concepts of boundary objects and boundary spanning.

Boundary objects facilitate developing coherence across intersecting social worlds. They are “objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star and Griesemer 1989). Boundary objects also form a resource for the symbolic structuring of organizations and facilitate changes in organizational identities (Gal et al. 2008). Boundary objects are artifacts that have interpretive flexibility and can enable coordination and knowledge sharing between diverse groups (Sapsed and Salter 2004). Faraj and Sproull (2000) stress that coordination of diverse expertise is a more important predictor of project effectiveness than traditional factors such as administrative coordination, individual expertise, or development methodologies.

Boundary spanning refers to activities that engage members of different communities to interact with each other. Individuals who can link separated groups of people and facilitate information sharing are called boundary spanners. IT artifacts may be assigned as boundary objects, but they may not, however, become boundary objects-in-use. Similarly, nominated boundary spanners may not become boundary spanners-in-practice. (Levina and Vaast 2005).

Following Jonsson et al. (2009) this dissertation asserts that enterprise systems may turn boundary spanning into an IT-intense activity, as they produce and transform information about the key activities of the company and there is no other means of acquiring or processing this information. In the case company the change of the staffing process itself is profoundly affected by the features of the ES.

3 Methodology

In this chapter I focus on the research method and on the empirical research process carried out in the dissertation. First, I discuss my research method and its underlying ontological and epistemological assumptions. Second, by introducing the philosophical orientation that this study is based upon, I present the different stages of the research process. Lastly, I discuss the learning process and my own role as a researcher

3.1 Philosophical assumptions

Qualitative research methods are seen to fit best studying a particular subject in depth in a single organization (Myers 2009). They are also considered the most suitable method for understanding the context within which human decisions and actions occur (ibid.). As I aimed to understand people's actions, reasons and motivations in a certain organizational context in an in-depth way, I found qualitative research methods most valuable for studying this organizational reality.

There is diversity of philosophical assumptions guiding research within the IS discipline (e.g. Mingers 2004, Myers and Klein 2011). Epistemology refers to the theory of knowledge and how to obtain "valid" knowledge (e.g. Hirscheim 1992). Epistemological approaches can be divided into positivist, interpretive, and critical (e.g. Myers 2009, Orlikowski and Baroudi 1991) approaches. In this dissertation I chose interpretivism as the way of interpreting research issues. During the research process I also contemplated applying the critical approach due to its ability to study reciprocal interaction between social structures and social activities (Mingers 2004). However, as my aim was to produce rich interpretation of recent events in the case company, not to criticize managerial decisions, interpretivism had a better fit with the research issues.

The philosophical assumptions regarding ontological nature refer to whether the reality to be investigated is external to the researcher or a product of the researcher's own observations (e.g. Burrell and Morgan 1979). The interpretative meaning of a research phenomenon is based on its

context, which is the socially constructed reality of the persons being researched (Myers 2009). As Orlikowski and Baroudi (1991) argue, “Social process is not captured in hypothetical deductions, covariances and degrees of freedom. Instead, understanding a social process involves getting inside the world of those generating it”. Thus, understanding of an organizational phenomenon requires that a researcher looks at it from the “inside” (Myers 2009). According to this “double hermeneutic philosophy” a researcher should already speak the same language as the people being researched. Adopting concepts in hermeneutic philosophy I found prior knowledge of research issues to be a prerequisite for understanding. As for the understanding, it was seen as a productive process including interpretations (Gadamer 1975, Myers 2009). In this dissertation I attempted to understand the research phenomena through perceptions and meanings that people assign to them in a natural context (Orlikowski and Baroudi 1991, Myers 2009).

Associated with ontological and epistemological issues, the third set of assumptions refers to human nature (Burrell and Morgan 1979). By rejecting deterministic assumption, which regards human beings and their experiences as products of the environment, I adopted a more voluntaristic perspective of human nature. According to this assumption human beings have their “free will”, being able to influence their environment to a certain extent. In this dissertation I applied this assumption of human nature especially in studying the implementation and use of the ES.

All these assumptions have a direct impact on research methodology (Burrell and Morgan 1979). As the nomothetic approach emphasizes the importance of canonical techniques and systematic protocol in hypotheses testing, the ideographic view stresses understanding of the social world by gaining first-hand knowledge of the subject under examination. I adopted a view, which is between nomothetic and ideographic assumptions. According to this view, perception is only achieved through a perspective (Burrell and Morgan 1979). Perspective making and perspective taking are seen to require sufficient knowledge about the research phenomena (Boland and Tenkasi 1995). I also employed theories and concepts established in different disciplines into my specific research questions. I used these theories and concepts in an exploratory fashion as a sensitizing device, when relationships between different variables were not expressed (Miles and Huberman 1994, Myers 2009).

Case studies are widely used in the IS discipline as a means to achieve an in-depth understanding of studied phenomena (Eisenhardt 1989, Walsham 1993, Eisenhardt and Graebner 2007). An unusual access to the company provided an excellent possibility to describe recent events in the case

company and to identify deep structures behind employees' everyday work activities. As case studies are generally seen to be most useful for theory building (Zmud et al. 1990), I also aimed to produce rich qualitative description of ES research. By using one in-depth case study I tried to create new theoretical constructs and propositions, or develop existing ones further. Although the theory-building approach (e.g. Eisenhart and Graebner 2007) took a back seat while the dissertation progressed, my ambitious objective was still to generate and build theories further rather than to test them (Currie 2009, Eisenhardt and Graebner 2007, Walsham 1993). I picked up four issues of interest that seemed particularly relevant for studying the interaction between the enterprise system and the knowledge-intensive project organization. By combining these issues of interest with an overall framework of the knowledge-intensive project organization I created a new way to investigate the interaction between the ES and the organization. Although I did not aim to generalize the research findings of a single case company to a larger population, it seemed to be possible to generalize from the research findings to theory (Klein and Myers 1999, Myers 2009).

3.2 Research process

3.2.1 Context

The case company, Neon (a pseudonym), is a large European high-tech company operating in project business. With over 16.000 employees in close to 30 countries it delivers IT, R&D, and consulting services to several customer sectors either locally or globally. Neon's corporate values emphasize effective collaboration, superior customer centricity, commitment to quality, as well as employees' personal learning and growth.

At the beginning of 2009, Neon implemented a new three-dimensional matrix organization structure in order to transform into a more horizontally integrated company (Figure 3-2-1: Organizational transformation process 2009-2011). The matrix model replaced a former business area structure in which there was very little interaction between business areas (customer-specific industries). As Neon's strategy was based on differentiation and specialization as well as high value added services, the company attempted to create competitive advantage by combining advanced technology with innovations and deep understanding of customer's businesses. In order to search growth opportunities and to respond to high price pressures, the company developed the global project delivery model. In this model the staffing organization replaced the team heads of small industry – or

customer-specific teams in handling resource management. As a result of the organizational transformation process 37% of Neon's employees worked in the global delivery centres (Annual report, 2010). Besides profitability and customer satisfaction targets, the new organization emphasized certain performance measures such as off-shoring and utilization rates. The new matrix structure was fine-tuned in May 2010.

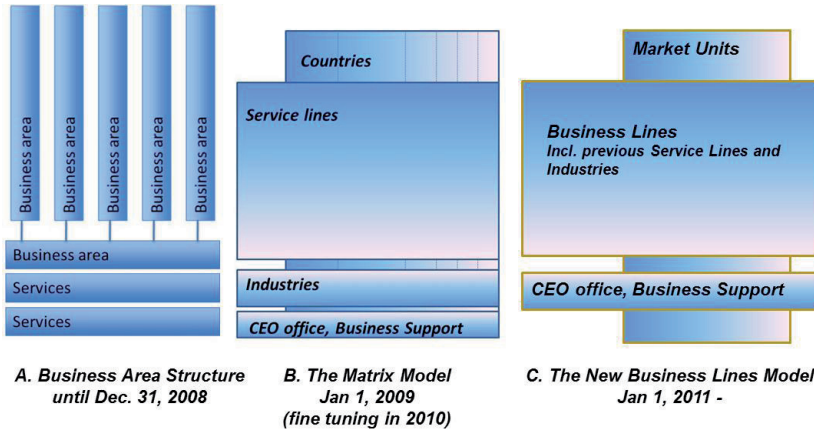


Figure 4 Organizational transformation process 2009-2011

Further, in January 2011 Neon announced a new two-dimensional Business Lines model, in which Service Lines and Industries were combined into Business Lines, and the country-dimension was replaced with market units. This new operating model aimed at a leaner structure that would result in faster decision-making, efficiency, and increased customer and market focus. This new organizational structure opened up great opportunities to transfer a good solution from one customer or industry area to another. In order to drive new sales Neon built specialized, high value added offerings in certain product, technology or process business area.

According to Neon's corporate strategy and global project delivery model, the company established a new staffing process in February 2009. In this process the staffing network of 50 staffing managers replaced the local collaboration between small customer and industry specific teams. The new staffing network aimed to ensure that the external customer needs were combined with internal employee competencies by allocating the right people to the customer projects and services. The global staffing process was supported by new enterprise system functionalities. Due to e.g. challenges of geographical distances, language requirements, and time zones, the staffing function was reorganized by delivery countries in January 2010. At the beginning of 2011, as the new Business Lines

organization model was announced, the staffing function was also expected to be reorganized. However, the new form and function were yet unclear. At the time of this research, Neon was also implementing the delivery harmonization project, which aimed to delegate the delivery responsibility as close to the actual delivery unit as possible. For example if 70% of project members were located in India, the delivery responsibility also was in India.

Neon's enterprise system was an US-based, commercial product with the basic operational functionalities for an expert organization. It was integrated with local banks, local payroll systems, a common invoice center system, and a common reporting and budgeting system. In the background of the ES project, in 2003, there was a need for corporation level process harmonization and reporting see Paper 1, Part II). Because Neon had a fragmented IT system history with different systems and versions in daily use, ES was aimed to provide a common service for the whole organization. Furthermore, the ES implementation sought to improve control over the company's international businesses.

Neon's ES had mostly been implemented during the years 2004-2009. At the time of this research, over 90% of Neon's staff, across nine countries, used ES daily. At the beginning of 2009, Neon implemented new ES functionalities in order to support its global project delivery model and staffing process. These new ES functionalities, the project resource management (RM) module and Competence Catalogue (CC), were aimed for use by both staffing of projects and staffing of continuous services. However, the ongoing organizational transformation process with simultaneous implementation of new procedures and tools set a wide variety of challenges for the organization (see Paper 2, Part II). Further, the use of new ES functionalities differed between organizational units due to features of organizational unit, features of work assignment, individual characteristics, as well as target customer (see Paper 3, Part II). In April 2011, Neon planned to implement the new RM interface, which aimed to delete some deficiencies of the current RM.

3.2.2 Data collection

The empirical data gathering took two and a half years (Table 3-2-2 Outline of the research process). The empirical material consisted of interviews, observations, and various sets of documents. The main emphasis was on the analysis of interview materials, while the other material complemented views of the studied phenomena. The additional material included a wide

variety of company documents, such as annual or financial reviews, organizational charts, Intranet and training (e.g. e-Learning) materials. I utilized these materials particularly early in the research process. During the field study phase, I had access to project documentation and other materials regarding the project. In order to obtain “a big picture” about the studied phenomena and update existing data I used these materials during the whole research process. Besides the “formal” face-to-face interviews, I discussed some specific activities or issues at hand with interviewees and other persons in the organization during lunches or at breaks.

Field research phases	Phase 1: Dec 2008 – Jun 2009		Phase 2: Mar-Aug 2010	Phase 3: Sep 2010 - Feb 2011
Research approach	In-depth case study and theory building approach (Currie 2009, Eisenhardt and Graebner 2007, Miles and Hubermann 1994, Walsham 1993), Grounded theory (Strauss and Corbin 1990)			
Focused, face-to-face interviews	Focused, face-to-face interviews of managers, enterprise system designers, and ES users with different backgrounds both in onshoring and in offshoring countries (see Appendix 1: Interview data), Snowball sampling (see Appendix 2: Sampling of interviews)			
	11 persons		20 persons	10 persons
Other material	Extensive review of company documents, Intranet and training materials, informal discussions and interviews			
Data analysis	Qualitative, interpretative analysis throughout the research process, categorizing of research themes by using grounded theory (see 3.2.3 Empirical analysis)			
Focus area	Interaction context		Distinctive features of KIPO	
Level of analysis	Organizational (company)	Organizational (company)	Organizational unit	Organizational unit / Community of knowing
Emerged research questions	What kinds of roles do the ES adopt during the organizational transformation process?	What kinds of factors have an influence on the implementation of the new ES functionalities in the matrix organization?	Why does the system usage differ between organizational units?	What is the role of ES in coordinating knowledge-intensive work?
Research papers	Paper 1	Paper 2	Paper 3	Paper 4

Table 2 Outline of research process

I selected face-to-face focused interviews as the research technique due to their ability to allow an interviewee the time and scope to talk about one's views on a particular subject. By using open-ended questions, as researcher I decided the focus of interviews. As the objective was to understand the interviewee's point of view, I could thoroughly discuss more complex issues.

The research team consisted of myself and my co-authors – Professor Matti Rossi, Professor Joe Nandhakumar, and Assistant Professor Petri Hallikainen. As the dissertation research was a gradual learning process my co-authors were more involved in the data gathering and analyzing process at the outset (Phase 1). At that time, in addition to myself either Rossi or Hallikainen participated in the interviews, and Nandhakumar had an important contribution in the data analysis and theory building. In Phase 3 Rossi also participated in some of the interviews. In this phase we continuously discussed and analyzed the research data with Nandhakumar.

We gathered interview data including 41 interviews in three phases (Appendix 1: Interview data). Phase 1 commenced in December 2008 as the case company agreed to participate in the research examining the behavior of the enterprise system users. By the end of September 2009 we had interviewed 11 managers, enterprise system designers, and ES users with different backgrounds. In order to ensure data integrity and to capture different points of view, we interviewed participants from different businesses, such as customer-specific industries and service lines or support functions. These businesses and functions were at different stages of ES post-implementation. The initial aim of this phase was to gain insights into the primary objectives of ES, business processes supported by the ES, the users' experiences and usage usefulness perceptions, and the attitude towards ES features. However, during the first interview with our contact person we found that Neon was going to implement a new steering model and a matrix organization structure supported by new enterprise system functionalities in January 2009. These simultaneous implementations were expected to cause difficulties for interviewees to separate the use of ES from the impacts of this ongoing transformation. Due to this, we reformulated our research problem by focusing on the emerging role of ES in the case company's transformation, in which ES seemed to play an important role in stabilizing the new matrix model and providing new tools for the restructuring. As a result, we reformulated focused interviews and collected the research data also on the organizational transformation process, matrix organizational structure, and the implementation of new ES functionalities. This shift in the research focus can be seen to be ideal in theory building research (Eisenhardt 1989).

The outline of the interviews in different phases is presented in Appendix 3 (Appendix 3: Outline data of the interviews in different phases).

Our first interviewee, who was responsible for the ES development, provided a comprehensive view of how the enterprise system was used in the company and how the company's processes and tools (i.e. enterprise system) were aligned. Next, we conducted an interview with a vice president who had been involved in assessing the primary objectives of the ES in 2003 and who had also been involved in formulating the latest corporate strategy. Subsequently we widened our knowledge by interviewing managers, ES designers, and ES users with different backgrounds at various levels of the organizational hierarchy. The selection of the interviewees was based on their position in the company or the recommendations of interviewees (snowball or chain sampling, Patton 2002). The selection of the interviews is illustrated in the Appendix 2 (Appendix 2: Sampling of interviews). Our contact person in Neon was interviewed three times (interview numbers 1, 12, and 32) over a period of two and a half years. In Phase 3 she revealed that a person, who was responsible for example staffing process was interested in our study. In that way we obtained another contact person (interview number 33).

In order to ensure that all the different perspectives were taken into account we actively searched interviewees from different parts of the organization. However, we did not have time and interest to interview all of the persons mentioned. For example one person was not able to participate in the interview but recommended some of his colleagues with similar positions and roles (interviewee numbers 9, and 10). As our aim was to find persons who were the best informants regarding a certain research area and who were able to tell openly about research issues, our approach for locating information-rich key informants was snowball or chain sampling (Patton 2002). By using this method key names were mentioned repeatedly, but we also obtained some other interviewees, who were out of these circles of acquaintances. For example in one interview we were told that 90 % of employees were using the new competence catalogue. In order to ensure the reliability of this information we searched interviewees who were not necessarily recommended by anyone but we felt that were useful for interview (interviewee numbers 8, 20, 37, and 39). This method proved to be beneficial in increasing the reliability of the research data. In phase 1, two researchers jointly conducted each interview.

Phase 2 of the data gathering stretched from September 2009 to May 2010. During this phase I conducted 18 additional interviews alone. In this phase, I built on the key issues identified in the first phase and focused on the use of the ES for project staffing at a more detailed level. Research

questions covered areas such as interviewee's organizational unit in the new matrix structure, organizational and technical roles, development of new functionalities and features (optional), project management, project resource allocation and controlling, performance measuring, and professional identity. To shed more light on the usage of the new ES functionalities and to ensure that all different points of view were taken into consideration, I conducted interviewees representing all main organizational units in the case company.

Phase 3 of data gathering took place between August 2010 and February 2011. In this phase we conducted four additional interviews in the Nordic countries. I also conducted six interviews in one offshoring country in Central Eastern Europe. Interviews focused on formal staffing process and system usage, informal networks in staffing decision-making, virtual project teams, different employee groups, identification, and knowledge sharing in the organization.

The interviews lasted for between 40-80 minutes, were recorded to MP3, and later transcribed for subsequent analysis. Interview data included contact summary sheets (Miles and Huberman 1994), which I composed before the interview. These summary sheets included basic data about the context, the interviewee, and the questions. In order to develop an overall summary of the main points I also wrote down some notes or brief answers into each research issue during the interview.

3.2.3 Empirical analysis

As the research progressed, I analyzed the research data "in order to draw valid meaning to realize when an interview should be conducted to fill in gaps" (Miles and Huberman 1994). The qualitative analysis and interpretation of the research data continued throughout the research in order to ensure that the results and the findings were grounded in the empirical data.

At the beginning of the research I imported interview recordings and transcripts into NVivo, a computer-aided qualitative data analysis software. I used NVivo for organizing and sharing data, while I mainly performed analysis by using for example mind maps, excel, or sticky notes for drafting concepts. However, after the first year of empirical research I abandoned NVivo as I found it to be unpractical and not well suited to this research.

During data analysis my aim was to be close to everyday practises and the system use, while keeping sufficient distance to be able to problematize them (Czarniawska 2008). I analyzed research data by using grounded

theory (Strauss and Corbin 1990). According to this method research findings formed a theoretical formulation of the reality under examination (Strauss and Gorbini 1990). I present an example of empirical data analysis process in Appendix 4 (see Appendix 4 Data and construct alignment).

In order to verify the emerging constructs, I categorized the empirical data by using a line-by-line coding method. In practice this meant that I went through interview transcripts numerous times and conceptualized the data by labelling the transcribed interviews using a line-by-line analysis (Strauss and Gorbini 1990). In essence, I derived all codes and categories inductively from the research data and documented the data analysis phase as a process. During initial (or open) coding phase I divided the data into discrete parts, studied it closely, compared it for differences and similarities, and asked questions, which were related to the research data. During the initial coding phase specific codes emerged from the data. After initial coding I began to group initial labels to categories. In categorizing the tentative codes or labels I attempted to define “in vivo” codes (Strauss 1987), which were used by interviewees themselves. Later these catchy terms helped me to return to a certain place during the interview and to make sense of a large body of interview data. I also found this method very fruitful in order to avoid standard ways of thinking about research phenomena and to concentrate on what interviewees were saying and what they can possibly mean.

After this, the emerged codes were combined into second order categories. As these patterns emerged, I started to view them in more abstract terms (Miles and Huberman 1994) in order to develop the conceptualization. I also continuously compared them with respective literature in order to find theories and models that could be used as a sensitizing device (Walsham 1993). Finally, I placed the categories in the selected theoretical framework. The aim of this process was to focus on constructs in order to create and develop IS theories and concepts further.

Particularly in the first phase of this research, we held research group meetings in which we discussed the interview data and its main interpretations, explanations, and findings. We also discussed next steps for data collection and implications for revisions. During this phase I illustrated the emerged themes and constructed an outline, which was discussed in our research group. Later this outline was used as the first draft for our joint research paper. The regular meetings were found to be productive. Three of the research papers included in this dissertation were written according to the similar process. As I wrote one research paper by myself, in that case the research group meetings were replaced by quite regular meetings with the supervisor.

The levels of analysis can also be categorized according to, for example, macro or micro phenomena, measured in terms of space, time or numbers of persons affected. In this dissertation the analyzing of research findings was carried out at different levels in each research paper. In the first and the second paper the research data was analyzed at an organizational level. The third paper adopted an organizational unit level. And finally in the fourth paper an individual was not seen to think in isolation being an autonomous origin of knowledge, and the paper adopted a community of knowing as the unit of analysis. This level was seen to be quite similar to the organizational unit level.

I do not claim that the empirical data would cover all the perceptions, experiences, or viewpoints in the company. However, I am confident that a plausible interpretation of the studied phenomena can be made through the empirical data.

3.3 Reliability and validity

Reliability in qualitative research is closely connected to the quality of the researcher, quality of the research data, the data analysis, and presentation of the research findings. Particularly at the very beginning of the research process I thought through my own role as a researcher. I considered my possible *a priori* biases (Robey and Boudreau 1999, Jasperson et al. 2002) by clarifying how and why my previous experiences of the studied phenomena impacted my perceptions, motivation, meanings, or interpretations. I had worked as an IT consultant for several years being familiar with the case company's history, business environment, products and services, customers etc. and I personally knew some of the interviewees beforehand. During the first year of research I had full access to the case company's intranet and all the documents regarding the transformation process, new functionalities etc. After that, I had a basic research access to the company. According to the non-disclosure agreement with the case company each research paper was read and commented upon by my contact persons before publication. In practice only small corrections or modifications were made to the research papers and I felt that the NDA did not limit my freedom to write; indeed it increased the mutual trust between the researcher and the company. The research was also completely free of financial charge to the case company.

During the data collection process (see 3.2.2 Data collection) I paid close attention to the quality of the research data. For example the interviewees represented different positions, genders, nationalities etc. working in

different locations in Nordic countries and Central Eastern Europe. The data analysis process is described in detail earlier in this dissertation (see 3.2.3 Empirical analysis). In empirical analysis I employed grounded theory (Strauss and Gorbun 1990) in all four research papers. I found this to be very suitable in analyzing this kind of research questions. In interpreting interview data meaningfully, my previous work experience as an ERP consultant for some years was useful as I was familiar with enterprise system technologies (language, meanings), implementation projects, and the challenges in training and supporting users. As the research progressed I also found my previous experience in working in dispersed teams useful. In my opinion my previous experience in the research field increased the reliability of this research. The interviews became more beneficial for all of the participants as interviewees were able to concentrate on the most important issues and elaborated their narratives further than it would otherwise have been likely. As a matter of fact, I felt myself as “an insider” as I understood this particular organizational context, speaking the same language as the people being interviewed (Myers 2009). In conclusion, my previous experience gave me a unique possibility to sum up research issues.

Keeping in mind the fact that the research in IS discipline should provide research that is both relevant to business professionals and meets the standards of scientific research I paid close attention to continuous presentation and discussion of the research results. In order to ensure this relevance I saw that all the research questions that emerged from the empirical data were real life business or managerial problems in IS field. I also discussed the research findings of each research paper with my contact persons in the case company to make sure that my research results were of interest to them. I found them to be interested in my research, and I was encouraged to continue. However, I did not attempt to achieve relevance at the expense of rigorous research. Therefore, I aimed to meet the standards of scientific research by continuously discussing the research findings with my supervisor and co-authors. I also presented my research findings at different academic seminars, doctoral consortiums and at peer-reviewed conference papers.

Validity in quantitative research is dependent on careful instrument construction to ensure that the instrument measures what it is supposed to measure. In qualitative research the researcher is seen as the “research instrument” (Patton 2002). As the researcher both gathers and analyzes the field data, the validity of qualitative methods is highly dependent on the researcher’s skills, experiences, competencies, as well as biases. Given this, I made my role as the “research instrument” of this dissertation as clear as possible.

However, acting as a researcher I was aware of a variety of judgmental processes during the empirical research process. In order to avoid misunderstandings, errors and biases I was aware of; e.g. the false consensus effect, in which an interviewer may assume that interviewees are more similar to each other than they really are (Ross et al., 1977). Furthermore, although focused interviews enabled interviewees to talk about research issues in detail and depth and interviewees felt free to discuss complex and sensitive issues freely, there was no real way of knowing if an interviewee was not telling the truth. However, I paid attention to this issue during the data collection process and there were certain saturation points when interviewees were telling the same issues over and over again. This made me confident that I had correctly captured the research issue.

4 Review of the findings

In this chapter, I summarize the four research papers constituting this dissertation. I provide an overview of the papers in Figure 4 (Figure 4: An overview of the four research papers), and present short summaries of each one thereafter. In the summaries I review the research goals, questions and contribution of each research paper. The complete research papers are provided in Part II of the thesis. The aim of the research papers is to provide a rich description of how the distinctive features of a knowledge-intensive project organization influence enterprise system assimilation and use in managing HR-related project resources.

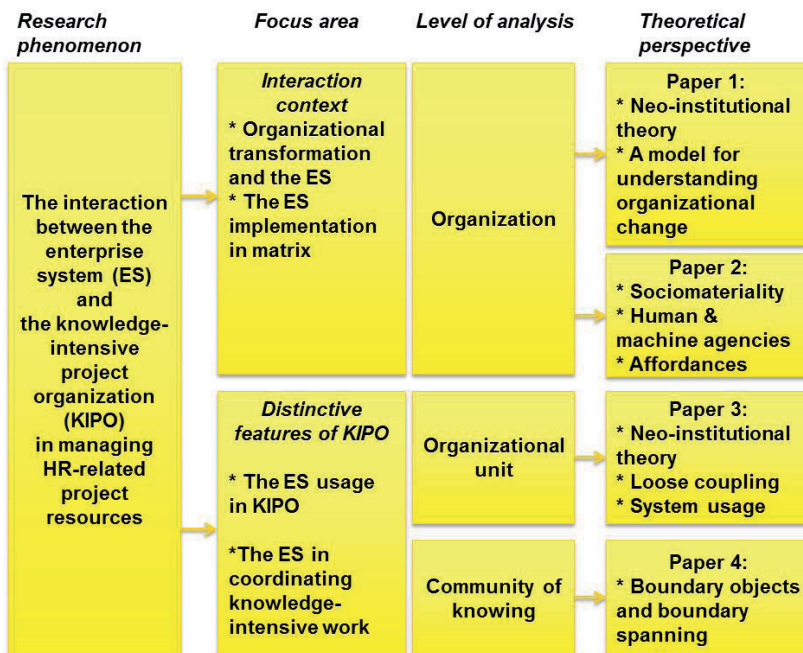


Figure 5 An overview of the four research papers

4.1 Paper 1: Role of ES in organizational transformation

Mattila, M., Nandhakumar, J., Hallikainen, P., and Rossi, M. (2010) “Reorganizing Projects through Enterprise System, Emerging Role of Enterprise System During Radical Organizational Change”, *Proceedings of the 43rd Annual Hawaii International Conference on System Sciences (HICSS-43)*.

As mentioned previously (3.2.2 Data collection) our initial aim was to gain insights into the primary objectives of the ES, the user’s experiences and usage usefulness perceptions and their attitudes towards the ES features in the post-implementation phase. As the simultaneous implementation of a new steering model and a matrix organization structure supported by new ES functionalities caused the interviewees difficulties to separate the use of ES from the impacts of ongoing transformation, we revised our research plan by focusing on the emerging role of the ES in the case company’s transformation. By adopting grounded theory and by conducting a literature review regarding organizational change we confirmed that the current organizational transformation was radical, rather than merely moderate. As a result, we refocused our research on radical organizational change and the following question emerged from the empirical data:

What kinds of roles do the ES adopt during the organizational transformation process?

In this research paper we participate in the discussion of organizational change and information technology (e.g. Gurbaxani and Whang 1991, Leavitt and Whisler 1958, Robey and Boudreau 1999) by increasing the understanding regarding the role of an ES as an instrument for de-institutionalization. We draw on neo-institutional theory (Scott 2003) and the model for understanding organizational change (Greenwood and Hinings 1996) and combine them with the enterprise system.

Our findings offer valuable insights into the role of the ES in a company’s re-organization. We contribute theoretically by showing how an ES in use serves as an agent and platform for de-institutionalization and later as a powerful force in forming the new institutional arrangement. Our analysis indicates that the ES played a dual role of both de-institutionalization by providing tools for re-structuring, controlling and decision-making as well as performance measuring and gradually becoming an agent in the re-institutionalization process (Figure 4-1-1 Dual role of enterprise system).

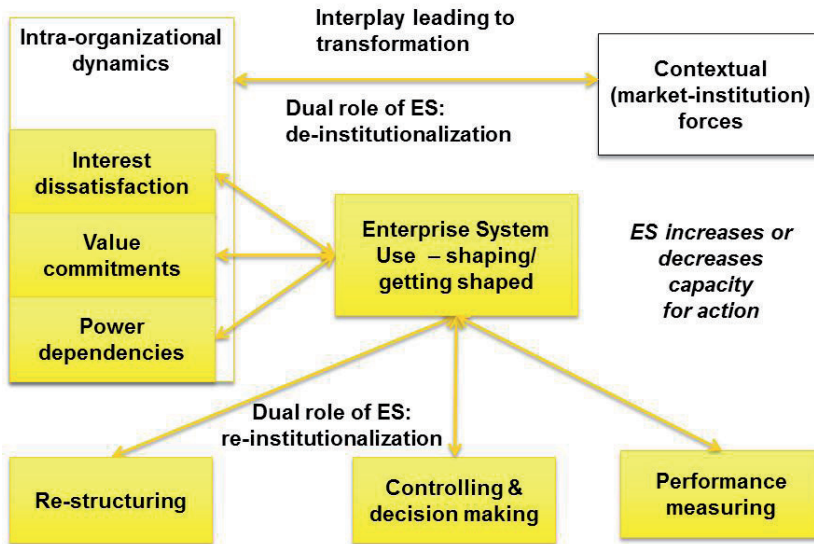


Figure 6 Dual role of enterprise system

Our results also have several important practical managerial implications. First, the timing of an ES deployment is critical. Second, all affected parties should understand the goals and needs of the new ES. And finally, users, who carry the burden of fulfilling the new information needs, need to see some tangible benefits from the system.

4.2 Paper 2: Implementation of ES in matrix model

Mattila, M., Hallikainen, P., and Rossi, M. (2010) "Challenges in Implementing Enterprise System Functionalities in a Matrix Organization", *Proceedings of the International Conference on Research Challenges In Information Science (RCIS)*.

According to the empirical data, interviewees' considered the implementation of new functionalities challenging in the new matrix model. At Neon, "a big bang" implementation was considered infeasible due to limited resources. Also, the ES infrastructure was seen to restrict procedures in which the existing functionalities were replaced with entirely new functionalities, or totally new functionalities and processes were implemented all at once. An incremental implementation strategy also set challenges because of difficulties in defining the reasonable scope or schedule for the implementation in a matrix model or the impacts of the matrix structure's light administrative function on participation, training, support etc. Due to these emerged issues the second paper focused on the

implementation of new enterprise system functionalities in a matrix organization.

The research was also motivated by the view that the enterprise system was not simply a part of the institutional infrastructure that can be taken for granted, but a socio-technical system that included both human agency and a material system (Orlikowski and Scott 2008). Also, in spite of a wide variety of research concerning ES implementation (e.g. Al-Mudimigh et al. 2001, Hong and Kim 2002, Scheer and Habermann 2000, Upton and Staats 2008), the implementation of new ES functionalities in a highly integrated matrix organization was not well understood. The research question of this research paper was:

What kinds of factors have an influence on the implementation of the new ES functionalities in the matrix organization?

By adopting the sociomateriality approach (Barley 1986, Boudreau and Robey 2005, Orlikowski 2007, Orlikowski and Scott 2008), the theory of the double dance of agency (Rose and Jones 2005) as well as the concept of affordances (Zammuto et al. 2007), our findings suggest a wide variety of internal and external factors and dynamics that influence the implementation of ES functionalities and the constitution of everyday work practices in the matrix organization. The outcome – the global project delivery model – is highly dependent on the interaction between organization and enterprise system. In this interaction, the material features of enterprise system are able to create or inhibit affordances for organizing.

The theoretical contribution of this research paper is to show how the organization and the ES are in an interaction with each other (see Part II, Paper 2, Figure 2: Challenges in implementing enterprise system functionalities in matrix organization). The matrix organization performs work tasks and practices with the assistance of the RM module. The co-evolving interaction between the humans and the enterprise system depends on both the organizational factors and the material characteristics of the enterprise system. These material characteristics of the ES create affordances for organizing over time. The outcome of the interaction between the humans and the ES is the successful implementation of the Global Project Delivery Model.

The practical contribution of this research paper is to emphasize the importance of legitimization and stabilization of training, support, and communication functions. In that case a dedicated network structure for training, support, and communication seems to be worth considering. The

findings also show that a major part of the organization operates in a matrix while other parts are still operating in a hierarchical form. This hybrid structure can be taken into account in the scoping and scheduling of implementation. In the case of the RM module, it may be unnecessary to implement the RM module into the functional parts of the organization. Also, small projects or ad hoc tasks can be handled without the official assignment handling in the RM module. This may decrease the resistance of an organization to the implementation, and thus the management can direct resources to the most critical parts of the organization. Implementing the ES functionalities selectively acknowledges the dynamic and interactive nature of the relation between the ES and the case company's organizational structure. Consequently, the use of the new RM module is concentrated in those parts of the organization and businesses that have the best fit with the ES.

The global optimization of work and delivery needs complex support from several modules of the ES. Top management expected the system to reinforce the new structures and coordinate across units. However, the interplay between the actual use and the goals has not always worked as expected. For example, the utilization of the local work force and the global resources has not been optimal because of the incentive structures of local managers, which can be in conflict with the global goals. In the future, Neon's rewarding system could include targets concerning employees' time and effort in the implementation of strategically important modules. Short-term incentive targets such as local utilization rates should not be emphasized at the expense of the long-term off-shoring objectives.

4.3 Paper 3: Differences in system usage in the organization

Mattila, M. (2011) "Why does the system usage differ between organizational units? - A case study in a knowledge-intensive project organization", *UK Academy for Information Systems Conference Proceedings 2011*.

This research paper was based on the view that the implementation of common staffing procedures and new ES functionalities were the management's way to improve efficiency of project resource allocation and control in the newly implemented matrix organization. By using these procedures and tools, Neon aimed to transform into a virtual organization in which the required project teams were staffed virtually. In previous phases of this study, I had noticed that the utilization of new staffing

procedures and the enterprise system functionalities varied a lot between organizational units. The research question emerged from the empirical data:

Why does the system usage differ between organizational units?

In this paper I go deeper into the organizational unit level and participate in the discussion regarding organizational features and system usage (e.g. Davenport 1998, Peppard and Ward 2005, Zammuto et al. 2007) as well as the appropriateness of ES in the organizations (Berente et al. 2008). I note that ES usage in a knowledge-intensive project organization is not taken into account in the previous ES research. By employing neo-institutional theory (Scott 2003, Gosain 2004, Berente 2009), the concept of coupling (March and Olsen 1976, Orton and Weick 1990), and by combining them with the framework of system usage (Burton-Jones and Straub 2006) I explain why system usage differs between organizational units.

A theoretical contribution of this paper is to describe how the ES functionalities are locally used in conducting everyday staffing actions. By dismantling the elements of system usage I show how the use of new ES functionalities is influenced by the features of an organizational unit, features of the work assignment, individual characteristics, and the target customer. I bring new elements – the organizational unit and the target customer – into the framework of system usage and argue that these new elements have an important impact on the use of common staffing procedures and new ES modules in a knowledge-intensive project organization. Although the new elements of system usage cannot be generalized to all organizations, they may be useful in analyzing system usage in knowledge-intensive project organizations. By emphasizing that the use of new enterprise system functionalities should be focused on certain organizational units and work assignments that have the best fit with the system usage, the paper also participates in the discussion of the appropriateness of ES in organizations (Berente 2009).

A practical contribution of this paper is to show how the system usage for integrating competencies, skills, and availabilities with work assignments pose challenges in practice. For example, finding the best possible mix between the requested competencies, person, and work assignment requires that all relevant requested competencies have been defined into the system. While staffing and the use of new ES functionalities requires system usage skills, wide knowledge of requested competencies or technologies, as well as networking skills, dedicated users, who would use the system on behalf of the line managers, could be worth considering. Due

to the fact that the use of new ES functionalities serve the staffing function more than other organization units, the staffing function should take more responsibility about, for example, support and training and linking the entire project delivery process with the system usage. Further, the information regarding employees' reservations is not produced during the project management process and the reservation data is often updated manually into the ES. The implementation of a new project management module in due course will probably reduce or even take away this manual work.

In conclusion, this paper recommends reconsidering the system usage regarding those organizational units and work assignments that have poor fit with the system usage (Figure 4-3-2 Coupling of system usage at Neon). It also suggests that some organizational units, such as certain sales units or joint ventures, could be more tightly coupled with the system usage. Regardless, it seems to be too simplistic to use the system only for simple work assignments, while more complex work assignments are handled with informal, personal networks. In fact, some interviewees are irritated about how even some of the simplest and shortest work assignments are carried out using the system.

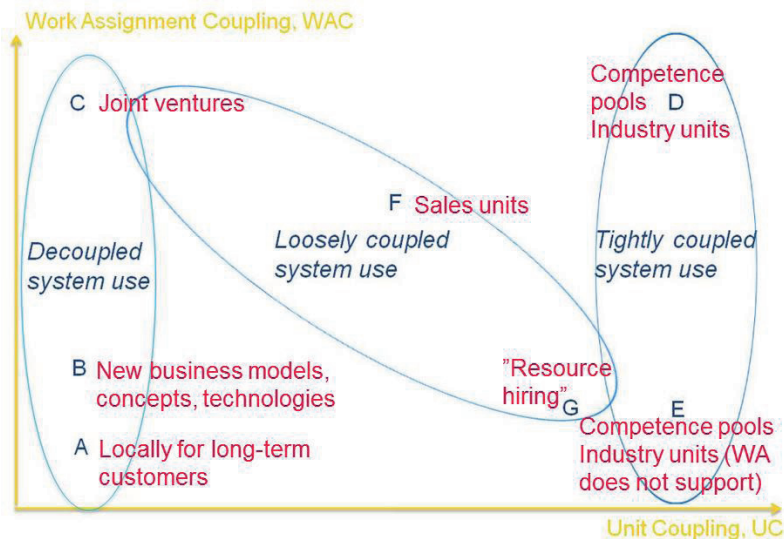


Figure 7 Coupling of system usage at Neon

4.4 Paper 4: ES as a coordinating tool

Mattila, M., Nandhakumar, J., Rossi, M. and Hallikainen, P. (2012)
 "Enterprise System as a Coordinating Tool in Large Scale Distributed

Development”, to be published in the *Proceedings of the 20th European Conference on Information Systems (ECIS 2012)*.

The research question of this research paper emerged from the research data as one interviewee formulated the need for transferring the customer team spirit to the off-shoring countries. Based on this insight we started analyzing the ways in which the goals and values of the team are shared across the boundaries. This led us to look at the ways in which the system can act as a coordinating tool and ask what the key boundary objects and boundary spanners are and what they should transmit across. The following research question emerged from the data:

What is the role of ES in coordinating knowledge-intensive work?

Despite the widespread use of ES, we have limited understanding of the effectiveness of ES as a coordination tool in knowledge-intensive, high-tech organizations with diverse expert groups. In this paper we aim to address this knowledge gap. We also participate in the discussion regarding knowledge sharing in the organization (e.g. Griffith, Zammuto and Aiman-Smith 1999, Orlikowski 2002, Sapsed and Salter 2004, Shang and Seddon 2002). To investigate the potential role of the enterprise system in coordinating work in globally distributed project setting we adopt concepts of boundary objects and boundary spanning (Boland and Tenkasi 1995, Carlile 2004, Gal et al. 2008, Kellogg et al. 2006, Star and Griesemer 1989). By focusing on the role of ES, we offer insights into different coordinative capabilities of the components of ES.

Our theoretical contribution is to show that in a knowledge-intensive project organization only certain parts of project staffing information can be codified and handled solely by using the ES. Several important parts of a project staffing process need informal contacts and boundary spanners to work. For example, as the knowledge about high-performers as key consultants or project managers for certain clients and projects cannot be stored in the system, it is challenging to recreate a new customer project team without using informal networks. Second, existing boundary spanning mechanisms are highly dependent on each other and all of the functionalities of the ES have to be in place from the start or otherwise difficult workarounds have to be found. Third, the boundary objects in the ES seem to emphasize employee’s personal identity, not customer team identity. For example, the project resource request in the ES is searching for individuals, not a customer project team. Further, measures in the ES often are at an individual level, not at customer project team level. Finally, we

argue that in this kind of large organization with flexible routines and diverse habits in different parts of organizational, there is a need for the simultaneous existence of formal boundary objects, trading zones and informal knowledge networks.

Our practical contribution is to show how the ES supports the staffing process and the reassembly of a project team. It seems that the goal of codifying all resource and competence information into the system is theoretically and practically impossible, and some parts of the staffing process are based on personal networks that cannot be replaced by a system. In this case the current staffing process and its supporting tools serve simple types of assignments well, but more complex consulting assignments are poorly supported.

Further, we illustrate how staffing decision-making requires integration of knowledge from various sources. The knowledge creation within community happens through communication. In order to present Neon's communication model we adopt two models of communication (Boland and Tenkasi, 1995) and bring them into this organizational context. Communication in a local group (community of knowing) is both a language game and a transmission of messages through a conduit (Boland and Tenkasi, 1995). Boundary objects (in the ES) are seen as conduits. The conduit model forms the core of Neon's communication model. As in this model communication is described as message sending and message receiving, it can be seen to be suitable for solving routine staffing cases. For example, in our model these routine staffing cases have been simplified to cover certain project types and work assignments such as maintenance or continuous services. The language game model in Neon is utilized in solving more complex project staffing cases. For instance staffing of strategic key customer project requires tacit knowledge transfer as persons involved refine their knowledge. Boundary problems in these cases are semantic. As these staffing cases demand integration of knowledge from different parts of the organization the role of boundary spanners and informal networks is important. It is worth noting that the wrong model of communication inscribed into technology such as in the ES may hinder perspective making and perspective taking in the interaction between different communities of knowing (Boland and Tenkasi, 1995).

In conclusion, in this paper we illustrate some of the key boundary spanning mechanisms in managing project resources in a knowledge-intensive project organization. It has been shown, that key boundary objects give shape, form, and visibility to the global project staffing process. However, we show that it is challenging to replace local project staffing

practices with a global staffing process supported by an advanced enterprise system.

5 Discussion and conclusions

Based on my research, I argue that managing project resources by using new enterprise system functionalities requires that the management is aware and takes into account the different needs of different types of professional services and projects as well as the businesses they operate on. In this chapter, I illustrate how distinctive features of a KIPO impact on ES assimilation and use by analyzing professional service intensity in the case company. Further, I present both the theoretical and practical contributions of the dissertation. And finally, I elaborate on limitations and make suggestions for further research.

5.1 Professional service intensity in the case company

As stated earlier, my aim is to provide new perspectives about the interplay between the enterprise system and knowledge-intensive project organization in managing the project resources. Further, I aim to show how the distinctive features of a knowledge-intensive project organization influence enterprise system assimilation and use in managing HR-related project resources. In order to address this theme I have developed a theoretical framework based on previous research on knowledge-intensive firms (e.g. Starbuck 1992, Greenwood et al. 2009, von Nordenflycht 2010), project-based organizations (e.g. Gann and Salter 2000, Davies and Hobday 2005, Yoo et al. 2006), as well as system usage in general and enterprise systems in particular (e.g. Davenport 1998, Peppard and Ward 2005, Burton-Jones and Straub 2006, Zammuto et al. 2007).

Previous research on project-based organizations (Davies and Hobday 2005, Gann and Salter 2000, Yoo et al. 2006) suggests that the complexity of the company's projects influences organization and management structures as well as capabilities. This phenomenon is also visible in the case company, which delivers a wide range of different professional services. The fluctuating service intensity of various professional services and projects creates different managerial challenges and organizational

responses within the company. In order to analyze the variation on the degree of professional service intensity within the case company, I apply the conceptualization of distinctive features of knowledge-intensive firms, managerial challenges and organizational responses presented by von Nordenflycht (2010, see chapter 2.4 Knowledge-intensive project organization). I recognize that the construct of professional service intensity is not previously presented in the context of one company, but rather in investigating within-industry or intra-industry variation (von Nordenflycht 2010). However, I find this construct applicable for my case study.

In Table 5-1 I give a simplified view of Neon's professional services and projects (on the left). The distinctive features of a knowledge-intensive organization create different kinds of managerial challenges - cat herding, opaque quality, employees' bargaining power, muted competition and trusteeship norm. I omit low capital intensity from the examination because the case company is a public limited company with low capital intensity. In essence, each professional service faces different managerial challenges to which Neon responds with different organizational responses. I have named these organizational responses regarding the ES use as autonomy in the organizational structure (Org str), autonomy in the use of formal staffing process and the ES (ES use), and autonomy in performance measuring (Meas). In practice, the same organization structure or the same processes combined with a uniform mode of system usage do not support all the organizational units to the same extent. For example in the KIPO the key professional norms of professionalized workforce – a preference for autonomy and the responsibility to secure the interests of certain interest groups such as customers – may cause, for instance, distaste for several, more integrated reporting relationships, or for formal and shared organizational processes supported by the new ES functionalities. As a result, the company has to allow a certain level of autonomy in organizational structure and system usage to these units. Autonomy in performance measuring, in turn, means that a certain amount of slack is allowed and the resource utilization rate is not emphasized as a primary or as the only measure. The basic rule is that the higher is the level of managerial challenges, the higher is the granted autonomy in the organizational structure, the ES use, and performance measuring. It is worth noting that, in general, professional IT services face the managerial challenge named "Opaque quality" as the quality of IT professionals' work is hard for customers to evaluate. I illustrate the variation on the degree of professional service intensity by giving some examples.

<i>Professional services/projects</i>	Characteristics and managerial implications					Org responses		
	Cat herding	Opaque quality	Bargain power	Muted comp	Trust norm	Org str	Autonomy in ES use	Meas
1 Own prod - long-term cust	√	√	√	√√	√√	√	√√	√
2 Services - long-term cust	√	√	√	√	√√	√	√	√
3 New bus models, tech	√√	√√	√√			√	√	√
4 "Resource hiring"	√	√	√	√	√√		√	√
5 Mgmt consulting service	√√	√√	√					√
6 Std sys implementations		√	√	√-				√-
7 Application mgmt- unique	√	√	√	√	√	√	√	
8 Application mgmt- std		√						
9 Continuous service- special	√	√	√	√				√
10 Continuous services- std		√						

Table 3 Professional service intensity and organizational responses in Neon

The professional service named “Own products for long-term customers” (row 1) has a relatively high amount of managerial challenges, particularly related to muted competition and trusteeship norm. Due to Neon’s own products and certain customer base (e.g. in the Health Care sector) these professional services are permitted high autonomy in the organizational structure, the ES use and performance measuring (row 1, on the right). As a result these units operate in a functional form, they are not using the shared staffing process and the new ES functionalities, and the utilization rate is not emphasized as a primary performance measure.

The professional service named “New business models, concepts or technologies” (row 3) represents the situation in which highly skilled employees have preferences for autonomy and distaste for formal organizational processes. In Neon the professional services with the high level of managerial challenges related to cat herding, opaque quality and employees’ bargaining power are allowed autonomy in the ES use and in performance measuring. This means that employees providing these services are not working in the highly integrated matrix organization structure but rather in the functional or project-based form, instead of the using of shared staffing processes and the ES functionalities they are using their own staffing system, and the utilization rate is not emphasized as a primary or as an only measure.

Furthermore, the professional service named “Management consulting services” (row 5) creates a high level managerial challenge regarding opaque quality as, for example, the impact of management consultant’s advice with regard to the customer’s financial profits is hard to evaluate. Opaque quality combined with retention and direction difficulties, here named cat herding, create challenges for the alternative compensation mechanisms. As a result, employees providing management consulting services work in the matrix organization, and are often staffed by using the shared staffing process and the ES functionalities, but the utilization rate is

not used as a primary measure for them. However, the commonly used tool to respond to cat herding challenges, bonuses, is no longer a widely used tool in Neon due to HR harmonization actions. This combined with other HR harmonization actions have diminished managerial tools of line managers to keep their highly skilled specialists or “artistic” talents.

“Standard systems implementations” (row 6) represent professional services that have a certain amount of managerial challenge regarding muted competition. In this case muted competition refers to, for example, certifications provided by product developers such as SAP, Oracle or Microsoft. These certificates create barriers of entry into these professional services and increase employees’ bargaining power. As a result employees are allowed a certain amount of autonomy in performance measuring.

The last example of standardized, interchangeable professional services in Neon is the professional service named “Continuous service, standard” (row 10). As opaque quality is the only managerial challenge linked with these services, Neon does not allow any autonomy in the organizational structure, the use of staffing process and the ES functionalities, or performance measuring. According to empirical data, large competence pools are operating in the highly integrated matrix structure, they use the formal staffing process and the ES functionalities, and they are expected to achieve the high utilization rates that reflect an extremely low level of slack in the organization. The professional service named “Application management, standard” (row 8) is seen to be quite similar to these services.

The variation in the degrees of professional service intensity raises some other questions. First, the analyzing of professional service intensity raises question of motivating and retaining highly skilled and mobile IT professionals. Alternative measuring and compensation seems to be particularly relevant to employees with strong outside options. At the individual level the increased visibility in the ES regarding competence levels or availabilities seem to decrease the willingness to assimilate and to use the system. Further, at the organizational unit level increased visibility and comparability are also expected to influence ES assimilation and use. Second, in the case company individuals are encouraged to reach their full potential by broadening their expertise regarding e.g. different customer set ups, new technologies or solutions, industry-specific best practices, quality, or project roles. As a result, employees’ expertise either may grow more prevalent thereby opening new opportunities, or they may lose their esoteric expertise and their credibility regarding deep customer or industry knowledge. This is particularly important as all professional IT services face opaque quality that makes the maintenance of work quality and the company’s reputation as a high-quality service provider critical for the

company's success. However, managerial decisions may lead to a lower degree of professionalized workforce, meaning that the case company moves from the level of Neo-PSFs to the level of Technology Developers (see von Nordenflycht's taxonomy of knowledge-intensive firms in chapter 2.4). Ultimately, the company may even move out of the KIF taxonomy for good. Moreover, these dislocations may also occur if professional services with the highest level of service intensity are forced to hand over their autonomy regarding the organizational structure, ES use, and performance measuring.

5.2 Theoretical contribution

The main theoretical contribution of the whole dissertation is to increase understanding of the nature, resources and barriers of interaction between the ES and the KIPO. I participate in the discussion on the interplay between enterprise system and organization (Boudreau and Robey 2005, Dery et al. 2006, Leonardi 2007) by opening the "black box" of ES and by combining the material characteristics of the ES with the organizational features of the KIPO. I also enhance knowledge regarding IT-supported knowledge work in organizations (e.g. Niederman 1999, Hustad and Munkvold 2005) by initiating a new discussion about the ES in streamlining HR processes in knowledge-intensive project organizations. In order to demonstrate the interaction between the ES and the organization in managing project resources I use the project staffing process as an example of a key organizational process that is supported by new enterprise system functionalities. In this case a project staffing process is seen to be a part of HR processes as it exploits traditional HR data such as competence catalogues and employees' work load data.

I illustrate my participation in different theoretical discussions by presenting the knowledge-intensive project organization as an onion (Figure 5-1 Theoretical contribution). The onion has a good-looking skin that is visible for the company's interest groups such as customers, suppliers, subcontractors, or investors. The company informs these interest groups about the major changes in organizational structure, decision-making practices or performance measuring (the outer circle). Sometimes they are even able to observe the changes themselves. For example, customers are able to see major changes in the project staffing process, but they are not usually aware of details such as how the ES is used in organizational change. The core of the onion represents the assimilation

and use of the enterprise system. And the layers (onion rings) between the skin and the core represent different boundary objects in the organization.

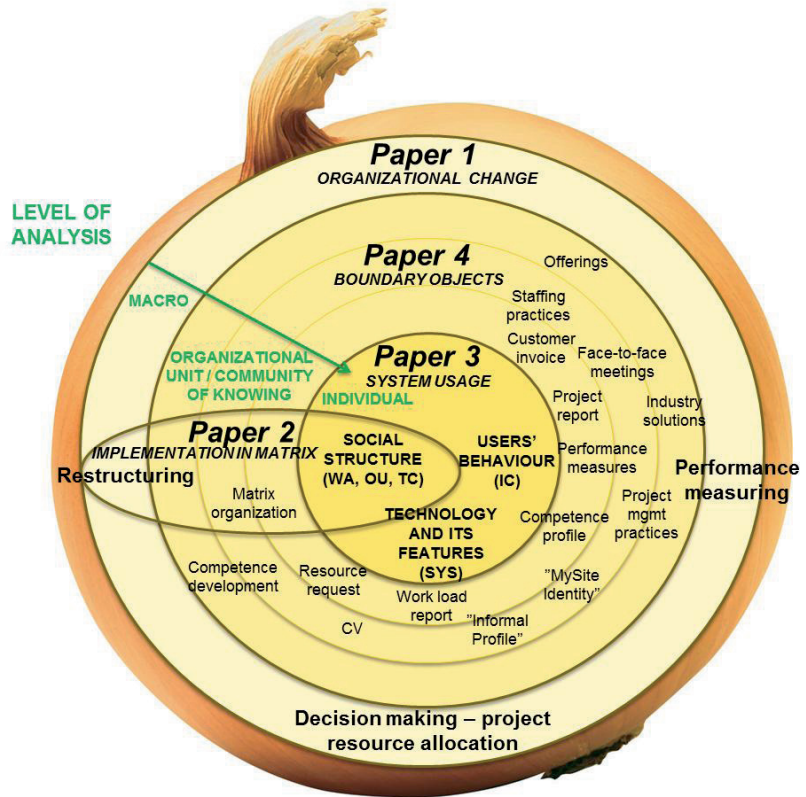


Figure 8 Theoretical contribution

Paper 1 participates in the discussion of organizational change and information technology (e.g. Gurbaxani and Whang 1991, Leavitt and Whisler 1958, Robey and Boudreau 1999) by increasing the understanding regarding the role of ES as an instrument for de-institutionalization. I draw on neo-institutional theory (Scott 2003) and the model for understanding organizational change (Greenwood and Hinings 1996) and combine them with the enterprise system. The focus of the paper is the interaction context at the organizational (macro) level. The paper demonstrates how the ES provides tools for re-structuring, controlling, decision-making and performance measuring (the outer circle).

Paper 2 participates in the discussion of ES implementations in organizations (e.g. Al-Mudimigh et al. 2001, Hong and Kim 2002, Scheer and Habermann 2000, Upton and Staats 2008) by emphasizing that ES

implementation in a highly integrated matrix organization is not well understood. By adopting sociomateriality (Barley 1986, Boudreau and Robey 2005, Orlikowski and Scott 2008), the double dance of agency (Rose and Jones 2005) as well as the concept of affordances (Zammuto et al. 2007) in this paper I focus on the interaction context at the organizational level (the outer circle). My contribution is to show how the interaction between a highly integrated matrix organization and the ES depends on both the organizational factors and the material features of the ES. I also contribute by indicating how the material features of the ES either constrains restructuring or creates affordances for organizing over time.

In Paper 3 I go deep into individual level (the core of onion) and analyze differences in the ES usage at the organizational unit level. In analyzing the ES usage I focus on distinctive features of the KIPO. The enterprise system usage (the core of onion) includes users' behavior (individual characteristics), ES technology and its features (system), as well as social structure (work assignment, organizational unit, target customer).

Paper 3 participates in the discussion regarding organizational features and system usage (e.g. Davenport 1998, Peppard and Ward 2005, Zammuto et al. 2007) as well as the appropriateness of an ES in organizations (Berente et al. 2008). By drawing on neo-institutional theory (Scott 2003, Gosain 2004, Berente 2009), the concept of coupling (March and Olsen 1976, Orton and Weick 1990) and the framework of system usage (Burton-Jones and Straub 2006), I contribute to the discussion by adding new elements into the framework of system usage. I show how the use of new ES functionalities is influenced by the features of the organizational unit, features of the work assignment and individual characteristics, as well as the target customer. I argue that the new elements – the organizational unit and the target customer – have an important impact on the use of common staffing procedures and new ES modules in a KIPO.

Paper 4 deepens the analysis of the distinctive features of a KIPO by analyzing the role of an ES as a coordinating tool in managing HR-related project resources. The level of analysis is the community of knowing. In the Figure 5-1 the layers (onion rings) between the skin and the core represent different boundary objects in the organization. Some of these boundary objects, such as resource request, competence profile, or resource request are stored in the ES (the small onion ring), whereas some boundary objects such as project management practices or CVs are closely related to the ES only (the mid-size onion ring). There are also some possible boundary objects such as customer offerings, industry solutions or competence development (the large onion ring) that are not used for coordination or knowledge sharing at present, but seem to have potential for it.

Paper 4 participates in the discussion regarding an ES in sharing knowledge in the organization (e.g. Griffith, Zammuto and Aiman-Smith 1999, Orlikowski 2002, Sapsed and Salter 2004, Shang and Seddon 2002). It recognizes that the role of an ES in coordinating work across organizational boundaries in a KIPO is not clearly understood. By employing the concepts of boundary objects and boundary spanning (Boland and Tenkasi 1995, Carlile 2004, Gal et al. 2008, Kellogg et al. 2006, Star and Griesemer 1989) I demonstrate how different organizational and IT elements act as boundary objects both enabling and inhibiting knowledge transfer in a geographically dispersed project organization. Following Orlikowski (2000), I open the “black box” of the enterprise system and analyze thoroughly boundary objects coded into the ES. Furthermore, I contribute by enhancing the understanding of the possibilities and limitations of boundary objects in a knowledge-intensive project organization by concentrating particularly on boundary objects in transferring knowledge about staffing of global project teams.

Although this exploratory case study is limited to a single case company with certain distinctive characteristics, it reflects similar phenomena observed in other knowledge-intensive organizations. I argue that this dissertation offers fresh new insights into the complex interaction between organization and digitalized processes to coordinate resources, to improve knowledge sharing and collaboration, or simply to survive in a volatile business environment.

5.3 Practical contribution

The managerial implications of this dissertation are discussed in this section. The findings of the dissertation carry some noteworthy managerial implications for individual employees, for an organizational unit (or community of knowing) and the company as a whole.

This dissertation reflects some current phenomena regarding knowledge-intensive project organizations. The knowledge-intensive project organizations are restructuring in order to become more effective through integrating their organizational structure and distributing work across the globe. However, these project organizations face problems in coordination and the effective utilization of project resources. To solve these problems they are implementing advanced reporting and work management processes included in their enterprise systems.

In implementing advanced reporting and work management processes in the ES, the company management is expected to understand how and why the specific features of the knowledge-intensive project organization cause

managerial challenges within the organization. In the case study I demonstrate how the professional IT services and projects face different managerial challenges by causing variation in the degree of professional service intensity (see chapter 5.1). As a result, management allows different levels of autonomy in organizational structure, in the enterprise system usage, and in performance measuring of organizational units.

Regardless of the form of organizational structure, organizational boundaries regarding, for example legislation, language, culture, or managerial issues, still exist somewhere. Further, a lack of formal organizational boundaries does not necessarily mean that the collaboration between organizational units is effective. In order to achieve effective project resource allocation, the management should be informed of both the boundaries and inefficient collaboration as well as where they are located in the organization.

Knowledge creation within community happens through communication between different groups. In the case company the ES supports the staffing process and the reassembly of a project team. However, it seems that the goal of codifying all resource and competence information into the system is theoretically and practically impossible, and some parts of the staffing process are based on personal networks that cannot be replaced by a system. Due to this, decision-making requires integration of knowledge from various sources. For example, staffing of a strategic key customer project requires tacit knowledge transfer as persons involved refine their knowledge. In the case study, I illustrate this by introducing some of the key boundary spanning mechanisms needed in managing project resources in KIPO. Some boundary objects such as resource requests, workload reports or competence profiles are stored in the ES while some boundary objects such as project management practices or CVs are outside the ES. Besides these boundary objects I suggest some possible boundary objects such as customer offerings or industry solutions for knowledge sharing in the case company. These mechanisms give shape, form, and visibility to the global project staffing process. Further, I show that it is challenging to replace local project staffing practices with a global staffing process supported by an advanced enterprise system. Moreover, the broad group of managers and specialists such as line managers or project managers, who are capable of identifying strengths and weaknesses of candidates that they bring to project work, are needed in this process. These key individuals are vital for strengthening coordination and collaboration between scattered sets of employees.

Currently, it is possible to process and store enormous quantities of data at ever-faster rates. This makes the gathering any kind of detail about

employees and projects easier and tempting. However, information regarding competencies and personal characteristics is confidential and in some cases it seems to be even out of the question to gather certain data about employees due to, for example, legislation or restrictions of trade unions. It is also worth noting that the subjectivity of certain data regarding, for example, employee evaluations makes its use dubious. If or when errors occur in evaluation, their importance will be significant. This poses requirements for real-time information controls, which should ensure information integrity and eliminate errors.

5.4 Limitations and suggestions for further research

My own journey through a knowledge-intensive company's organizational change gives a glimpse of the diversity and complexity of organizational life supported by technological tools. Although my dissertation reveals a relatively narrow part of it, focusing on a single case company with certain distinctive characteristics, it reflects similar phenomena observed in other knowledge-intensive organizations. Additionally, my dissertation raises further questions about the interaction between a knowledge-intensive project organization and an ES in general and the assimilation and the use of the ES human resources functionalities in project management in particular.

One interesting future research issue will be to compare how these findings will hold in other knowledge-intensive project organizations. For instance, it will be interesting to find out if managerial challenges and organizational responses are the same in different adoption contexts. Another interesting issue will be how traditional ES boundaries are evolving due to new interfaces and social media in knowledge-intensive organizations. For example, it will be interesting to learn whether the traditional functional boundaries of the ES will elaborate or even disappear.

In this dissertation, I analyzed enterprise systems as institutions that set bounds of rationality by inhibiting certain alternatives or opportunities. However, it may be of interest to IT researchers to understand more thoroughly how certain features of ES technology such as complexity, visibility or the integrated nature of the ES influence during assimilation process. For instance, it will be interesting to compare the assimilation of the ES human resources functionalities with the assimilation of certain best-of-breed HR systems and analyze if these systems create different outcomes in the way HR are managed in the practice.

Finally, the case study in a knowledge-intensive project organization will raise some specific future research issues. In a knowledge-intensive project

organization a customer project forms a temporary organizational form. As the form of customer project team varies all the time, the development, building or strengthening of customer team spirit or customer project networks is challenging. It will be of interest to study more thoroughly how ES human resources functionalities and some informal collaboration instruments contribute to these issues. Further, it will be of interest to find out whether the company will be able to create internal competence or job markets by exploiting different kinds of internal tools. Obviously, there will be some challenges regarding, for instance, the sensitive nature of HR data, but the path to future research is wide open for the company. By finding a right balance between tight and loose control of company's resources, a company will increase its capacity for innovating and facilitating new offerings to the customers or it will just survive.

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APPENDIX 1: Interview data

Phase 1: Dec 2008 - Jun 2009 (Paper 1 Transformation, Paper 2 Implementation in matrix)

No	Date	Place	Position	Main role	WE	CO	PO	SUB	AGE	G	Duration
1	9-Dec	Nordic	Director	ES developer	30	10	3,5	20	50-59	F	0:42:17
2	8-Jan	Nordic	Vice President	Controller	25	15	8	50	50-59	M	0:53:16
3	15-Jan	Nordic	Template Owner	ES developer	25	9	2	6	40-49	M	1:03:46
4	30-Jan	Nordic	Manager	Project manager	32	25	3,5	0	50-59	M	1:04:26
5	5-Mar	Nordic	Senior Consultant	Project member	25	10	0,5	0	40-49	M	0:45:37
6	17-Mar	Nordic	Staffing Manager	Staffing manager	30	25	0,5	0	50-59	F	0:37:23
7	18-Mar	Nordic	Director	Business manager	28	8	0,5	20	50-59	F	1:15:00
8	19-Mar	Nordic	Director	Controller	25	13	4	6	40-49	M	0:58:00
9	4-Jun	Nordic	Template Owner	ES developer	25	21	2,5	4	40-49	M	0:43:42
10	8-Jun	Nordic	Executive Advisor	ES developer	25	5	0,5	0	40-49	M	1:05:30
11	9-Jun	Nordic	Team Leader	Controller	31	31	3,5	7	40-49	F	0:41:05

Table 4 Appendix 1 - Interview data, Phase 1

Phase 2: Sep 2009 – May 2010 (Paper 3 System usage in the organization)

No	Date	Place	Position	Main role	WE	CO	PO	SUB	AGE	G	Duration
12	18-Sep	Nordic	Director	ES developer	30	10	3,5	20	50-59	F	0:45:00
13	4-Mar	Nordic	Project Owner	Business manager	15	13	0,1	0	30-39	F	1:00:09
14	9-Mar	Nordic	C Staffing Manager	Staffing manager	21	21	1	0	40-49	F	1:09:10
15	15-Mar	Nordic	Head of Presales	Sales manager	16	8	1	0	40-49	M	1:25:24
16	16-Mar	Nordic	G Staffing & Comp Man	Staffing manager	22	4	1	0	40-49	F	1:11:54
17	22-Mar	Nordic	Project Director	Project manager	26	26	3,5	0	50-59	F	0:56:47
18	23-Mar	Nordic	Project Manager	Customer manager	30	5	5	0	40-49	F	1:02:14
19	24-Mar	Nordic	ERP Consultant	Project member	10	10	5	0	30-39	M	0:34:36
20	26-Mar	Nordic	Lead Project Manager	Project manager	15	4	3,5	0	30-39	M	1:14:31
21	29-Mar	Nordic	Del Perf & Proj Man	ES developer	4	1	0,2	0	20-29	F	0:58:53
22	31-Mar	Nordic	Unit Manager	Line manager	8	5	1	20	30-39	M	0:51:20
23	1-Apr	Nordic	Head of Service Unit	Line manager	12	10	3	25	30-39	F	1:10:00
24	6-Apr	Nordic	C Staff Man & Unit Head	Business manager	16	8	1,5	7	30-39	M	0:57:31
25	23-Apr	Nordic	Head of Industry	Business manager	10	8	2,5	35	30-39	M	0:57:23
26	27-Apr	Nordic	Sys Analyst & Proj Man	Project member	14	13	13	0	40-49	M	0:47:38
27	29-Apr	Nordic	Customer Manager	Customer manager	15	9	1	0	40-49	F	0:55:25
28	3-May	Nordic	Director	Business manager	29	16	6	15	50-59	F	0:54:52
29	12-May	Nordic	Manager of Service Desk	Line manager	15	8	1	15	30-39	M	0:54:43
30	17-May	Nordic	Service Manager	Project manager	11	3	1	0	30-39	M	1:00:40

Table 5 Appendix 1 - Interview data, Phase 2

Phase 3: Aug 2010 – Feb 2011 (Paper 4 Formal and informal staffing)

No	Date	Place	Position	Main role	WE	CO	PO	SUB	AGE	G	Duration
31	25-Aug	Nordic	Head of Industry	Business manager	30	9	2	44	50-59	M	0:47:14
32	29-Oct	Nordic	Director	ES developer	30	10	3,5	20	50-59	F	0:48:10
33	10-Nov	Nordic	Director	ES developer	20	20	2	10	40-49	F	1:29:44
34	11-Jan	Nordic	Manager	Line manager	20	14	8	30	40-49	M	1:00:15
35	14-Jan	Nordic	Manager of Insurance	Customer manager	27	15	2	9	50-59	F	1:09:54
36	2-Feb	Offshore	Tech Practice Evangelist	Sales manager	20	2	0,5	0	40-49	M	1:03:56
37	2-Feb	Offshore	Line Manager	Line manager	20	4	2	23	40-49	M	0:57:59
38	2-Feb	Offshore	G Staffing Manager	Staffing manager	19	6	3	0	40-49	M	1:04:56
39	2-Feb	Offshore	Line Manager	Line manager	11	4	1	30	30-39	M	1:00:00
40	2-Feb	Offshore	Tech Consultant	Project member	6	1	1	0	30-39	M	0:39:09
41	3-Feb	Offshore	G Staffing Manager	Staffing manager	15	7	3	0	30-39	M	0:47:22

Table 6 Appendix 1 - Interview data, Phase 3

Commentary on table:

- WE work experience (total)
- CO work experience in Neon
- PO work experience in this position
- SUB the amount of direct subordinates
- AGE age group (20-29, 30-39, 40-49, 50-59)
- G gender: female/male

Certain information such as interviewee's name, office address, mobile number, or line of business was excluded from the table in order to retain interviewee anonymity.

APPENDIX 2: Sampling of interviews

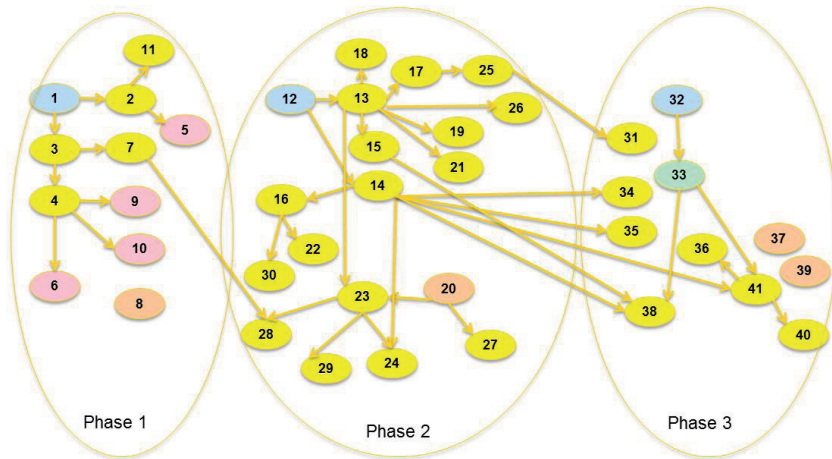


Figure 9 Appendix 2 - Sampling of interviews

Commentary on circles:

- 1-35: Interviews in Nordic countries
- 36-41: Interviews in an offshoring country
- 1, 12, and 32 (blue): Interviews with the primary contact person in Neon
- 33 (green): An interview with the second contact person in Neon
- 5, 6, 9 and 10 (pink): Interviewees, who were recommended for an interview both by an interviewee and someone else (e.g. a colleague with similar position or role)
- 8, 20, 37, and 39 (orange): Interviewees recommended for an interview by interviewees from out of circles of acquaintances

APPENDIX 3: Outline of the interviews

BACKGROUND QUESTIONS (all phases)

Interviewee:

Date:

Location:

1. Present job title: _____
2. How long is your work experience? ___ years
3. How long have you worked within the company?
___ years, ___ months
4. How long have you been in the current position?
___ years, ___ months
5. Do you have any subordinates? Yes, ___ subordinates, No ___
6. What is your line of business? _____
7. Age: ___ years
___ 20-29, ___ 30-39, ___ 40-49, ___ 50-59, ___ 60 or more
8. Gender: ___ Female, ___ Male
9. The last 4 digits of your mobile phone number are: _____

PHASE 1 – Dec 2008 – Jun 2009 (Paper 1, Paper 2)

1. Primary objectives for ES and a new feature set

- primary objectives for ES
- a new feature set (supports achievement of these objectives)
- measurement of the achievement (when, how, measures)
- development of new ES functionalities (optional)
 - A. describe the development process
 - B. matching of tools (ES) and processes

2. Business processes supported by the ES

- the most important business process supported by the ES
- describe this process
- persons involved in this process
- the process before the ES / the new ES functionality

- the most important changes introduced by the ES / the new ES functionality
- benefits and problems in performing the work tasks with the ES / the new ES functionality (manual steps or other tools e.g. Excel, sticky notes etc.)
- the implementation phase of the ES / the new ES functionality
- discussion about the system with colleagues (sharing experiences and opinions about the system, learning)

3. The users' experiences and usage usefulness perceptions

Perceived usage usefulness (the ES/ the new ES functionality):

Do you think that the ES / the new ES functionality:

- provides real-time and reliable data for your use?
- provides sufficient and relevant information for your decision-making?
- improves the quality of your work?
- changes the nature of your everyday work (the use of the ES)?
- improves your work performance?
- has an impact on organizational performance?
- provides personal benefits for you? Please specify?
- has a different fit in with certain organizational units or in certain work tasks?

Training and support, communication

- any problems or challenges implementing the technology
- sufficient resources for training and support (technical, business processes)

4. The attitude towards ES features

Intention to continue usage

Do use the feature set in the future to improve:

- your decision-making?
- the quality of your work and to save time?
- your work tasks and your work performance?
- organizational performance?
-?

5. Organizational transformation process and matrix structure

- describe the matrix structure
- roles and responsibilities
- requirements for data
- reporting etc.
- changes in own position (roles, responsibilities, locations, management)
- resistance and change management
- challenges regarding a matrix organization for the implementation of new ES functionalities (implementation structure, scope, schedule)

6. Implementation of new functionalities

- implementation process (new functionalities vs. new features)
- deliver – customer- relationship
- persons involved
- roles and responsibilities
- scope and schedule, adjustments, common rules and parameters
- instructions, communication
- training and support (during/after implementation)

PHASE 2: Sep 2009 – May 2010 (Paper 3)

1. Interviewee's organizational unit in the new organization structure

- describe the matrix structure
- roles and responsibilities
- requirements for data
- reporting etc.
- own organizational unit and position (roles, responsibilities, locations, management) and current changes in them
- the implementation phase of the ES / the new ES functionalities
- challenges and opportunities

2. Organizational and technical roles

- organizational roles and responsibilities in matrix structure
- focus on the project delivery business
- parallel roles and responsibilities
- technical roles provided by ES
- role-based reporting, instructions, data
- authorization

3. Development of new functionalities, features

- describe the development process
- matching of tools (ES) and processes

4. Project resource allocation and controlling, project management (RM, CC, PM)

- describe the project resource allocation and controlling process before and now
- system usage for staffing (GPDM), main challenges and opportunities, conflicts
- experiences and perceptions about RM/CC (PM, if relevant)
- daily/weekly/monthly use (reporting, measuring, planning & forecasting)
- manual steps or other tools (e.g. excel, e-mail)
- training and support function
- discussion about the system with colleagues
 - experiences of colleagues
 - sharing opinions, learning from colleagues
- conflicts between RM/CC and organization (different fit)
- training and support (during/after implementation)
- describe the informal staffing process (personal connections, reasons for this)
- describe project management tools (formal) and other tools in Neon
- persons involved (interest groups, roles etc.)
- subcontracting, competence development, recruiting
- work assignments

- nature of work assignments (individual project, continuous services etc.)
- schedule, target customer and customer connections etc.
- different interest groups (within the company, outside the company e.g. target customers)
- different employee groups (work experience, expertise, competencies, locations)
- personal knowing of employees
- planning and forecasting, reporting

5. Performance measuring

- changes in performance measuring
- new measures (STI, LTI)
- the use of ES
- experiences and perceptions (complicated)

6. Professional identity

- recent changes in everyday work tasks and procedures
- changing roles and responsibilities in matrix organization
- global project delivery model and delivery centers

PHASE 3: Aug 2010 – Feb 2010 (Paper 4)

1. Formal staffing process and the system usage

- Staffing process and the use of RM/CC:
 - before and now
 - challenges, benefits, problems
 - other tools in Neon (e.g. People Performance, HR tool)
 - subcontracting, competence dev., recruiting
- Experiences and perceptions about RM/CC:
 - daily/weekly/monthly use
 - manual steps or other tools (e.g. excel, e-mail)
 - training and support function (e.g. advance communication and reciprocal feedback)
 - discuss the system with colleagues
 - experiences of colleagues

- sharing opinions, learning from colleagues
 - conflicts between RM/CC and organization
- Perceived usage usefulness, RM/CC:
 - provides real-time and reliable data?
 - provides sufficient and relevant information for decision-making?
 - improves the quality of work?
 - changes the nature of everyday work?
 - improves work performance?
 - has an impact on organizational performance?
 - provides personal benefits?
 - has a different fit in certain parts of organization or in certain work tasks (ad hoc-projects/tasks, large projects)?
- Technical support:
 - sufficient resources for technical support
 - problems or challenges during the implementation

2. Informal networks in staffing decision-making

- describe the informal staffing process
- personal connections in staffing decision-making (why, how)
- informal networks for certain staffing tasks
- narrow competencies/technologies (competent and available resources are known)
- job description, definition of competencies

3. Virtual project teams

- the best possible mix (a customer specific team)
- information about competencies (from system, staffing managers, project team members etc.)
- collaboration across cultural and national boundaries (organizational boundaries in the new organization?)
- transferring work into an offshore location (willingness to transfer competencies and work abroad)
- transferring customer or industry specific information between countries and organizational boundaries
- connections between project members (how to create “customer team spirit”)
- respect, free exchange of points of view, status differences

- coordination challenges: different time zones, communication difficulties (languages), a lack of common ground (experience), the inability to observe each other's work practises (feedback)
- monitoring/controlling cooperation and results
- trust and commitment
- tools and practices in communication: through ITC (Live Meeting, Communicator, e-mail..) or interpersonal face to face meetings

4. Different employee groups: experienced – inexperienced

- expertise, work experience varies
- top consultants; egos, pride, etc. (visibility in the system)
- different locations; meetings very rare
- personal knowing of employees
- certain work tasks or project phases

5. Identification

- recent changes in everyday work tasks and procedures
- changing roles and responsibilities in matrix organization
- global project delivery model and delivery centers
- different organizational / social groups in the organization
 - technology, solution, competence area
 - customer, customer team
 - a certain project task
 - formal organization structure, professional global grouplocal team (location, team size, team tenure, cultural diversity..)
 - other
 -

6. Knowledge sharing in the organization

- describe the information searching process (to whom to contact etc.)
- local vs global
- formal platforms, informal networks etc. (reasons for this)
- nurturing the “right” kind of cooperation

APPENDIX 4: Example of data and construct alignment

construct alignment

As an example of data and construct alignment, I illustrate the empirical data analysis process regarding Paper 3.

During the initial coding codes such as Requested competence, Work assignment, Nature of project work, Time frame, Target customer, System, Organizational unit or Individual characteristics of employees emerged from the data (Figure 1, I Initial coding). These emerged codes were joined together into categories (Figure 1, II Coding) such as features of Work assignment (WA), Organizational unit (OU), Individual characteristics (IC), Target customer (TC), and System (SYS). As this research adopted a view that the system usage was more linked with work assignment and user than the features of the enterprise system itself, the system was cut out from the data analysis. Next, these categories were placed in the framework of system usage (e.g. Burton-Jones and Straub, 2006) by linking target customer and individual characteristics with both work assignment and organizational unit (Figure 1, III System usage). Thereafter, organizational unit and work assignment were combined with the concept of coupling (Figure 1, IV Coupling). Analyzing of research findings was done at the organizational unit level.

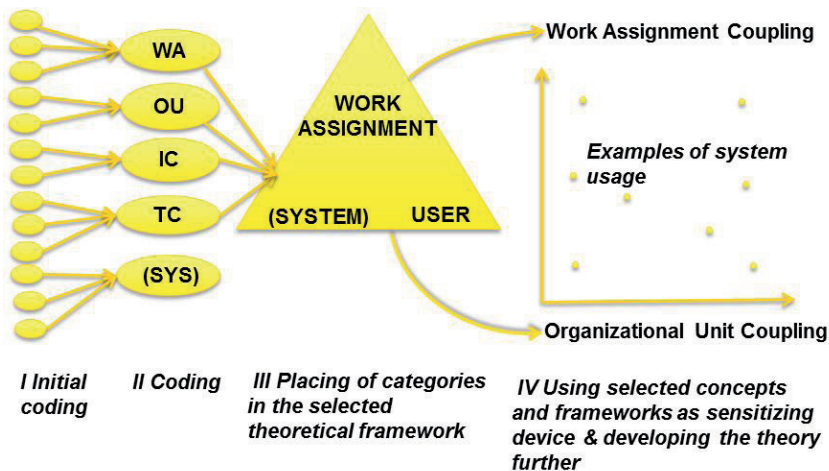


Figure 10 Appendix 4 - Example of empirical data analysis process

APPENDIX 5: List of abbreviations

General abbreviations

CMS	Competence Management Systems
ERP	Enterprise Planning System
ES	Enterprise System (former Enterprise Resource Planning system)
ICT	Information and Communication Technology
IT	Information Technology
HR	Human Resources
HRM	Human Resource Management
KIF	Knowledge-Intensive Firm
KIPO	Knowledge-Intensive Project Organization
KMS	Knowledge Management Systems
PBO	Project-Based Organizations
PSF	Professional Service Firm

Abbreviations used in the case study

CC	Competence Catalogue (the ES module for competence management)
GPDM	Global Project Delivery Model
PM	Project Management (the ES module for project management in Neon)
PP	People Performance (dedicated HR tool)
RM	Resource Management (the ES module for project resource management in Neon)

PART II: Original research papers

Paper I

Mattila, M., Nandhakumar, J., Hallikainen, P., and Rossi, M. (2010) "Reorganizing Projects through Enterprise System, Emerging Role of Enterprise System During Radical Organizational Change", *Proceedings of the 43rd Annual Hawaii International Conference on System Sciences (HICSS-43)*, Hawaii, U.S.A. ISBN 978-0-7695-3869-3/10

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*Best research paper award, HICSS-43

Reorganizing Projects through Enterprise System: Emerging Role of Enterprise System in Radical Organizational Change

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Abstract

In this paper we analyze the role of Enterprise System (ES) in shaping a company's transformation process by conducting an in-depth case study in a large European high-tech company. Although there are previous studies concerning organizational transformation and ES implementation process, the role of ES as an instrument for de-institutionalization is not well understood. By drawing on the framework of neo-institutional theory we seek to understand how ES facilitates discarding of the old ways of doing things and the simultaneous forming of the new institutional arrangements. This paper seeks to provide valuable insights into the de-institutionalization process and the role of ES in a company's re-organization. The findings show how ES in use serves as an agent and a platform for de-institutionalization and later as a powerful force in forming the new institutional arrangement.

1. Introduction

Faced with environmental uncertainty and the need to improve organizational efficiency, and ultimately performance, large international companies have been seeking to implement standardized processes and practices across borders and divisions. Localized business practices have been increasingly forced out by general rules and uniform practices, often implemented through integrated enterprise-wide information systems (e.g. Enterprise System (ES), and its primary form Enterprise Resource Planning (ERP) system). A uniformly implemented enterprise system facilitates standardization of processes and satisfies needs for management control by concentrating all information into one system and making it available in real-time [4]. However, a more integrated organization structure

combined with ES and common procedures does not necessarily guarantee intended outcomes and the ES might actually adopt roles which have never been anticipated before.

In this study we seek to understand the roles that the ES play during an organizational change, where old institutional practices are being replaced by new ones. Extant research has sought to understand either this de-institutionalization process itself, or the process of implementing an ES into an environment, but there is limited research on the role that the ES plays during and after the change.

To study the change process we outline a model for understanding organizational change [9]. We analyze a case company's transformation to gain insights into how a radical organizational change is implemented partially through deployment of an ES. The new organization and ES in the case company are aimed at enhancing the efficiency and control of their global project delivery. We analyze the roles that ES is adopting during organizational transformation by studying employees' own subjective experiences and perceptions on transformation processes and ES. This study was conducted during the post-implementation stage [13].

The relationship between information technology and organizational change has been widely recognized [10, 12, 18]. This study draws on neo-institutional theory [17] and a model for understanding organizational change [9]. We apply it in a high-tech sector, which is less mature and less homogeneous. The high-tech sector can also be considered to be loosely coupled and permeable. Further, we study how the case company responds to market and institutional pressures and focus on the role of ES in the change process by adopting a context-aware perspective with the recognition that ES is a social and physical artifact that is continuously transforming.

The research follows how the case company creates a new institutional order by transforming from a “silo” type organization into a horizontally integrated company with fewer organizational units and stronger company-wide competence centers. We gathered in-depth case data from different managers, specialists and ES users within this publicly quoted company and refined issues of radical organizational change and enterprise systems in certain organizational context. The findings show that the case company is implementing a radical organizational change, in which the use of enterprise system acts as an instrument or even as an agent for transformation by providing tools for re-structuring, controlling and decision-making as well as performance measuring.

The remainder of the paper is structured as follows. Background and theoretical framework is presented in section 2. Section 3 introduces the research approach and process. In section 4, we outline the case description. Section 5 contains the case analysis. And finally, sections 6, 7 and 8 include the discussion, conclusion and implications as well as future directions.

2. Background and theoretical framework

Enterprise systems have been defined in many ways in prior research [20]. In this paper we consider enterprise systems (ES) to include the enterprise resource planning (ERP) system functions and all the other applications providing an integrated information system for most functions of a company. According to Davenport [4] an ES seamlessly integrates all the information flowing through the company (e.g. financial, accounting, HR, SCM and customer information). Thus enterprise system provides a technology platform that enables a company to integrate and coordinate business processes and to share information across the company.

Although enterprise systems are seen to increase organizational efficiency [15], this depends on the context if the associated changes in business processes or efficient control can be achieved [6, 8]. The benefits of ES are linked with, for example, the experience cycle [13, 20], where the majority of possible benefits

are supposed to be captured on the later phases of the ES utilization [5, 16]. Organizational change either before or during the implementation is seen as beneficial for the implementation. In this paper we see ES in use as a change agent and a way of enforcing the changed practices.

During a company’s organizational transformation enterprise systems may adopt different roles. In studying these roles we adopt concepts from neo-institutional theory by defining enterprise systems as institutions, which are “multifaceted, durable, social structures, made up of symbolic elements, social activities, and material resources” [19]. Enterprise system in use may be seen as encoded in the scripts (patterned behavior) used in a specific setting through a socialization process [1]. The usage of ES may transform a script and (re-)institute the script through re-producing continuously. After a while the usage of ES becomes taken-for-granted and finally users may not even realize that their behavior is in fact partially shaped by ES. In conclusion, ES influences the actions of its user, but at the same time ES is an outcome of these actions. We consider that this institutionalization of ES is a non-linear process influenced by various forces [3].

In this research, we draw on Greenwood and Hinings model for understanding organizational change and develop this further. According to Greenwood and Hinings [9] the organizational transformation is defined by applying concepts of radical and convergent change as well as revolutionary and evolutionary change. Radical organizational change involves moving away from an existing orientation and the transformation of the organization. On the contrary, convergent change is fine-tuning the existing orientation. Revolutionary and evolutionary changes are defined by the scale and pace of upheaval and adjustment. Whereas evolutionary change occurs slowly and gradually, revolutionary change happens swiftly and affects virtually all parts of the organization simultaneously. Greenwood and Hinings’ model [9] combines market and institutional context with intra-organizational components such as interest dissatisfaction, value commitments, power dependencies (roles) and capacity for action (Figure 1).

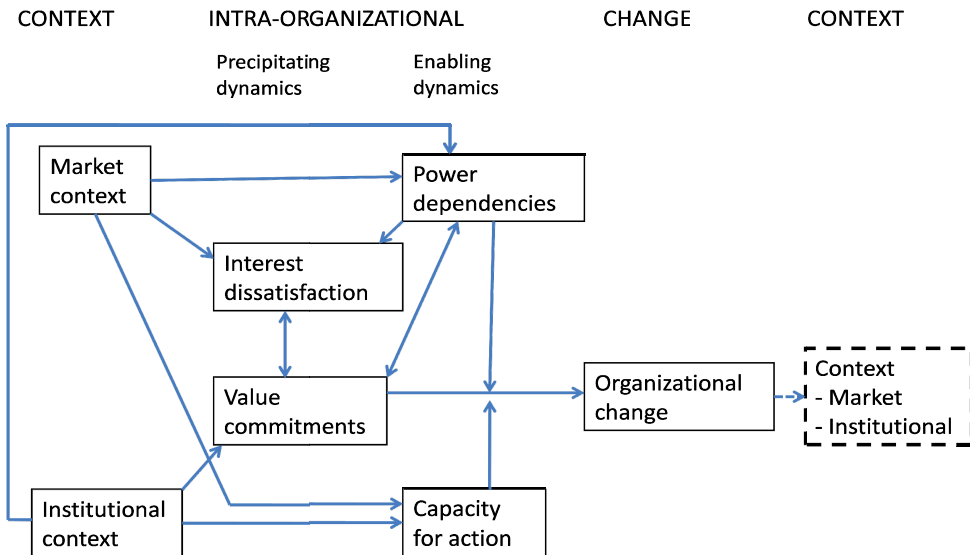


Figure 1 Model for understanding organizational change [8]

In analyzing the use of enterprise system as an instrument or even as an agent of organizational change, we combine perspectives from the social construction of technology [11] and from a human agency perspective [2]. We consider that different interest groups in the company associate different meanings with enterprise systems, which leads to interpretive flexibility appearing over the ES. In spite of the mandatory use of ES, users may also be relatively free to enact ES in different ways. In addition, certain features of ES may set opportunities or boundaries for organizational change. Due to these issues, the use of enterprise system may enable organizational transformation and build capacity for action but it can also set certain limits or even prevent re-organization.

3. Research approach

The research approach employed is an in-depth case study approach [22] to generate theoretical constructs and propositions [7]. The approach was chosen mainly to develop a better understanding of the role of ES in shaping the new institutional order. This was facilitated by researcher access to a company implementing a radical organizational change.

The in-depth case study was carried out in a large high-tech company within Europe. The data gathering took 6 months from December, 2008 to May, 2009. During data gathering, 11 managers, enterprise system

designers and users with different backgrounds were interviewed by using focused interviews, which focused on participants' own subjective experiences and perceptions about transformation process and ES. Interviews lasted for 40-80 minutes on average and they were recorded and later transcribed for subsequent analysis. Interviewees were selected by the research group mainly based on their positions in the company or based on the recommendations of other interviewees. In order to ensure data integrity and to capture different points of view, we interviewed participants during different stages of the post-implementation phase and also other staff in different businesses and support functions. Interviews were conducted by two researchers at a time. In addition an extensive review of company documents, such as annual or financial reviews, Intranet and training (e.g. e-Learning) materials was carried out during this field study phase.

As the research progressed, we sought to verify the emerging constructs by applying qualitative analysis. The analysis and interpretation of the data continued throughout the research process in order to assure that the results and findings were grounded in the empirical data. Tape recordings and interview transcripts were imported into NVivo, computer-aided qualitative data analysis software. NVivo was used for organizing and sharing data, but analysis was mainly performed by using a tool for drafting concepts. During the data analysis we sought to focus on the process of generating theory and build theory rather than test

theory. The research themes that emerged from the data were categorized. During initial coding phase we defined codes such as Training, Reporting or Common metrics. These codes were joined to categories such as Capacity for action, Re-structuring, Controlling, or Performance measurement. As these patterns emerged, we started to view them in more abstract terms [14] and to develop our conceptualization. In this process we used Greenwood's and Hinings', [9] model as a sensitizing device [22]. During the thorough analysis of research data two core categories emerged from the data. These two core categories were "ES as an instrument" and ES as an agent".

4. Case description

Neon (a pseudonym) is a large multinational high-tech company; being among the leading high-tech companies in its main markets in Northern Europe. Compared with a more traditional context, high-tech sector is seen as less mature, less homogeneous and loosely coupled institutional sector with permeable boundaries. There were interactions between this sector and other institutional sectors: typically through high rotation of personnel and close customer relationships. This interaction also enhanced the creation of new

solutions and circulates them to high-tech companies within high-tech sector.

During the last decade the company has experienced a rapid growth through acquisitions, mergers and strategic alliances and has become more international in step with its customers. For the last few years the market environment has been challenging for Neon as well as its customers. Neon's revenues have declined and the company's shareholders received a public tender offer during spring 2008. Major changes in the financial markets and prudent IT investment by customers were seen as major challenges for Neon in the future.

At the beginning of 2009, Neon announced a new steering model and a matrix organizational structure. This was aimed at transforming Neon into a more horizontally integrated company. Previously the company structure had been based on business areas (customer-specific industries) and it had operated in small, industry- or customer-specific teams, which had taken care of every phase of customer projects. The team heads had been responsible for resource management by exchanging employees between teams according to project and customer needs. During the last few years, Neon had gradually been transferring employees from teams to larger industry- or customer-specific competence groups located in business areas (Figure 2: A. Business Area Structure).

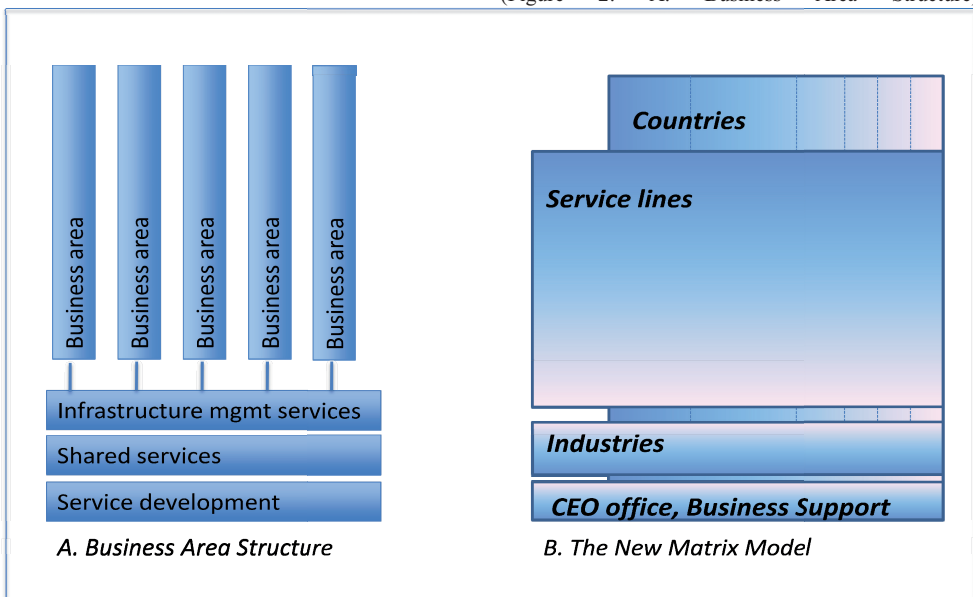


Figure 2 Transforming into a more horizontally integrated company

In the new matrix model most of the employees were located in service lines and industries diminished in size and in power. The new organization structure had a stronger focus on countries, fewer organizational units and stronger company-wide competence centers (Figure 2: B. The New Matrix Model). In order to increase global service capabilities and to respond to intense competition in high-tech sector, the company implemented a global delivery model. According to the company's Annual Report, (2008) 40% of its employees would work in the global delivery centers in the future.

Neon has many newly appointed executives, such as the CEO, Head of Service lines, Head of Country and Head of HR, and some of them came from non-high-tech sectors. There was also a shift in values resulting from the new executives attempting to emphasize more on human resource management and corporate culture change, and also refocusing the organization to be more customer oriented. They regarded a company's work force as vital to its economic competitiveness. Neon also recruited executives with deep experience in the outsourcing services and familiarity with the market situation in strategically important locations. It was hoped that this would enable the organization to act in a fundamentally different way. The new management considered ES an important tool for this transformation.

Neon's enterprise system was based on a commercial product and it was integrated with local banks, local payroll systems, common invoice center system and common reporting and budgeting system, and it had the basic operational functionalities for an expert organization. The ES project started in 2003. Currently, over 90% of Neon's staff uses ES daily in nine countries.

In the background of the ES project was a need for corporation level process harmonization and reporting. Because Neon had a fragmented IT system history with different systems and versions in daily use, ES was aimed to provide a common service for the whole organization. Furthermore the ES implementation sought to improve control over the company's international businesses. As a result, ES provided efficiency improvements in financial processes:

"A need for cost-efficiency led to the situation that we got sort of as a by-product a possibility to relocate accounting activities. First we centralized accounting activities and second we re-located them in a lower-cost country." (VP Finance)

The primary objectives of ES were defined in such a way that they favored the interests of support functions (such as accounting, HR) instead of interests of businesses. The ES was seen as a tool for unifying

new processes and making the consolidation of data across units and countries easier. To facilitate this no local or industry specific customization was allowed. Project management designed the features and procedures of ES with limited end-user consultation. Many of the interviewees reported that ES, which offered standard functionalities only, replaced their sophisticated best-of-the-breed local systems. Therefore, ES acted as an extension of accounting control and was seen as an invoicing tool governed by accounting function (ownership, access management). Because the ES supported centralized decision-making authority and control many felt that the business areas could not realize its benefits. The ES was resisted by users and its reputation as an enterprise-wide information system suffered. Also the quality of information was poor.

5. Case analysis

The analysis mainly focuses on the intra-organizational dynamics and the roles of ES during transformation. Next we illustrate Neon's change and the roles of ES during transformation.

5.1. Interest dissatisfaction

As noted in the case description Neon had been structured according to business areas, which served customers in different institutional sectors. These institutional sectors differed from each other due to, for example, maturity or strategic importance. Business areas were only loosely integrated and they had clear boundaries. Definition of process owners was aimed to increase interaction between business areas, but they were usually not strong enough and organizational situation did not legitimate their position. Without transparency and common metrics between units, Neon's resources were not utilized efficiently. Decision-making authority was delegated to business areas and corporate management required only some common procedures and ES reporting. In short, business areas had their own sub-cultures and operating practices, and ES was mainly considered an invoicing tool providing information for support functions.

The internal complexity of the organization was rather high and there were different interest groups structured by, for example, management level, industries, geographic locations, and roles or competencies of employees. The staffing management group was a new agent in the organization. Previously resource management had been handled between certain units, but in the new organization structure

staffing managers and staffing management group were acting as an internal, global platform combining external customer needs and internal competencies. The use of ES might have served this process by providing a crucial module for project resource management (RM-module). However, it was evident that the module had not been implemented and thus the resource management process did not work as designed. Therefore it was unclear how ES would serve the resource management process in practice.

It was evident that the use of ES served the transformation by providing reporting structure and tools for both vertical and horizontal reporting needs. Neon also implemented some new corporate level metrics concerning internal processes and increased the reporting frequency. Faster and more transparent decision-making created a potential pressure for change or inertia, because interests of different groups conflicted at all events. This caused resistance to ES use or unwillingness to provide more accurate information. For example employees perceived forecasting of personal workloads frustrating in a turbulent market situation.

5.2. Value commitments

In order to create a collective meaning to strategy and the way of organizing, 1000 employees joined the strategy formulation process in 2008. We found that there were several competitive commitments in the organization, where some groups supported the template-in-use, whereas others preferred the emerging matrix model. These value commitments varied between and within different interest groups.

Because of the challenging market situation (a decline in revenues, a public tender offer) Neon had searched opportunities to become more horizontally integrated. The aim of the new steering model and matrix model was to make it easier for Neon to utilize competencies and to release full potential to become more agile and to serve customers more efficiently. This assisted Neon to balance demand between different functions in the organization and to increase employee's utilization rates. Due to this Neon was eager to respond to the market requirements by implementing the new matrix model.

Neon had previously rearranged its operations several times and it had grown through acquisitions and mergers. The complexity of the organizational arrangements had produced a large product and service offering. Also the portfolio of activities had been changed and some activities had been re-located during the last few years. In addition, the composition of the workforce had diversified and different parts of the organization had been specialized into silos of

expertise. It was evident that in order to respond to this fragmentation and to utilize all of its competencies Neon needed a new structure. The emerging matrix model was seen as this new structure.

Although Neon is a global leader in selected segments, it is not centrally located within its institutional sector due to its peripheral local main markets. The peripheral location within its institutional sector, made Neon less committed to existing practices and readier to develop new ones.

5.3. Power dependencies

As discussed earlier, Neon had different interest or power groups, which varied in their ability to impact transformation. Many employees had not worked in a matrix organization before and they were not sure about their roles and responsibilities. Organization had also new managerial roles (e.g. staffing managers), whose impact on others' decision-making authority was unclear. Staffing managers' role was to allocate resources across projects and former business sectors. Because groups had different level of power, they varied in their ability to influence re-organization. For example some well-performed directors or well-known gurus in certain key focus areas were listened to more keenly than others and thus they had more potential for enabling or resisting change. In addition, some major changes, such as downtrend or postponed projects in certain customer base, in a market context may have impacted the relative power of groups within the organization.

The allocation of decision-making authority among interest groups or individuals in a company is determined by the costs associated with acquiring, storing, processing and disseminating information [10]. It also depends on other organizational and environmental factors such as the role of ES in the company, characteristics of the information flows, and the organizational culture. On one hand, ES may have supported decision-making authority and control among the interest groups and individuals in Neon by centralizing some decision-making authority rights and by decentralizing others. Further, ES may have moved the location of centralized decision-making authority and control. On the other hand, users had the power to define the importance of ES by using or ignoring it. In short, ES influenced the allocation of decision-making authority among interest groups or individuals, but at the same time ES was an outcome of this allocation.

5.4. Capacity for action

Neon’s new steering model and matrix organization seemed to emphasize HR processes and a unified corporate culture. The company tried to change organizational culture so that employees would feel that employer makes an investment in their expertise and competencies. Rewards were increasingly based on individual performance. This emphasis on individualism meant a cultural shift, which altered the work environment and was intended to support Neon to achieve the new objectives.

The company sought to increase investments in employees to achieve skills and competencies required to function in the new matrix model. Although the transformation process was communicated continuously through the company’s intranet, interviewees found the mobilization of the new matrix model problematic. The role of ES in the transformation process was considered essential, but the tools were not available yet. Also the implementation projects were considered difficult. This lack of clarity helped to promote almost experimental steps and influenced the speed of change. Interviewees had a lot of experience of recent organizational

changes and ES was believed to be rather immune to any future reorganization within the company, which increased the capacity for action. ES also helped to influence the development of a corporate-wide organizational culture replacing different sub-cultures. Further, the difficult market context had an impact on the level of capacity for action by increasing the possibility for radical change.

The analysis indicates that Neon underwent a radical change, which disregarded the previous organizational structure. The institutional and market context had led to shifts in the organizational structure and strategy to respond to competition and cost-efficiency requirements. The newly appointed executives were seen as the precipitators of change. Obviously Neon was transforming from an old project organization to a more industrialized model in which project tasks were divided into small parts. Staffing managers took an important role in managing resources and increasing utilization rates. Different ES implementations and industry-based procedures were replaced by one enterprise-wide implementation and process model. This created the new way to perform things in ES.

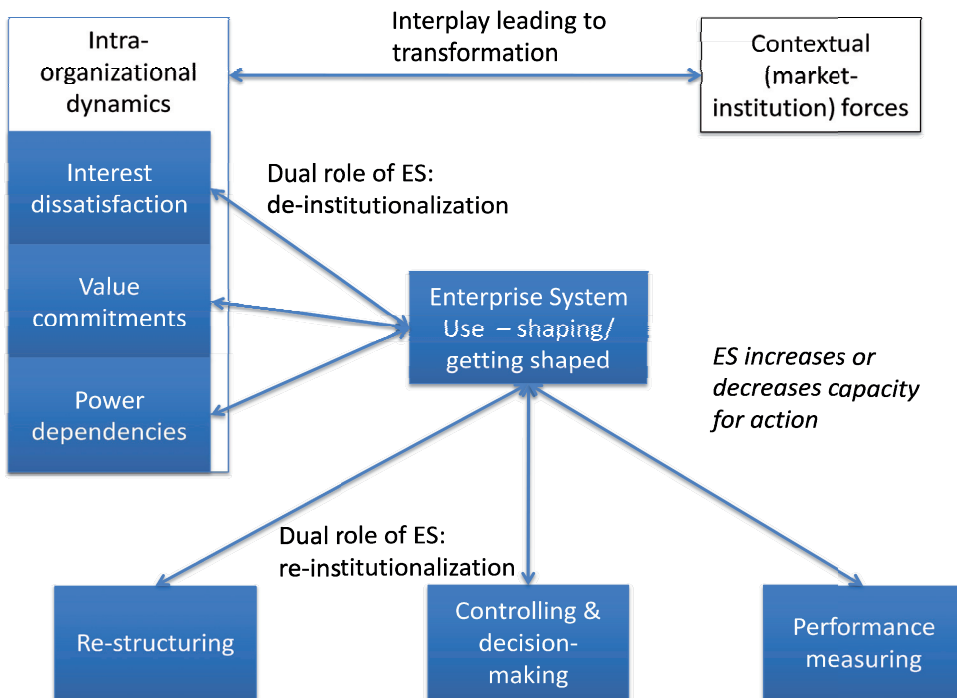


Figure 3 Dual role of enterprise system

6. Discussion

Our analysis indicates that the ES played a dual role of both de-institutionalization by providing tools for re-structuring, controlling and decision-making as well as performance measuring and gradually becoming an agent in re-institutionalization process (Figure 3). Based on the description of the forces of de-institutionalization above we discuss the role of ES in implementing the change and reinforcing the new structure.

6.1. Re-structuring

In the new matrix model the competence pools were larger than earlier and managers had more subordinates located globally. The use of ES decreased fragmentation of the workforce and unified different sub-cultures. In this situation the use of ES served as an instrument for re-structuring by helping to introduce common procedures and stabilizing them through reproduction of these procedures over time. It may also have had potential in finding out synergies between business units. However, working within the matrix structure was new to many employees and they were unsure of their roles and responsibilities. Also increased transparency, measurability and comparability between units and competence centers linked with implicit off shoring objectives caused resistance towards ES. This combined with the complexity of ES usage caused employee frustration and difficulties in communication process. In addition, the transformation process itself caused inefficiencies, when old tools and procedures were ignored even they were efficient and workable and the tools for transformation such as ES's project resource management (RM) module were not available. In addition, units were going through different phases in the ES life cycle and the perceived benefits differed accordingly.

As described above, ES was an important instrument for the change initiative by providing multidimensional organizational structure and tools for transformation. Interviewees believed that the new matrix structure and the global delivery model would have been impossible to implement in this schedule without enterprise-wide information system.

6.2. Controlling and decision-making

Previously, when benefits were not realized, ES was seen as a black box at Neon. The usage of ES varied with business areas and the "one company and

one tool" –principle did not work in practice. The new matrix model was setting more requirements for e.g. information quality, forecasts, or common processes than the previous organizational structure. The usage of ES was seen as mandatory and advanced usage would create more benefits for users and the company. The relationship between the new matrix model and ES was reciprocal: ES served as an instrument for transformation by increasing capacity for action, but at the same time the transformation shaped the usage of ES.

ES also acted as an agent for change by relocating and tightening centralized decision-making authority and operative control. Previously resource management was handled between small teams, but in the new global delivery model service line management was responsible for staffing management. ES's project resource management (RM) module was the main tool for resource management. We argue that in the new matrix model the control of ES was not decentralized but rather re-located to staffing managers and service line management in order to achieve company's off shoring objectives.

6.3. Performance Measuring

The use of ES acted as an instrument in company's cultural shift towards individualism by providing tools for e.g. individual performance measurement. The new model emphasized individual measures such as utilization rate or competence development instead of employee's customer invoicing or team results. This is somewhat contradictory to the espoused values of seeing team and project performance as the key to company success. Also high emphasis on utilization rate in the managers' short-time incentives may lead to ignoring the off shoring objectives, which are seen critical for the company's long-term competitiveness.

However, the project resource management module was not yet implemented at the time of the research and in that sense the ES decreased the company's capacity for action in the transformation process. For resource management and utilization this module is critical.

7. Conclusion and implications

In this paper we analyzed the role of ES in the organizational transformation process. We used the model of Greenwood and Hinings [9] as the theoretical basis for our analysis and developed a new conceptualization of the role of ES in the organizational transformation process. It was found that the ES has a dual role in the transformation: it

helps both to implement and to sustain the change. Moreover, the ES will affect the power balance in the organization. Finally, since an ES is instrumental for the change, it can also decrease an organization's capacity for action if the implementation of the ES modules is delayed.

7.1. Theoretical implications

Our results show that the ES played a dual role in the transformation process: 1) it helped to implement the change initiatives and 2) it helped to sustain the new organizational structure.

The ES acted in an instrumental role in establishing a platform for the new matrix organization. Moreover, it acted as an agent since implementing the ES relocated decision-making power in the organization. In helping to sustain the new organizational structure the ES acted in an instrumental role in providing tools for the reproduction of the new practices over time.

Finally, in addition to playing the dual role of enabling the change and reinforcing the new form, there is a reciprocal influence between the ES and the organizational change. While the ES enabled and helped to sustain the change it was also getting shaped by the organizational change and eventually as the implementation progressed the ES was shaped by the organizational objectives.

7.2. Practical implications

Many of the previously identified problems, such as resistance to change and problems related to role changes and ambiguity were present in our case. However, our results provide a new understanding of the role of the ES in the organizational transformation process.

Furthermore our analysis highlights the importance of planning the deployment order and timing of ES in such a way that it helps the change process instead of hindering it. In this case the delay in implementation of the resource allocation and project monitoring (PM) modules clearly caused resistance for the whole change, as the benefits and burden of the new tasks were distributed unevenly (e.g. project managers had to input far more detailed planning information, but they did not get advanced project reporting before the PM module would be implemented).

Organizations and enterprise systems transform all the time and exploring their co-evolution is one of the most interesting future research directions. Another interesting area for future research is to look at the use of the ES at a more detailed level and how the use evolves over time.

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Paper II

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Challenges in Implementing Enterprise System Functionalities in a Matrix Organization

Industrial practice and experience paper

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Abstract— In this paper we examine the implementation of new functionalities of enterprise system (ES) in a matrix organization. We conduct an in-depth case study in a large European high-tech company, which implements new ES functionalities and a new matrix organization in order to support its global project delivery model. The research is motivated by the view that enterprise system is not simply a part of the institutional infrastructure that can be taken for granted, but a socio-technical system that includes both the human agency and a material system [21]. In spite of a wide variety of research concerning ES implementation, the implementation of new ES functionalities in matrix organization is not well understood. By employing sociomateriality approach [21], the concept of agency [e.g. 10, 24] and the lens of “affordances” [e.g. 19, 29] we focus on factors and dynamics that have an impact on the implementation of ES functionality in the new matrix organization. The findings suggest that there are a wide variety of both factors and dynamics that influence the implementation of ES functionalities and the constitution of everyday work practices. The outcome – the global project delivery model – is highly dependent on the interaction between organization and enterprise system. In this interaction, the material features of enterprise system may create or inhibit affordances for organizing.

Keywords—affordances, double dance of agency, enterprise systems, matrix structure, sociomateriality

I. INTRODUCTION

Changes in a company’s business drive organizational design and ICT strategy. The new organizational structure is the result of a complex interaction between the technological and social environments [23]. In this process the company management evaluates affordances and constraints that their current IT infrastructure provides [19]. This often means modifying the existing enterprise system (ES, and its primary form Enterprise Planning (ERP) system) by implementing new functionalities accordingly. On one hand these new ES functionalities play a crucial role by replacing old institutionalized practices and by assisting in stabilization of the new organizational structure as well as a new way of doing things. On the other hand difficulties or even a failure in implementing the new ES functionality may slow down or hinder the implementation of the new business strategy.

A matrix organization is often introduced to increase the company’s ability to respond to rapidly evolving customer needs. In a more integrated organization structure, customers may be listened to more carefully in order to achieve innovative solutions or better financial results. The matrix organization can also be used to increase coordination and control in the organization by allocating resources more effectively and cost efficiently. Although the intended benefits of the matrix organization may be remarkable, decision-making may require a lot of negotiation and can be time consuming. Furthermore, unclear roles and responsibilities may be confusing in practice.

The implementation of a new ES, or modification of an old one, is always challenging. In a large organization “a big bang” implementation is often considered infeasible to adopt due to limited resources. The ES infrastructure may also restrict procedures in which the existing functionalities are replaced with entirely new functionalities or totally new functionalities and processes are implemented all at once [28]. An incremental implementation strategy may also set challenges because of difficulties in defining the reasonable scope or schedule for the implementation in a matrix structure or the impacts of the matrix structure’s light administrative function on participation, training, support etc. Therefore, in spite of seemingly similar objectives, both the matrix structure and the new ES functionality may cause unintended outcomes and even hinder the implementation of the company strategy.

The implementation of new ES functionalities in a matrix organization is not well understood. According to our view, an enterprise system should not be regarded simply as a part of the institutional infrastructure, which can be taken for granted, but a socio-technical system that evolves continuously. By employing sociomateriality approach [20, 21] and human and machine agencies [24] we focus on factors and dynamics that impact the implementation of a new ES functionality in a newly implemented matrix organization, when the old institutionalized practices are replaced with the new ones. When studying the implementation of new ES functionality we treat the implementation as an organizational intervention [8], designed and implemented to achieve the desired changes and objectives. In order to capture the interplay between the

implementation of new ES functionality and organization we adopt the term “affordances” [9, 13, 19, 29]. Affordances are based on the assumption that “new combinations of technology and organizational features continually create possibilities that affect organizational form and function” [29]. We also point out that the trade-offs made in the ES functionalities during implementation, may produce some unintended consequences.

In this study we conduct an in-depth case study in a large European high-tech company, which is implementing the project resource management (RM) module in a new matrix structure in order to support its new global project delivery management and staffing process. We focus on two primary issues. First, we study the different factors and dynamics influencing the implementation of new ES functionality in the matrix model in a post-implementation phase. Second, we explore how the implementation of the RM module enables or constrains the implementation of a new global project delivery model.

The research findings show that there are a wide variety of factors and dynamics that have an influence on the implementation of the enterprise system functionality in a matrix structure. In our analysis we combine the material characteristics of an enterprise system with the organizational factors enabling and hindering the implementation of the new ES functionality.

The paper is organized as follows. After this introduction, section two presents the theoretical background for the paper and section three describes the research methodology. Section four describes the case study and the results are analyzed in section five. Finally, the results are discussed in section six and future research in section seven. The paper is concluded in section eight.

II. BACKGROUND AND THEORETICAL FRAMEWORK

The concept of *enterprise system (ES)* has been defined in many ways in prior research [e.g. 6, 14, 27]. We consider ES to include the enterprise resource planning (ERP) system functions and all the other applications providing an integrated information system for most functions of a company. Enterprise system provides a technology platform that enables a company to integrate and coordinate business processes and to share information across the company. Enterprise systems also allow allocating and coordination of resources across time zones and geographical locations, while keeping the data available and centralized. And because ES creates a standard data structure, it is valuable in eliminating the problem of information fragmentation caused by multiple information systems in a company. In this research we study the enterprise system in the post-implementation phase [15, or the second wave of ES; 26]. This phase often includes making continuous improvements and maximizing the benefits of the installed enterprise system [e.g. 5, 12, 22].

Previous ES literature has emphasized the ES implementation process [e.g. 1, 25] with little attention on the interaction of the ES and the organization over time [e.g. 6]. Prior literature has concentrated on, for example, critical success or failure factors [4, 18], project success factors [7], or

best practices in order to improve ES implementation process. The factors affecting an initial ES implementation are assumed to influence the implementation of the new ES functionality during the post-implementation phase by decreasing the risk of project failure.

The main characteristics of the enterprise systems - integration and standardization - may have different influences in companies and they do not necessarily suit all kinds of organizations at all. Previous research of organizational fit of ES [11, 17] has argued that certain organizations have a higher degree of fit with ES characteristics and it possibly has a positive impact on the ERP implementation success. However, an ideal organizational form for enterprise system is hardly possible to define. Further, an organization may have different parts with different fit with ES characteristics.

While providing shared information across all functional levels and management hierarchies, an enterprise system may enable a company to organize around what can be done with information [29]. For example, a company may be able to implement a more integrated matrix structure in order to increase coordination and control in the organization. However, the success depends on the combination of the ES features with the organizational arrangements and practices that support the ES use [29].

Enterprise systems and organizations can be seen as either discrete entities or mutually dependent ensembles [e.g. 21]. In this research, the enterprise system and the human agents in the organization are seen as interdependent systems, which are shaped in the dynamic and often unpredictable interaction over time [2, 3, 21]. The interaction and outcomes of this shaping process between the ES and the organization is studied by adopting “the term *affordances* in the sense that new combinations of technology and organizational features continually create possibilities that affect organizational form and function.” [29]. It has also been argued [29] that these affordances can create the potential for new forms of organizing by supplanting hierarchy’s role in coordinating and controlling activities.

III. RESEARCH APPROACH

A. Data Collection

As mentioned before, we conducted an in-depth case study in a large European high-tech company, which was implementing a new project resource management (RM) module in a new matrix structure in order to support its global project delivery model and staffing process.

The research study was carried out in 10 months from December 2008 to September 2009. We conducted 12 focused interviews that concerned ES users’ own subjective experiences and perceptions about the new matrix structure and the implementation of a new project resource management (RM) module. These perceptions reflected how the new matrix structure impacted employees’ own way of thinking or everyday work practices and how the RM module was implemented and adopted in the case company. Face-to-face interviews were recorded and later transcribed for subsequent

analysis. The durations of the recorded interviews varied from 40 to 80 minutes and two researchers attended each interview.

In the selection of the interviewees we aimed to acquire a comprehensive understanding of the previous ES implementations. Our first interviewee was the director who was responsible for the ES development. Subsequently we interviewed the enterprise system developers and users as well as the managers on the various levels of the organizational hierarchy. The interviewees represented the different lines of business, such as the customer-specific industries or service lines and different support functions. During data gathering we also studied a wide variety of company documents. They included information of the strategy formulation process (e.g. e-Learning), and training and support documents in the Intranet. We studied the implementation of the RM module at an individual's level.

B. Data Analysis

We analyzed the research data during the research process "in order to draw valid meaning and to realize when an interview should be conducted to fill in gaps" [16]. As every interview was recorded and transcribed, we coded the research data in order to summarize and explain the data. This first coding had codes such as Cultural differences, Regulation, Country-specific interests, Communication, Training and Support or Features of ES. After that we created explanatory patterns or themes that emerged from the research data [16]. These pattern codes turned into four constructs: External factors, Organizational factors, Managerial interventions, and Material characteristics of ES.

In our research group meetings we discussed about the interview data and its main impressions and results. In explaining what was really going on in the case company and in illustrating the emerging themes we used a tool for drafting concepts. During the data analysis we noticed that external factors, such as cultural differences or regulation, were basically the same for every company in the high-tech sector. Consequently, we focused on three other constructs, which were unique for this particular case company. At that time we adopted the sociomateriality approach [21] and model for explaining the interaction between the human and the machine agency [24] as well as the lens of affordances [9, 13, 19, 29].

IV. CASE DESCRIPTION

The case company Neon (a pseudonym) is a large European high-tech company. In the beginning of 2009 Neon announced a new organization structure in order to support the implementation of its new corporate strategy. The new matrix structure was planned to support Neon's global project delivery management by increasing integration and coordination between organizational units. A staffing management group with about 50 staffing managers was a new actor in the organization. The aim of this group was to ensure that the external customer project needs were combined with the internal employee competences in order to allocate the right people to the customer projects. The company's main business area, the project delivery business, had significantly changed during the last few years.

"Previously, when I started to work at our company, I took care of selling, defining, coding, testing and roll outing of the customer project. I even handled the application management - all by myself. Now we are transforming - or we have already done it - so that one person sells, second person makes an agreement and third person manages the project. We have split up our projects into small parts in a totally new way. Of course this is a terrific change." Manager

Neon's previous enterprise system was based on a commercial product with the basic operational functionalities for an expert organization. It was integrated with local banks, local payroll systems, common invoice center system and common reporting and budgeting system. The commercial product was technically "a patchwork quilt" with modules built by different vendors at different times. Even the interfaces were diverging in appearance. The US-based product also had some annoying features and even lacked certain features such as organizational subunits required by the matrix organization. Although the reporting was built to support the new organization, the lack of subunits made adjustments or corrections into the ES demanding as one interviewee narrated:

"We have this Operating unit and then we have cost centers, but that is it. These intermediary levels that we have (in the new matrix model), they do not exist because there is not this kind of structure in our ES. Reporting works, naturally, but not through the ES in which all the information is stored. For example in our new matrix structure we have cost centers, but because my own unit is not a cost center but a team, I am not able to get team information from ES." (Director)

Although the constraints of the commercial ES product were supposed to influence the implementation of the new ES functionality, interviewees argued that some previous difficulties were caused by the customization policy and early configuration choices. On one hand, the business units were argued to have too much freedom in customizing their ES. On the other hand, interviewees complained that a very strict customization policy was likewise unreasonable. In the future Neon was argued to take the middle course by requiring discipline in the ES use but allowing customization of the commercial product in certain situations. Furthermore, configuration choices of authorization and role-based reporting especially in the new matrix organization were considered to be confusing.

According to the interviewees the use of ES required a considerable amount of training as well as regular use of the system. In order to decrease the system's complexity Neon had introduced new graphical interfaces, for example, for administrative purposes. These new interfaces were easy to use and they were built on ES database.

Neon's new corporate governance model required that the development of both business processes and the enterprise system functionalities must be aligned. The corporate governance model was a collection of "how-to" guidelines, structured as processes covering areas of work, and representing Neon's business models, rules, best practices and experiences. Although Neon's corporate governance model included all core and support processes, they were not covered to the same extent. Obviously the main efforts were made for

the alignment between the Finance, HR, sales and global project delivery processes and the enterprise system.

As a part of organizational transformation process Neon modified its enterprise system with a new functionality for project resource management (RM module). The new RM module was intended to support staffing management and global project delivery process in the new matrix organization. The RM module was aimed to be implemented in 12 countries with over 14.000 users. In September 2009 the RM implementation project was ongoing.

The implementation of the RM module influenced almost all the employees in the case company's matrix organization

(red line in Figure 1, Project Resource Management in matrix model). Employees were expected to input and update their competence profiles and administrative assignments into the system on a regular basis. Generally the RM maintenance work concerning project resource requirements and assignments as well as utilization and workload forecast reporting was divided between customer-specific industries and service lines. While industries were usually responsible for sales, customer delivery, or product development, their time and efforts were seen as critical in implementing the RM module and the global project delivery model.

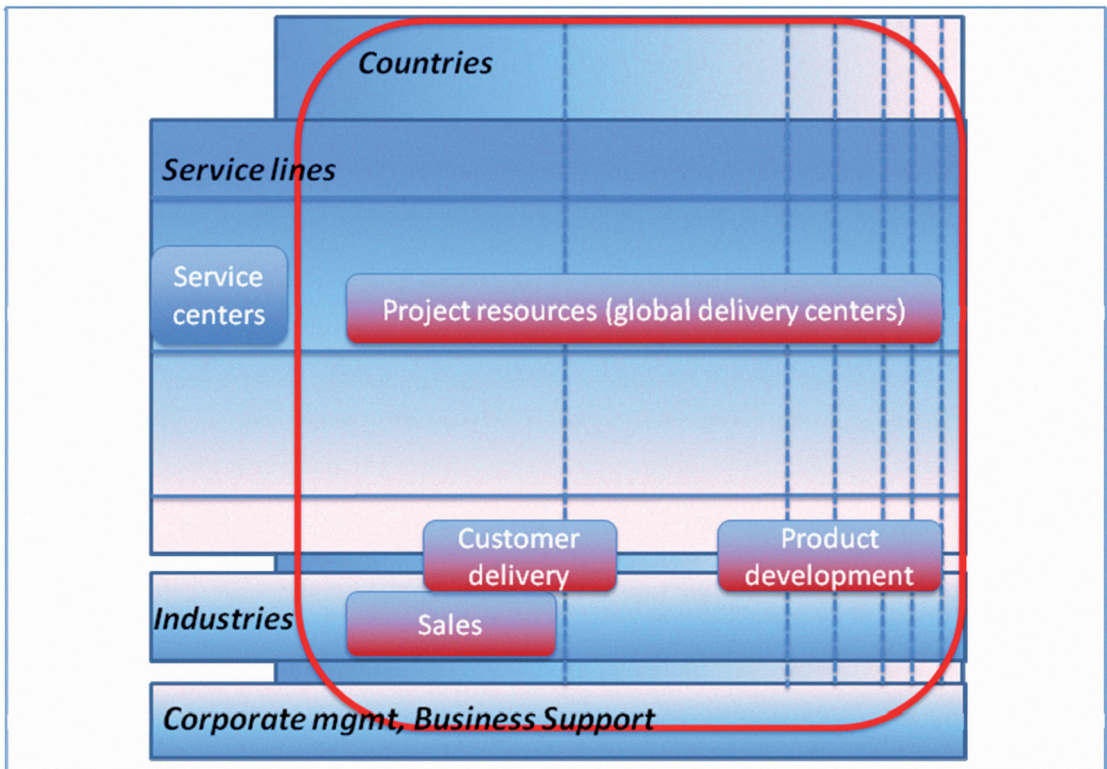


Figure 1: Project resource management in matrix model

During our research Neon was also developing a new project management (PM) module in order to support project delivery management. In configuration of these new modules Neon was highly dependent on the ES technology vendor and external consultants. These external actors impacted, for example, the implementation schedule and the settings of new modules. According to one interviewee these external actors did not have enough competencies and Neon was considering strengthening their own competencies in certain areas of ES technology.

In a matrix model an employee had one administrative superior besides his/her secondary reporting dimensions. In theory an employee could have a project manager role in one project and a team member role in another project. In practice an employee did not necessarily have these parallel roles and responsibilities because of, for example, his/her long-term customer assignment or current position in a support organization. However, the new RM module made it possible for employees to publish their own special competencies and strengths. Further, the use of the RM module was considered mandatory and employees were required to update their competence profiles and administrative assignments on a

regular basis. Thus the new matrix structure and the implementation of the RM module increased information requirements, reporting frequency etc.

Due to the lack of sufficient resources Neon rejected the big bang implementation and adopted the incremental approach instead. In the incremental implementation Neon had two major options. According to an organizational units approach a new RM module was implemented in all organization units in a certain customer-specific industry at the same time in every country. Although Neon emphasized that the matrix structure should operate with the “cross border” principle, there were significant cultural, regulative etc. differences between the countries. Due to these differences Neon employed a country approach where the RM module was implemented country by country.

“The country approach was proven important, for example, in Germany, where regulation of Working Councils in using or in publishing employees’ competence profiles in everyday work was remarkably tight. As we decided to roll out the RM module by country, we tried to combine country-specific interests with interests of (customer-specific) industries during the roll-out. And this was proven to be more difficult than we ever imagined in the beginning.” (Executive Advisor)

During the strategy formulation process in 2008 one thousand employees had allegedly participated in the strategy formulation. Although it seemed that commitment for change was high, working in the matrix model was new to many employees probably causing the resistance to change. However, a similar matrix structure had previously been in use in different parts of the organization as explained by one interviewee:

“We had this kind of matrix organization for 5 years, in a smaller scale though, where every project was resourced from different parts of the organization. At that time it was difficult, when a project member came from somewhere else and did not know our customer at all and so on. I suppose that there is similar friction in other parts of our organization at the moment.” (Staffing manager)

In practice, the commitment for RM implementation seemed to vary greatly in the organization. Naturally, internal work such as development of common procedures or implementation of new ES functionalities was seen as secondary compared with customer work. Further, especially sales units felt that the implementation of new functionalities actually disturbed their everyday business. They were either too busy with their current customer work or they were more interested in their short time incentives than benefits for the whole company in the long run. As a result commitment for the RM implementation varied highly, for example, by country or by business and caused a lack of resources during the RM implementation.

Although the new management of Neon emphasized that the use of the RM module was strategically important in order to achieve global project delivery management, the image of ES as an invoicing system still remained. Also Neon’s off

shoring objectives were assumed to cause resistance to the use of the RM module.

Neon’s Processes and Tools unit with 15 persons provided a general framework for the implementation of the RM module. During the RM module implementation a temporary project organization handled, for example, support issues. Business units had the main responsibility for this implementation process. After the implementation the support issues were aimed to be submitted to an official support function located in a low-cost country. Interviewees considered this support function as purely technical and it did not fulfill their special business needs. In addition, some interviewees reported that they never had feedback about how the issue had finally been solved.

Interviewees pointed out that the roles and responsibilities regarding training and support issues were unclear during and especially after the implementation. For this reason interviewees often utilized their personal network instead of official support channels. Especially issues that demanded business knowledge were handled by unofficial support persons, who had often been e.g. coaches during ES implementations and were located near businesses. Their supportive role was not defined in the unit’s official organization chart. Obviously the units were willing to secure a certain level of ES business support after the implementation “by hiding” these persons in their organizations. Interviewees considered these persons essential in translating the general ES framework into more specific instructions. As an example, the Project Accounting (PA module) was reported to be so complicated that business support was desperately needed. This PA module provided project information for the RM module.

Communication during and after the RM module implementation was seen as a major challenge. Advance communication was seen as particularly difficult. Although there was co-operation between Neon’s Transformation Office and Communication units, a suitable channel and suitable amount of information was difficult to define. Intranet and shared workspaces, such as SharePoint, seemed to be inefficient because they were not followed on a regular basis.

“We made a mistake in using the Intranet as a channel for assignments. It did not work at all. All issues concerning assignments should be more focused and preferably you should make sure in a face-to-face discussion or by a phone call that the assignment is clear.” (Executive advisor)

In order to solve these communication, training, and support issues, a “Project office” that handled project acceptance etc. had been under consideration. However, it had not been set up so far and the master data maintenance was handled in a low-cost country. Also “Project network” was considered an option as one interviewee narrated:

“The important thing that we have missed and that we have tried to build on the project side (PA and PM modules), is some kind of project network. This network would include so called main users, local project controllers or project support persons, who are responsible for the ES in a certain unit. By using this network we (Processes and Tools unit) would be able to communicate about new ES features and to be sure that our

communication reaches a certain organizational level. We would make sure with these contact persons that our information has been distributed in the unit. In the same way we would get feedback from the issues, which are experienced as a problem in a certain unit.” (Template owner)

V. CASE ANALYSIS

In the case analysis we illustrate the challenges in implementing the RM module in the case company’s new matrix organization.

A. Organizational factors

Although both the case company’s new matrix organization and the RM module are implemented in order to support the global project delivery model, their simultaneous implementation is challenging. On one hand, the more integrated matrix organization itself increases e.g. information requirements and reporting frequency. On the other hand, the implementation of the RM module in a very tight time schedule causes pressures in the organization. The implementation and the use of the RM module are considered mandatory and the commitment for change is argued to be high, but resistance to the change exists in the organization.

In the new matrix organization there are new actors - e.g. a staffing management group located in service lines - whose position is not established so far. Customer-specific industries responsible for e.g. sales and project management are critical for establishing and legitimizing the use of the RM module. Delivery centers seem to benefit most of the implementation of the RM module, but the greatest amount of the RM module maintenance work remains with the project managers located in the customer-specific industries. The major challenge for the RM module implementation seems to be to show the benefits of the new module and practices. This is considered to be very important especially in this organizational context, in which the commitment for the RM implementation seems to vary even among the top management.

The scope and schedule of the RM implementation is more difficult to define in the more integrated matrix organization. Due to a lack of sufficient resources Neon adopts an incremental, country-specific approach in the RM implementation. Although this approach is considered to be reasonable, the implementation of a company-wide RM takes a lot of time. Also cultural and regulation differences between the countries as well as different interests between e.g. countries and industries affect the RM module implementation.

B. Training, Support and Communication

The case study illustrates that in the matrix organization many employees have parallel roles and responsibilities. The roles and responsibilities concerning internal ES support and training seem to be unclear in the new matrix model. On one hand, some interviewees emphasize that they are very well aware of their profit requirements and they are not willing to establish a support function in their own “light” organization. On the other hand, some interviewees report of “hiding” support persons in their organization in order to secure a

certain level of business support. Obviously the efficient implementation of the new RM module and the future ES functionalities would require the stabilization and legitimization of business support and training functions. This more transparent support and training function (or network) would also take care of the advance communication and reciprocal feedback.

C. Material Characteristics of the Enterprise System

As described earlier, during the past few years the use of Neon’s enterprise system has become taken-for-granted because of its embeddedness and legitimacy as an invoicing system. The implementation of the new project resource management (RM) module is a management intervention to establish the global delivery management model, but the image of the ES as an invoicing system seems to remain to a certain extent.

The features of the chosen commercial ES product have an influence on the implementation of the new RM module in the matrix organization. For example, the adoption of the matrix organization without hierarchy causes difficulties in correcting or adjusting the data stored in the ES. Although the use of the RM module is considered quite easy, the use of the enterprise system requires a considerable amount of training as well as regular use of the system. Neon is highly dependent on the ES technology vendor and external consultants, which creates risks for the implementation of the new functionalities.

The material constraints of the commercial ES product combined with poor discipline of use during the early enterprise system roll outs set challenges for the RM module implementation. In principle there seems to be a common ES set-up in Neon, but the individual units have different system configuration settings or information structures. Authorization is considered confusing in everyday work since users are not necessarily able to verify the data stored in the ES. In addition, the role-based reporting seems to be confusing in the matrix organization, in which users have parallel roles and responsibilities.

VI. DISCUSSION AND IMPLICATIONS

In this study we analyzed the simultaneous transformation of the company structure into a matrix and the implementation of a new enterprise system functionality to support this transformation. First, we studied the different factors and dynamics influencing the implementation of the new ES functionality in the matrix model in the post-implementation phase. Second, we explored how the implementation of the new ES functionality enables or constrains the implementation of a new global project delivery model. We adopted the lenses of sociomateriality, agency, and affordances to identify the issues arising during the process. In the following the key findings are explained.

A. Theoretical implications

Our research shows that Neon’s organizational transformation is highly dependent on the successful implementation of the new ES functionality. In illustrating the interaction of machines and humans we adopt the theory of the

Double Dance of Agency [24] and the lens of affordances [29].

As described in Figure 2 (Figure 2: Challenges in implementing enterprise system functionalities in matrix organization) human agency (i.e. Neon’s matrix organization) and machine agency (i.e. the RM module) are seen as mutually dependent ensembles [21] in interaction with each other. By the assistance of the RM module the matrix

organization performs work tasks and practices. The co-evolving interaction between the humans and the enterprise system depends on both the organizational factors and the material characteristics of the enterprise system. These material characteristics of the ES create affordances for organizing over time. The outcome of the interaction between the humans and the ES is the successful implementation of the Global Project Delivery Model.

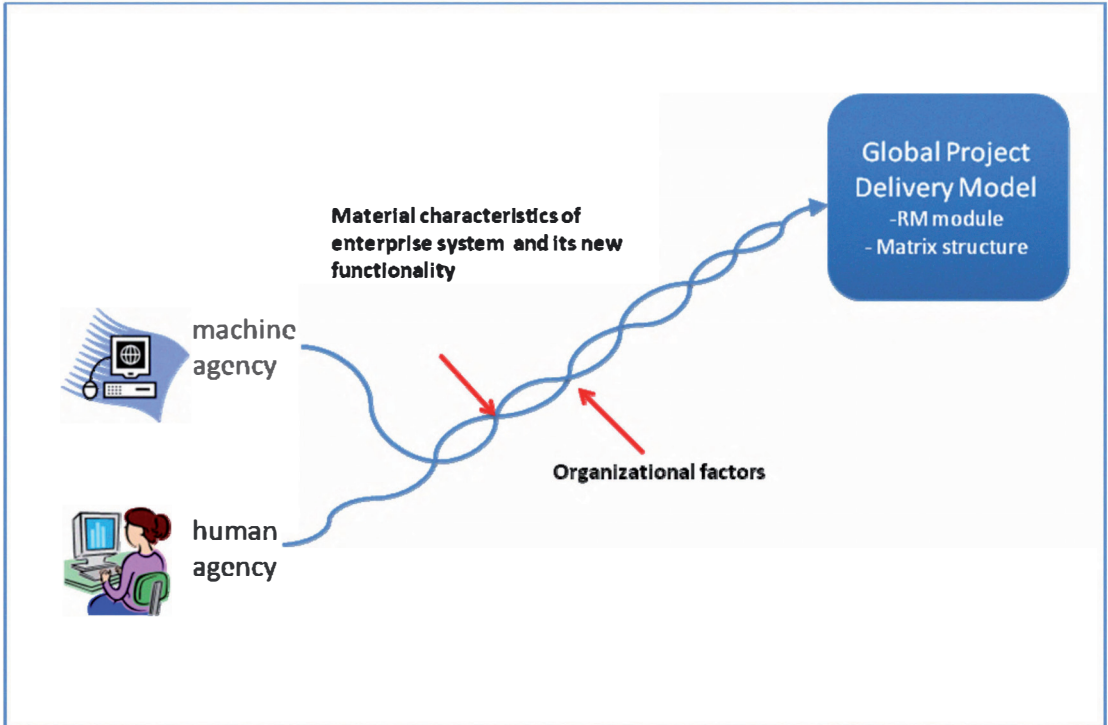


Figure 2: Challenges in implementing enterprise system functionalities in matrix organization [24]

The enterprise system and its new RM functionality may have potential in stabilizing Neon’s new matrix organization. It could replace the role of hierarchy in controlling and coordinating organizational activities over time [Cf. 29].

B. Practical implications

In order to make sure that future implementations of ES functionalities would succeed, it seems crucial to legitimize and stabilize training, support and communication functions. In that case a dedicated network structure for training, support, and communication seems to be worth considering.

We found a major part of the organization operating in a matrix while other parts still operated in a hierarchical form. This hybrid structure can be taken into account in scoping and scheduling of the implementation. In the case of the RM module, it may be unnecessary to implement the RM module into the functional parts of the organization. Also small projects or ad hoc tasks can be handled without the official

assignment handling in the RM module. This may decrease the resistance of an organization to the implementation, and thus the management can direct resources to the most critical parts of the organization. Implementing the ES functionalities selectively acknowledges the dynamic and interactive nature of the relation between the ES and the case company’s organizational structure [17]. Consequently, the use of the new RM module is concentrated in those parts of the organization and businesses which have the best fit with the ES.

While delivery centers seem to benefit most from the implementation of the RM module, the greatest amount of RM module maintenance work remains with the project managers located in customer-specific industries. Thus the major challenge for the RM module implementation seems to be to communicate the benefits of the new module and practices for all the parties involved. This shared understanding of organizational level benefits is crucial for the success of the implementation.

The global optimization of work and delivery needs complex support from several modules of the ES. Top management has expected the system to reinforce the new structures and coordinate across units. However, the interplay between the actual use and the goals has not always been working as expected.

For example, the utilization of the local work force and the global resources has not been optimal because of the incentive structures of local managers which can be in conflict with the global goals. In the future, Neon's rewarding system could include targets concerning the employees' time and effort in the implementation of strategically important modules. Short-term incentive targets such as local utilization rates should not be emphasized at the expense of the long-term off shoring objectives.

The case highlights certain properties of modern organizational information technology: there are overly optimistic assumptions about the capabilities of technology and the power of standardization. At the same time, local workarounds and patches have been needed to keep the operations ongoing.

VII. FUTURE RESEARCH

The current study is a snapshot of an organization during its transformation. As the process unfolds, it will be interesting to see how the system shapes the organization and vice versa. Of special interest are the "meeting points" of the organization and the ES implementation, such as user roles or performance measurement in the matrix organization. The institutional and technical arrangements needed to implement the new organizational form are often manifested in the definitions made to the system and the implementers do not necessarily see all the consequences of seemingly minor implementation decisions.

VIII. CONCLUSIONS

In this case study, we analyzed the organizational factors and the material characteristics of the enterprise system enabling and hindering the implementation of the new ES functionality. The research shows that the implementation of the new ES module is influenced by both the material features of the ES and the organizational factors. These factors are tangled together in the implementation process and as users use the ES [24]. We point out that the trade-offs made in the ES functionalities during the implementation can produce unintended consequences that might affect the organization in unexpected ways.

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Paper III

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Why Does The System Usage Differ Between Organizational Units? - A Case Study In A Knowledge-Intensive Project Organization

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WHY DOES THE SYSTEM USAGE DIFFER BETWEEN ORGANIZATIONAL UNITS? - A CASE STUDY IN A KNOWLEDGE- INTENSIVE PROJECT ORGANIZATION

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Abstract

This paper seeks to examine how a case company exploits new staffing procedures and enterprise system (ES) functionalities in order to improve allocation and control of project resources. The paper relies on qualitative data collected through an in-depth case study in a large European high-tech company over a period of one and a half years. In order to understand the system usage in the case company the paper employs institutional theory and Orton and Weick's concept of coupling. By combining the concept of coupling with the elements of system usage - work assignment, user, and system -, the paper explains why system usage differs between organizational units. Findings show how the use of new ES functionalities is influenced by features of organizational unit, features of work assignment, individual characteristics as well as target customer. The paper also recommends selective system use in a knowledge-intensive project organization.

Keywords: Competence catalogues, Enterprise Systems, Knowledge-intensive organizations, Coupling, Project management, Staffing

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WHY DOES THE SYSTEM USAGE DIFFER BETWEEN ORGANIZATIONAL UNITS?

- A CASE STUDY IN A KNOWLEDGE-INTENSIVE PROJECT ORGANIZATION

Abstract

This paper seeks to examine how a case company exploits new staffing procedures and enterprise system (ES) functionalities in order to improve allocation and control of project resources. The paper relies on qualitative data collected through an in-depth case study in a large European high-tech company over a period of one and a half years. In order to understand the system usage in the case company the paper employs institutional theory and Orton and Weick's concept of coupling. By combining the concept of coupling with the elements of system usage - work assignment, user, and system -, the paper explains why system usage differs between organizational units. Findings show how the use of new ES functionalities is influenced by features of organizational unit, features of work assignment, individual characteristics as well as target customer. The paper also recommends selective system use in a knowledge-intensive project organization.

Keywords: Competence catalogues, Enterprise Systems, Knowledge-intensive organizations, Coupling, Project management, Staffing

1.0 Introduction

Companies are seeking new ways to create and capture value. One important way to increase value in the organization is to innovate new business models and concepts. The challenge is to efficiently combine structures and procedures that enhance innovation with tools that support allocation and control of resources. In order to find a balance between these often competing objectives companies may implement integrated matrix organizations, common procedures and new enterprise system (ES) functionalities. By standardizing internal procedures and by mandating enterprise system use in organizational units, a company's management aims to allocate and control resources more efficiently.

In this paper an enterprise system is defined as a software package that "enables the integration of transaction oriented data and business processes throughout an organization" (Markus et al. 2000). It includes both the enterprise resource planning

(ERP) system functions and all the other applications providing an integrated information system for most functions of a company.

In order to shed light on the issues that have an impact on the use of newly implemented ES functionalities, this research adopts the lens of institutional theory and the concept of coupling (Orton and Weick 1990) in the context of a knowledge-intensive project organization. The paper follows the lead of Comstock and Scott (1977) and emphasizes that a company consists of subsystems that are combined with each other in different ways. Enterprise system use in these subsystems i.e. organizational units is examined by adopting a commonly used framework for system usage i.e. user, system and task (e.g. Burton-Jones and Straub 2006). Recognizing the complexity of system usage and that the business value of ES is rarely linked with the features of the ES itself (e.g. Davenport 1998; Peppard and Ward 2005; Zammuto et al. 2007) this paper leaves the system in the background, and focuses on the user, herein enhanced to cover organizational unit, and the task, herein work assignment. As previous literature recognizes the importance of loose coupling associated with enterprise systems (Berente et al. 2008) this paper goes deeper into analyzing the coupling of the organizational unit and the work assignment with system use in a knowledge-intensive organization. Based on in-depth case data from different managers, specialists and ES users within a publicly quoted case company, the paper figures out why the use of new ES functionalities differ between organizational units.

The findings show that features of organizational unit, features of work assignment, individual characteristics and target customer cause the variation in system usage between organizational units. By introducing two concepts - the organizational unit coupling and work assignment coupling, the paper presents how some organizational units and work assignments are tightly coupled with staffing procedures and the use of ES functionalities while other organizational units are loosely or even decoupled with them. Further, as the system usage and new ES functionalities themselves represent the institutionalized procedures of some organizational units and the stabilized procedures of certain customers or industry area, the findings emphasize the impact of target customer into the system usage.

Given that this research is only a snapshot of the use of new ES functionalities during an organizational transformation, it is important to understand the dynamics of system usage. Theoretical contribution of this study is achieved by combining the concept of coupling with elements of system usage in a knowledge-intensive project organization. It broadens the discussion into the fit of enterprise system functionalities with all elements of system usage. Practical contribution of this paper is to demonstrate why organizational units have different fit with new ES functionalities. It also recommends selective system use regarding those work assignments and organizational units which have poor fit with system use.

This paper is organized as follows. Theoretical underpinnings are presented in section 2. Section 3 introduces the research approach and process. In section 4, the case description is outlined. Section 5 contains the case analysis and the discussion. And finally, sections 6 and 7 include the conclusion and implications as well as future directions.

2.0 Theoretical Underpinnings

In this paper enterprise systems are defined as software packages that “enable the integration of transaction oriented data and business processes throughout an organization” (Markus et al. 2000). An enterprise system includes the enterprise resource planning (ERP) system functions and all the other applications providing an integrated information system for most functions of a company. Enterprise systems allow allocation and coordination of resources across time zones and geographical locations, while keeping the data available and centralized.

Scott (1995:33, 2001:48) defines institutions as “social structures that have attained a high degree of resilience”. He suggests that institutional elements (regulative, normative, cultural-cognitive) produce meaning, stability and order to social behaviour. These institutional elements move from place to place and time to time with the help of four types of carriers, which are symbolic systems, relational systems, routines, and artifacts (Scott, 2003). As presented previously (Barley 1986; Orlikowski 1992; Gosain 2004; Berente 2009) this paper considers technology, i.e.

the enterprise system, as a fourth institutional carrier. While socially constructed by the actions of e.g. designers or users, once developed technology tends “to become reified and institutionalized, losing its connection with the human agents that constructed it or gave it meaning to be part of the objective, structural properties of the organization (Orlikowski, 1992)”. The paper emphasizes the duality of enterprise systems by noticing that while enterprise systems are subject to institutional forces and institutional processes that set the rules of rationality, they also represent institutional commitments by constraining the action of users (e.g. Gosain 2004). Further, as the development and the use of ES functionalities often emphasize logics of certain organizational units (e.g. Orlikowski 1992), rationalities of other organizational units may be in conflict with ES usage.

In similar way as an enterprise system is a combination of different modules a company consists of subsystems (Lawrence and Lorsch 1967; Weick 1976), which vary in their degree of coupling with each other. In this research subsystems consist of organizational units, which may be loosely coupled with the other parts of the company in order to achieve innovation, agility or flexibility. Further, the use of enterprise system may combine differently coupled organizational units together. In order to study how organizational units are coupled with the system usage, this paper adopts the concept of coupling (March and Olsen 1976; Weick 1976; Orton and Weick 1990). The concept of coupling defines tightly coupled systems as highly integrated and responsive to each other, while decoupled systems are seen as separate and indifferent to whatever occurs in other parts of the system. Loose coupling includes the presence of both tight coupling and decoupling (e.g. Berente, 2009). Because disturbances in one part of a system need not cause disturbances in other parts, loosely coupled organizations are currently seen to survive longer (Czarniawska, 2008). This paper also recognizes recent literature on coupling in organizations (Fitz-Gerald and Carroll 2006; Volkoff et al. 2007; Berente 2009; Marabelli and Newell 2010).

The business value of enterprise systems is rarely linked to the ES technology itself, but rather to how organizational features support the system usage (e.g. Davenport

1998; Peppard and Ward 2005; Zammuto et al. 2007). By adopting a commonly used framework for the system usage i.e. user, task and system (e.g. Burton-Jones and Straub 2006) and recognizing the complexity of ES use this paper focuses on the influence of organizational unit and work assignment on system usage. By analyzing organizational unit coupling and work assignment coupling this paper also participates in the discussion of appropriateness of ES in the organizations (Berente et al. 2008; Berente 2009).

3.0 Method

By adopting a view that reality is socially constructed by humans this paper attempted to understand the enterprise system usage through the meanings that users assigned to it. As ES users translated these meanings according to their own frames of reference, this research employed the interpretive case study approach (Walsham 1993). The interpretive approach was selected in order to help to make sense of present events and in order to recognize the formation of new patterns in everyday staffing practises. The aim was to be close to the everyday practises and the system use, while keeping enough distance to be able to problematize them (Czarniawska, 2008).

In order to reveal the underlying assumptions, expectations, and knowledge that people had about global staffing process and the use of new enterprise system functionalities in it, we conducted focused interviews in the case company, here named Neon. During the first phase between December 2008 and September 2009 we conducted 12 focused interviews about the company's transformation process, newly implemented matrix organization and the new enterprise system functionalities. In order to achieve a comprehensive understanding about the use of the new ES functionalities in different parts of the organization, 19 additional interviews were conducted between March and August in 2010. The total of 31 interviews covered different interest groups, positions, competence areas or industry fields. One or two researchers conducted face-to-face interviews on interviewees' own experiences and perceptions. The interviews lasted for 40-90 minutes, they were recorded on MP3 and later transcribed for subsequent analysis. Furthermore, an extensive review of the company's documents, Intranet and training materials was carried out.

As the research progressed, the research data was analyzed “in order to draw valid meaning to realize when an interview should be conducted to fill in gaps” (Miles and Huberman 1994). The analysis and interpretation of the research data continued throughout the research in order to assure that the findings were grounded in the case data. In order to categorize the data the research data was coded. During the initial coding codes such as Requested competence, Work assignment, Nature of project work, Time frame, Target customer, System, Organizational unit or Individual characteristics of employees emerged from the data (Figure 1, I Initial coding). These emerged codes were joined together into categories (Figure 1, II Coding) such as features of Work assignment (WA), Organizational unit (OU), Individual characteristics (IC), Target customer (TC), and System (SYS). As this research adopted a view that the system usage was more linked with work assignment and user than the features of the enterprise system itself, the system was cut out from the data analysis. Next, these categories were placed in the framework of system usage (e.g. Burton-Jones and Straub, 2006) by linking target customer and individual characteristics with both work assignment and organizational unit (Figure 1, III System usage). Thereafter, organizational unit and work assignment were combined with the concept of coupling (Figure 1, IV Coupling). Analyzing of research findings was done at the organizational unit level.

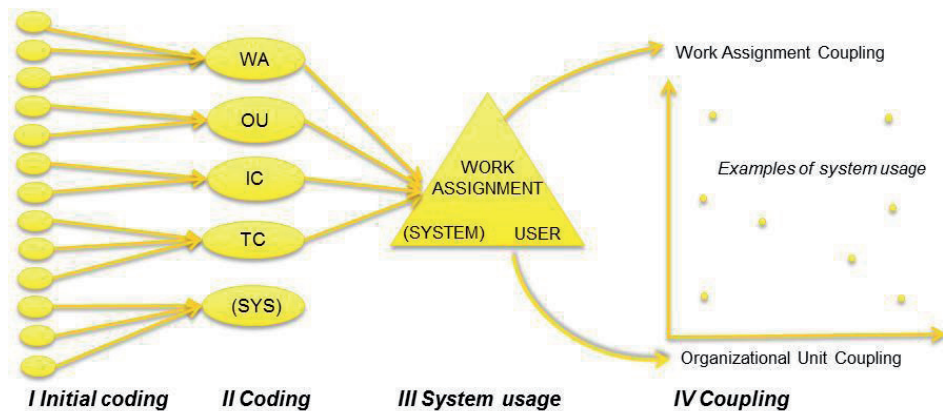


Figure 1. Research phases

4.0 Case Description

4.1 4.1 Case Company

The case company Neon (a pseudonym) is a large European high-tech company operating in project business. With over 16.000 employees in close to 30 countries it delivered IT, R&D, and consulting services to several customer sectors either locally or globally. At the beginning of 2009 Neon implemented a new matrix organization structure in order to support its new corporate strategy and a global project delivery model. The transformation process was materialized through a transformation program spreading over a three-year period from 2009 to 2011.

Previously the company structure had been based on customer-specific industries, which varied greatly in their size, procedures, operations, or ability and need to benefit from the global network. During the transformation process employees were continuously transferred from industries into competence pools located in service lines. These competence pools were structured according to the employees' competencies on certain technology or work assignments. In the new matrix structure the industries were responsible for sales and customer relationships, and the service lines took care of project or service delivery. While service lines became responsible for delivery, the business responsibility remained at the customer-specific industries.

4.2 4.2 Staffing and Enterprise System

As an important part of its new strategy and global project delivery model Neon implemented a new global staffing process in February 2009. This new global staffing process replaced small, industry- or customer-specific teams, which had taken care of every phase of the customer projects. The new staffing function aimed to ensure that the external customer needs were combined with the internal employee competencies by allocating right people to the customer projects and services. It also aimed at maximizing the utilization of the company's human capital globally. The staffing management group consisted of about 50 global and country staffing managers organized first globally by competence areas. Due to e.g. challenges of geographical

distances, time zones and language requirements, staffing function was reorganized by delivery countries in January 2010.

In order to support its global project delivery model and staffing process Neon modified its ES with new functionalities, the project resource management (RM) module and competence catalogue (CC). In practice these new ES functionalities were used for both staffing of projects and staffing of continuous services. Neon's enterprise system had mostly been implemented during the years 2004-2009, while in the spring 2010 some organizational units were in the middle of their first ES implementation (Figure 2). Based on a commercial, US-based product Neon's enterprise system was integrated with local banks, local payroll systems, common invoice system and common reporting and budgeting system (Mattila et al. 2010b). It also had the basic operational functionalities for an expert organization. However, the ongoing organizational transformation process with simultaneous implementation of new procedures and tools set a wide variety of challenges for the organization (Mattila et al. 2010a).

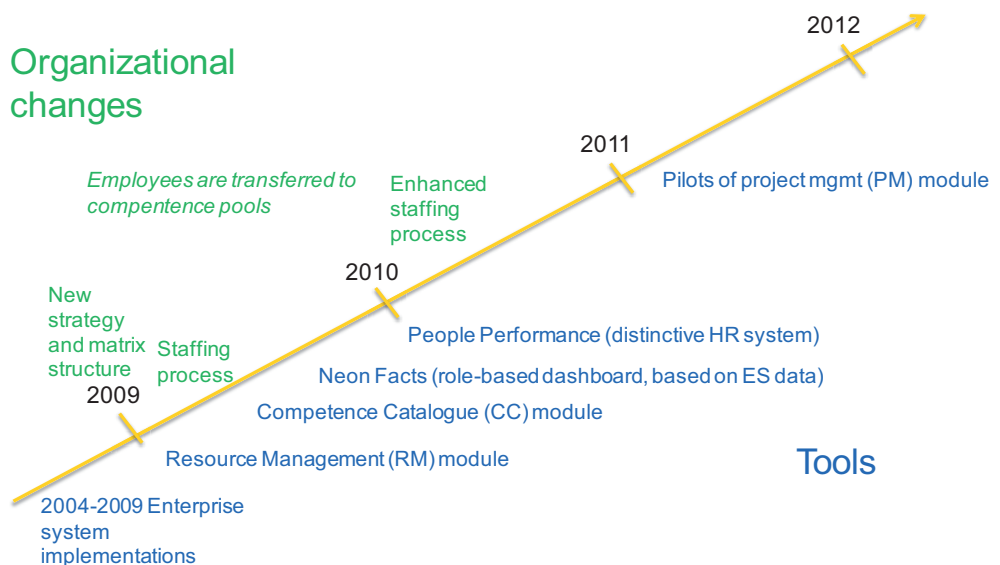


Figure 2. Timeline of organizational transformation process and new tools

The employees were expected to input and update their competence profiles and administrative assignments into the system on a regular basis. The line managers were

responsible for the utilization rate and that the employees work assignments were updated in the RM module. On a high level the resource searching and matching went as follows. First, a resource requester such as a project manager planned the project resource requirements and assignments. Then a project manager sent a resource request to the global staffing monitor by using the RM module. Next, the global staffing monitor allocated a resource request to a staffing manager in a certain delivery country. In order to find suitable candidates the staffing manager reviewed competence requirements as well as the utilization and assignments of employees by using the CC and the RM modules and his/her personal networks. After matching the requirements and resources the staffing manager offered candidates to the project manager, who made the final decision in cooperation with business units.

If internal candidates were not found, staffing was allowed to use subcontracting, internal competence development or recruiting in collaboration with business units. However, responsibilities between industries and service lines regarding these procedures were unclear. As all the interest groups were eager to acquire the best available resources for their work assignments, for example internal competence development through project work required a lot of negotiations and caused conflicts between different interest groups. Also the role of staffing between industries and service lines was confusing as staffing managers had neither business nor project delivery responsibility.

In conclusion, the business units argued being losing business opportunities all the time due to the unclear staffing process. Further, in spite of the formal staffing process, a lot of staffing seemed to be carried out separately through personal networks. Particularly experienced employees took advantage of their own networks, while inexperienced employees were more dependent on the formal staffing process and new ES functionalities.

4.3 4.3 Work Assignments

Work schedules and reservations were typically input into the RM at the beginning of the project, but they were not updated after that. As project work assignments were highly dependent on other work assignments, idle time commonly occurred. However,

costs of idle time were handled differently in different organizational units causing conflicts between them. Also some work assignments such as sales work or internal development were not visible in the system. The inaccurate and incomplete reservation data in the system caused misunderstandings and conflicts between the resource seeking industries and the resource offering service lines. Due to unreliable reservation data the system could suggest candidates, who were not available in practice:

"The problem is that the information is not updated regularly. For example I know that a couple of persons have extremely heavy work load, but according to the RM module their work loads are practically zero. The challenge is that if a person works for sales, there is not necessarily a project in which he/she could be assigned to in order to get his/her work load visible. Another thing is that I have project managers, who are making assignments to a project by themselves. And when they are busy in taking care of many things at the same time, they easily forget to update their own reservations." Head of Service Unit

4.4 4.4 Competencies

As job titles and descriptions varied in different parts of the organization and definition of resource request typically required a lot of technical knowledge of possible competence areas, some users were sceptical about the use of the RM module. Generic competencies (such as project management competencies) serving different businesses were often easier to define into the system than more specific technology competencies. Some businesses had solved this problem by adding their special business competencies into the system. However, defining of competence items into the system was seen frustrating as one interviewee expressed:

"It is visible, that Neon is mostly a software development company. Competencies are to a large degree defined into it (competence catalogue) according to software development assignments. The same shows up in our People Performance tool (dedicated tool for HR) too. And our competencies are always very difficult to find from any of the tools used in Neon." Service Desk Manager

The employees rated their competence levels by using objective evaluations such as course degrees or certificates or by evaluating them subjectively. Basically the employees were seen willing to take any kind of task that had a fit with their competencies. However, some employees were arguably hiding certain competencies in order to avoid work assignments in certain competence areas. Also employees' eagerness to develop their existing competencies seemed to be impossible to define into the system. These subjective evaluations as well as incomplete competence profiles decreased the trust in the quality of the data.

The competence profiles included an employee's skills and knowledge in a certain competence area. Employee's personal features such as cooperation skills, motivation, drive, behavior or on-the-job experience were not included into the competence catalogue. However, these features were emphasized in project work, where personal relationships between project members and customers were very important. Finding the best possible mix between features of work assignment and personal characteristics of a person required a lot of communication between staffing and line managers. As a result staffing should have known a person so well that it was able to identify those of his/her competencies and shortcomings that had an influence on performing a work assignment.

Transferring employees back and forth between industries and service lines set challenges for maintaining customer or industry specific knowledge. In large competence pools line managers were not always aware of the customer or industry specific competencies of their recently arrived subordinates. Defining of these specific competencies into competence profiles was considered difficult or even impossible.

4.5 4.5 Target Customer

The system usage was also influenced by local institutionalized procedures in different parts of the organization. These procedures were related with e.g. their target customers. For example the bidding phase differed between customers. While some customers expected a response to the request for a tender in two months, some expected to get a response in a couple of hours. In addition to differences in time frame, the customers' established procedures regarding interviews of key persons,

elaborateness of agreements or willingness to use global delivery centers varied greatly. Most surprising finding was that the use of the RM module varied even inside the staffing function.

5.0 Case Analysis and Discussion

As demonstrated above the use of staffing process and the new ES functionalities varied greatly between organizational units. In this paper the system use was analyzed by leaving out the ES technology itself and focusing on:

- The features of organizational unit
- The features of work assignment
- Individual characteristics, and
- Target customer

The features of an organizational unit consisted of characteristics which illustrated the unit's dependence on other organizational units. For example some organizational units had very different business model and everyday work practices, they operated in different locations and time zones, and they were forced to use the system. *The features of work assignment* represented the nature of work assignment, i.e. requested skills, competencies and technologies, time frame, or requirements of project work. Respectively *Individual characteristics* consisted of features of requested competence and employee's own attitude towards the system usage. These features included level, evaluation and demand of person's competencies, ego, pride, professionalism, background, or other features such as motivation, cooperation, drive or personal characteristics. *Target customer* included characteristics such as procedures, business environment or specific requirements, i.e. language, confidentiality, customer or industry specific knowledge, which had an influence on the system usage. Individual characteristics and target customer had an impact on system usage throughout both work assignment and organizational unit.

In order to uncover the relationships between these elements a 2-dimensional framework of system usage was created (Figure 3). In this framework the x-axis represented the nature of unit coupling and y-axis the nature of work assignment coupling. Basically the work assignment coupling was high when the features of work assignment supported the system usage. For example requested skills, competencies

and technologies could be defined easily and unequivocally and personal knowing of resource was not necessary. Respectively unit coupling was high when an organizational unit was highly dependent on other organizational units, staffing process and the use of new ES functionalities. These organizational units often represented large competence pools in service lines. Also some industry units, whose former employees were transferred into these competence pools, had high unit coupling. Also established procedures with target customers and individual characteristics impacted both unit and work assignment coupling and the system usage.

In the second phase, the 2-dimensional framework of system use was completed by bringing the concepts of coupling (Orton and Weick 1990) into the context of system usage. The theoretical background of tight and loose coupling as well as decoupling was presented in the theoretical part of this paper. Next, the system usage was analyzed in each of these dimensions by introducing examples of system usage in Neon.

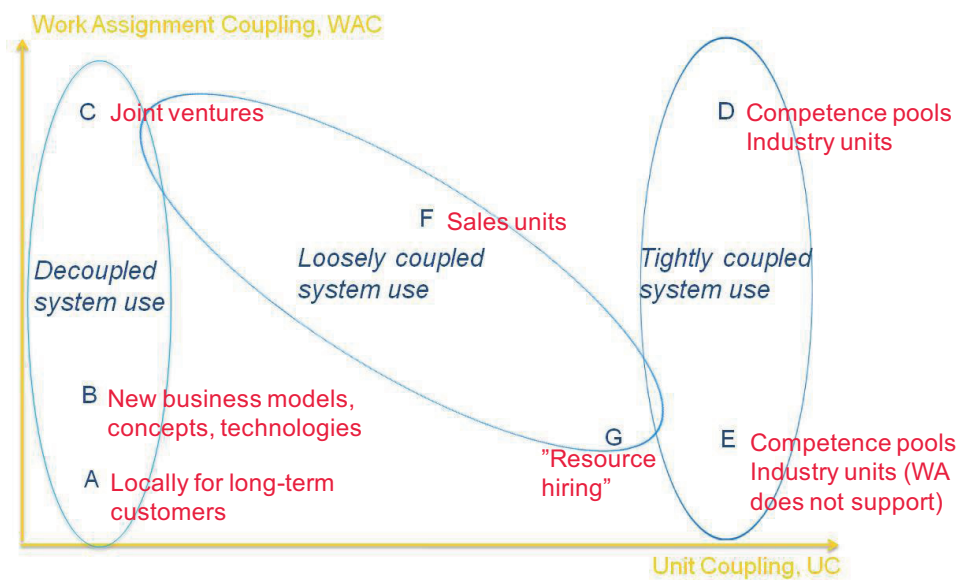


Figure 3. Coupling of system usage in Neon

5.1 5.1 Decoupled System Usage

First, some organizational units were knowingly disconnected from the system use. These organizational units were typically located in an industry, provided projects and services locally for certain long-term customers or sold their own software products. Naturally, requested competencies and technologies were found within their own organizational units. They had often not adopted a matrix form, but were operating in a hierarchical or in a hybrid form. Customers of these locally operating units were not ready to use the global delivery model often having certain specific requirements such as language or very strict confidentiality requirements as one interviewee narrated:

”We have long-term relationships with our customers. Customers are willing to know our people and of course we want to know them too. It has been a clear advantage in our deliveries that we know each other and our respective procedures”. Project Manager.

Due to the fact that both unit coupling and work assignment coupling of these organizational units were low the system usage was categorized as **Decoupled** (Figure 3, A).

Second, also some other parts of the company seemed to be disunited from the system use. The aim of these parts of the organization was to find new customers by implementing new business models, concepts, services or technologies. The ways to do business with these new customers were not established and the decision making process in e.g. offering or staffing phase was more flexible. The nature of their work assignments differed greatly from the main business in the company. For example these work assignments typically required a lot of work in advance, lasted less than 3 months, sometimes a couple of hours only and were invoiced by hours, not by days. Due to these reasons the resource planning was made at a remarkably detailed level and the use of common staffing procedures as well as the RM module was seen too complicated. As a result these units had implemented their own resource management tool, My Staffing Beta. Typically these units had low unit coupling and from low to medium work assignment coupling (Figure 3, B).

Third, some joint ventures created challenges for common staffing process and the use of the ES functionalities. These organizational units had not adopted common procedures and tools yet, although their staffing needs were high. At the time of the research these units were still decoupled from system usage with low unit coupling and high work assignment coupling (Figure 3, C).

5.2 5.2 Tightly Coupled System Usage

On one hand, large competence pools were very dependent on the resource requests they received from other parts of the organization. Typically these units operated in an integrated matrix structure, which required a lot of connections between e.g. different superiors, locations, or time zones. Formal staffing procedures and the ES functionalities seemed to be essential for these units. On the other hand, employees of these large competence pools had been transferred from the industry units. As the industry units had lost their competencies, they were very dependent on the staffing process and the RM as one interviewee narrated:

” A person, who has people, also has the power. Of course it is more challenging for me now, because previously I used to be self-sufficient, I had project managers, architects, consultants, and all the prioritizing in my own hands. Now I am totally dependent on the staffing process. And in order to get things work, that we really have employees with right competence profiles, staffing has a challenge how it succeeds in allocating and prioritizing existing employees for different assignments. Of course it (staffing) is allowed to use subcontractors, if it doesn't find any in the organization. But it will be challenging, because certain competences such as a project manager are in a key role in a project.” Director, Industry Unit

As unit coupling of these organizational units was high, the system usage was categorized as **Tightly coupled**. Typically work assignment coupling was also high, although it varied according to e.g. requested skills, technologies and customer or industry specific competencies (Figure 3, D). As a matter of fact the new ES functionalities were used in these organizational units even if the nature of the work assignment did not exactly support the system usage (Figure 3, E).

5.3 5.3 Loosely Coupled System Usage

As illustrated above low organizational unit coupling was the reason for decoupling, while high organizational unit coupling was the reason for tight coupling. **Loosely coupled system usage** (Figure 3) had features from both of them. The main reasons for loose coupling were the impact of target customer and individual characteristics.

The sales process seemed to be loosely coupled with system use. Although the sales units required information on competencies during the sales process, staffing was rarely requested to map a certain competence area. Obviously unclear boundaries and lack of common procedures inhibited collaboration between the staffing function and the sales units. Also the individual characteristics of the persons involved and the procedures of target customers had an important impact on collaboration. Further, competence areas regarding sales cases seemed sometimes so narrow that the sales person already knew the possible candidates and their availabilities without staffing and the system use. Typically unit coupling of sales units was average, while work assignment coupling varied from low to high (Figure 3, F).

Target customers had often certain established procedures that did not support the use of staffing and the new ES functionalities. For example some organizational units operated in industry fields of high competition, employed new technologies, and provided projects and services to geographically distributed customers. As unit coupling was rather high the work assignment coupling was low (Figure 3, G). In fact staffing activities of these organizational units resembled resource hiring.

Individual characteristics were another reason for loosely coupled system usage. According to some interviewees the definition of competencies into the system was difficult and frustrating. Particularly, top consultants, who were always busy with their work assignments and got them through informal channels in any event, felt inputting and updating of competence profiles useless. In addition, the information regarding competencies was input into two different systems in different formats. In conclusion, the main deficiency seemed to be that information regarding employees' reservations was not created during the project management process, but the

reservation data was expected to be input into the system for staffing purposes. There were also some competing views about who should use the system in the first place.

6.0 Conclusion and Implications

Based on the in-depth case data from different interest groups within the publicly quoted case company, the paper studies why the use of the new staffing procedures and enterprise system functionalities differs between organizational units. By employing the lens of institutional theory and the concept of coupling (Orton and Weick 1990) into the context of system usage (Burton-Jones and Straub 2006) and by adopting the view that the business value of the enterprise system is rarely linked with the features of the ES itself (e.g. Davenport 1998; Peppard and Ward 2005; Zammuto et al. 2007), this paper focuses on the effect of organizational unit and work assignment on system usage.

The findings show how organizational units are differently combined with the system usage in Neon. These differences are mainly caused by the features of organizational unit, the features of work assignment, individual characteristics, and target customer. On one hand both resource offering competence pools and resource seeking industry units operating in a matrix structure are highly dependent on common staffing procedures and the use of new ES functionalities. Basically the system is used for staffing all work assignments in these organizational units even if the features of work assignment do not always exactly support the system usage. Typically the features of work assignment support the system usage when requested skills, competencies and technologies are easily and unequivocally definable and knowing of employees personally is not necessary. On the other hand some organizational units are consciously separated and disconnected from the common staffing process and the use of new ES functionalities in Neon. Generally requested competencies and technologies are found in their own organizational units, and their business model and everyday activities differ greatly from the main business in the company. Also some joint ventures are currently disconnected from the system usage. However, due to the high work assignment coupling of these units, it would be beneficial to combine them more tightly with the system usage. Another issue is that due to e.g. organizational

boundaries and strategy it may be completely out of the question to combine joint ventures more tightly with the system usage.

Individuals and different interest groups respond in different ways to the newly implemented staffing process and the new enterprise system functionalities. Due to limited interest and time or difficulties in seeing the benefits of the new ways of doing things they are not able to use new functionalities properly. Also their individual characteristics have an impact on system usage through level, evaluation and demand of employees' competencies, other features such as motivation, cooperation, drive and personal characteristics, ego, pride, or professionalism.

Previous ways of staffing are not possible in the new matrix organization, while operative implementation of new procedures and tools is still ongoing. Procedures regarding e.g. project management differ between organizational units being influenced by individuals' and organizational units' own background as well as established procedures of target customers. These established procedures of target customers often include certain specific requirements regarding schedule, language, confidentiality, or customer of industry specific knowledge, which do not support the use of new ES functionalities. Further, some organizational units operating in industry fields of high competition by employing new technologies and by providing projects and services to geographically distributed customers are very willing to adjust their internal procedures according to the customer needs. As a matter of fact target customers mainly define how the business is done in these cases. However, due to the great variation in both unit coupling and work assignment coupling, it would be beneficial to reconsider if it is reasonable to combine certain organizational units, e.g. certain sales units, more tightly with the system usage. Recognizing of all skills and competencies as well as availabilities may in turn create opportunities and new business models in the knowledge-intensive project organization.

6.1 6.1 Theoretical Implications

The paper describes how the ES functionalities are locally used in conducting everyday staffing actions by dismantling elements of system usage for organizational unit and work assignment that are studied separately. As expected local staffing

practices are connected to many other actions and reproduced in organizational parts gradually becoming translocal. The paper suggests that new elements – organizational unit and target customer – have an important impact on the use of common staffing procedures and new ES modules in a knowledge-intensive project organization and brings them into the framework of system usage. Although the new elements of system usage cannot be generalized to all organizations, they may be useful in analyzing system usage in knowledge-intensive project organizations.

By emphasizing the use of new enterprise system functionalities should be focused on certain organizational units and work assignments that have the best fit with the system usage, it also participates in the discussion of appropriateness of ES in the organizations (Berente 2009).

6.2 6.2 Practical Implications

The implementation of common staffing procedures and ES functionalities is seen as the management's way to improve efficiency of resource allocation and control in the newly implemented matrix organization. By using these procedures and tools Neon aims to transform into a virtual organization in which the required project teams will be staffed virtually.

However, the system usage for integrating competencies, skills and availabilities with work assignments poses challenges. For example finding the best possible mix between the requested competencies, person, and work assignment requires that all relevant requested competencies are defined into the system. While staffing and the use of new ES functionalities requires system usage skills, wide knowledge of requested competencies or technologies as well as networking skills, dedicated users, who would use the system on behalf of the line managers, could be worth considering. Due to the fact that the use of new ES functionalities serve the staffing function more than other organization units, the staffing function should take more responsibility about for example support and training and linking the entire project delivery process with the system usage. Further, the information regarding reservations is not produced during the project management process and the reservation data is often updated

manually into the ES. The implementation of a new project management module in due course will probably reduce or even take away this manual work.

While the staffing network offers an unusual way to collaborate across boundaries in order to combine skilled employees into a suitable project team, the prioritizing seemed to be very challenging. This is emphasized when certain top consultants are requested at the same time for many simultaneous projects for different customer projects. Even if the competencies and availabilities of top consultants are more visible in the organization, the staffing decisions require a lot of negotiations between several parties. Further, although finding some sporadic top level competencies seems to be important for interviewees, all important competencies should be developed in order to ensure the company's long-term success. However, the procedures for internal competence development by using staffing and common tools are not yet stabilized in Neon.

In conclusion, this paper recommends reconsidering the system usage regarding those organizational units and work assignments, which have poor fit with the system usage. It also suggests that some organizational units, such as certain sales units or joint ventures, could be more tightly coupled with the system usage. Regardless, it seems to be too simplified to use the system only for simple work assignments, while more complex work assignments are handled with informal, personal networks. In fact, some interviewees are irritated about how even some of the simplest and shortest work assignments are carried out using the system.

6.3 6.3 Future Research

As mentioned before the everyday staffing tasks in Neon are carried out by using both *formal and informal networks*. Future research will go deeper in studying the differences of system usage between employees and employee groups.

In a knowledge-intensive company the professional norms are steering actions. These professional norms are a part of the employees' *professional identity*. As the data collection at Neon continues the research is expected to raise discussion about *internal competence development* in a way that enables the company to remain viable.

Future research will combine this fundamental managerial problem about human competencies at work with the system usage.

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Paper IV

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ENTERPRISE SYSTEMS AS COORDINATING TOOL IN LARGE SCALE DISTRIBUTED DEVELOPMENT

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Abstract

In this paper, we explore the role of Enterprise systems in coordinating knowledge-intensive work. Drawing on an in-depth case study conducted in a global high-tech, knowledge-intensive project organization, this paper offers insights into different coordinative capabilities of enterprise systems and the relationship with the project context. By employing the concepts of boundary object and boundary spanning this paper suggests that the enterprise systems and related IT components can only partially support information sharing between organizational groups. The organizational actors in different roles drew on enterprise systems components and IT tools as boundary objects to a varying degree. These boundary objects were more significant to some actors than others. The paper argues that different kinds of boundary objects and communication were needed depending on the project context. The findings also suggest that staffing for high value strategic projects could be effectively handled through the informal organization whereas routine staffing could be handled with the help of the enterprise systems.

Keywords: Boundary Objects, Boundary Resources, Enterprise Systems, Expertise, Knowledge-intensive organization, Organizational change, Staffing.

1 Introduction

Many global knowledge-intensive organizations are restructuring through flattening their structure and distributing the work across the globe to become more customer oriented and to focus on relationships with their key customers. These flexible and informal organizational forms have strong employee involvement and they rely on self-organizing autonomous teams (Greenwood et al., 2009). Due to the informality they face challenges of coordination and effective resource utilization across diverse expert groups and spatial and temporal boundaries. Enterprise systems (ES) are often employed by global high-tech companies to deal with these challenges of work coordination and project resourcing. This may allow for flexible work organization, however may also alienate the workers and if executed poorly might hinder the crucial transfer of knowledge across work sites causing inefficiency and poor quality of work. Despite the widespread deployment and use of ES, we have only limited understanding of the effectiveness of ES as a coordination tool in knowledge-intensive, high-tech organizations with diverse expert groups. This study aims to address this knowledge gap.

Existing studies on coordination between diverse expert groups have emphasized the challenges of sharing knowledge and creating shared understandings around activities (Boland and Tenkasi, 1995). Coordination in these contexts, as a result, might be hinging less on structural arrangements and more dependent on knowledge integration (Argote, 1999; Faraj and Xiao, 2006). Many studies draw on the concept of “boundary object” to illustrate the role played by objects in establishing shared meanings and understandings across diverse expert groups in organizations (e.g. Carlile, 2002). The boundary-crossing capacities of objects are also significant for facilitating coordination across expert groups (Levina and Vaast, 2005).

To investigate the potential role of the ES in coordinating work in a globally distributed project setting we conducted an in-depth case study in a knowledge-intensive project organization that was undergoing a transformation from a hierarchical structure, with operations in a few countries, into a multinational matrix organization. The key research question the paper seeks to address is: *What is the role of ES in coordinating knowledge-intensive work?* Given this role, to what extent ES served as a boundary object? By focusing on the role of ES, we seek to gain insights into different coordinative capabilities of components of the ES.

Our findings suggest that the ES and related IT components could only partially support information sharing between organizational groups about project staffing. This means that staffing for high value strategic projects was handled through the informal networks within the organization whereas routine staffing was handled with the help of the ES. Furthermore, it was found that organizational actors in different roles drew on a collection of ES components and IT tools as boundary objects to a varying degree. These boundary objects were more significant for some actors than others. Finally, we found that different kind of boundary objects and communication was needed depending on the project context.

The remainder of this paper is structured as follows. Section 2 presents a review of the key concepts relating to the role of objects in coordination. Section 3 presents the research methodology and Section 4 the case description in. The analysis of the case is presented in Section 5, followed by our observations and findings in Section 6. Finally Section 7 outlines the implications of our findings for research and practice.

2 Theoretical background

Many companies seek to deal with the challenges of work coordination and project staffing by using Enterprise systems (ES) and their primary form Enterprise Resource Planning (ERP). They integrate and standardize the core business processes and information resources (Davenport, 1998) and are

claimed to create various kinds of benefits, such as lower costs, better customer service, improved resource management and performance control (Shang and Seddon, 2002). If the implementation of ES is successful it can lead to big efficiency gains, but the reported rates of failure are high (e.g. Griffith, Zammuto and Aiman-Smith, 1999). Originally ERP systems were developed with a focus on resource planning and accounting, but now they include also HR and project management functions.

Knowledge-intensive organization relies on intellectual capital and expertise (Starbuck 1992, Alvesson 1993) as well as horizontal collaboration between diverse groups. For coordinating work between employees across boundaries of communities, existing research suggests the use of boundary objects (Star and Griesemer, 1989) or other mechanisms facilitating interaction. Boundary objects are a range of artifacts that have interpretive flexibility and can enable coordination and knowledge sharing between diverse groups (Sapsed and Salter, 2004). Faraj and Sproull (2000) stress that coordination of diverse expertise is a more important predictor of project effectiveness than traditional factors such as administrative coordination, individual expertise, or development methodologies.

Coordinating work in laterally structured organizations requires communication within and between different communities of knowledge workers. Boland and Tenkasi (1995) argue that producing knowledge in this kind of organizations requires developing perspectives inside a community, perspective making, and taking the perspectives of others into account, perspective taking. Boundary objects facilitate the development of coherence across intersecting social worlds.

Engaging members of different communities to interact with each other is referred to as boundary spanning. Individuals who can link separated groups of employees and facilitate information sharing are called boundary spanners. IT artifacts may be assigned as boundary objects but they may not, however, become boundary objects-in-use. Similarly, nominated boundary spanners may not become boundary spanners-in-practice. (Levina and Vaast, 2005).

Following Jonsson et al. (2009) we see that ES may turn boundary-spanning into an IT-intense activity, as they produce and transform information about key activities of the company and there is no other means of acquiring or processing this information. In our case the change of the staffing process itself is altered.

Organizational members may engage in cross-boundary coordination in several ways. Coordination may be aided by the processes of transferring, translating and transforming (Carlile, 2002; Kellogg et al., 2006). However, Kellogg et al. (2006) found in a dynamic environment "*boundary objects.. may be less effective in nonhierarchical and shifting contexts*" (p. 24), instead coordination across the different groups involved the following practices: 1) making work visible ("*display*" practices) 2) making work legible to other groups ("*representation*") and 3) assembling products, such as client presentations, from loosely linked items produced by different communities ("*assembly*" practice). Barrett and Oborn (2010) stress that boundary objects and their use have implications for knowledge sharing and power relations in distributed software development. These political dynamics are visible in our case. The relational aspects of boundary objects are for our case, as the project organization is maintained through the system.

3 Research approach

In this case study we adopted an interpretive case study approach. Walsham (1995, p.79) argues that generalization from interpretive research may take the form of development of concepts, theory, specific implications or rich insights. The rich insights we gained from our study may be useful for understanding related work in other organizational settings (Walsham, 1995). Our challenge was to identify deep structures, which were hidden below everyday work activities and which had an important influence on the use of formal and informal networks in the case company. We used theories and concepts regarding boundary spanning and identification in an exploratory fashion as sensitizing device, when relationships between different variables were not expressed (Miles and Huberman, 1994, Myers, 2009). The research question of this case study emerged from the research

data as one interviewee formulated the need for transferring the customer team spirit into offshoring countries:

“We have to be happy to work for a certain customer in our offshoring countries too. That we all have the customer’s flag on the table and we keep saying to ourselves ‘yippee, the customer will be able to manufacture its products since we have finished our own work assignments’. We should be able to transfer our own pride and joy [from Nordic countries] to offshoring countries too.” Director (Role: Business Manager)

Based on such comments we started analyzing the ways in which the goals and values of the team are shared across the boundaries. This led us to look at the ways in which the system can act as a coordinating tool and what the key boundary objects and boundary spanners are and what they should transmit across.

3.1 Data collection

We conducted an in depth case study in a large European high tech company, here named Neon. Bearing in mind criteria for good qualitative data (e.g. Patton, 2002; Myers, 2009) the empirical material consisted of interview transcripts, field notes from observations, and excerpts from documents. The main emphasis was on the analysis of interview transcripts and notes whilst official documents complemented the data collection by offering further insights into phenomena under investigation. In order to get a bigger picture about the phenomena and updating existing data we used these materials during the whole research process.

The empirical data gathering took two and a half years from December 2008 to February 2011. We gathered interview data including 41 interviews in three phases. The lead author conducted most of the interviews, with all researchers participating in the data analysis. In order to make a better perspective of how the boundary spanning mechanisms and identification were structured we introduced interviewees’ “main roles” during the staffing process. These main work roles were: Sales Manager, Customer Manager, Business Manager, Project Manager, Staffing Manager, Line Manager, HR Manager, Project Member, Controller, and ES Developer. Face-to-face interviews lasted for 40-80 minutes, they were recorded and later transcribed for subsequent analysis.

3.2 Data analysis

In order to draw valid meaning and to realize when an interview should be conducted to fill in gaps we adopted a continuous data analyzing method (Miles and Huberman, 1994). All the transcriptions from previous phases were reread, coded and discussed thoroughly in the research group meetings. In these meetings we presented the emerging explanatory themes and patterns, and discussed these along with our main interpretations and explanations. The coding process involved categorization of empirical data based on the emerging constructs. During the initial coding phase specific codes emerged from the data. These codes were for example technology, work role, virtual team, collaboration activity, collaboration device, customer, or utilization. We continuously compared emerged codes with respective literature in order to find theories and models that could be used as a sensitizing device. We adopted three cross-boundary practices – display, representation, and assembly - (Kellogg et al., 2006) as our second order categories and combined emerged codes with them.

4 Case description

4.1 Company description

The case company Neon (a pseudonym) is a large European high-tech company operating in project business. With over 16.000 employees in close to 30 countries it delivers IT, R&D, and consulting services to several customer sectors either locally or globally.

At the beginning of 2009 Neon implemented a new three-dimensional matrix organization structure in order to transform into a more horizontally integrated company (*Figure 1*). The matrix model replaced former business area structure, in which there was very little interaction between business areas. As Neon’s strategy was based on differentiation and specialization as well as high value added services, the company attempted to create competitive advantage by combining advanced technology with innovations and deep understanding of customer’s businesses. In order to find growth opportunities and to respond to high price pressures the company developed the global project delivery model. In this model staffing organization replaced the team heads of small industry-specific or customer-specific teams in handling resource management.

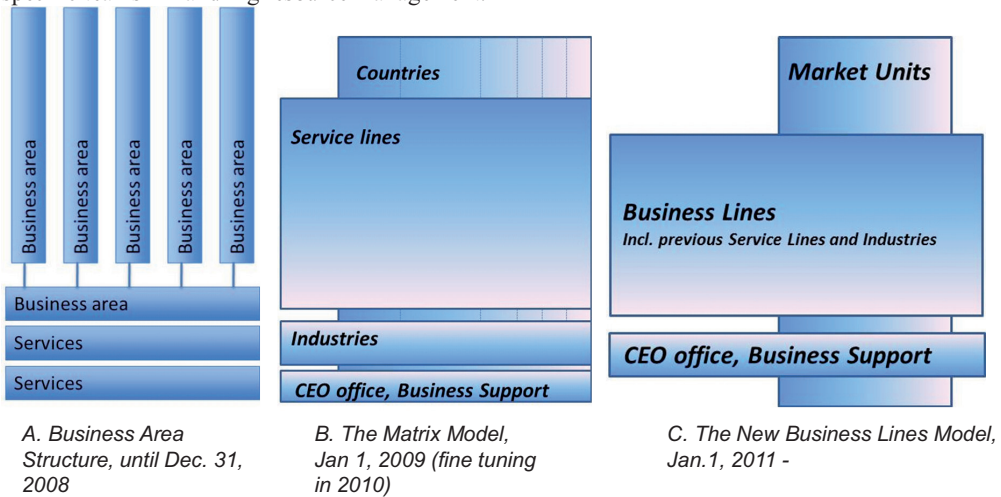


Figure 1. Organizational transformation process 2009-2011

Further, in January 2011 Neon announced the new two-dimensional Business Lines model, in which Service Lines and Industries were combined together into Business Lines and the country-dimension was replaced with market units to streamline decision-making.

4.2 Enterprise system and the formal staffing process

Neon’s enterprise system was an important tool for organizational transformation. The ES was a US-based system with the basic operational functionalities for an expert organization, integrated with local systems. Figure 2 illustrates the timeline of organizational change and related ES and systems tools. Guided by Neon’s new corporate strategy and global project delivery model the company established a new staffing process in February 2009. In this process the staffing network of 50 staffing managers replaced the local collaboration between small customer and industry specific teams. The new staffing network aimed to ensure that the external customer needs were combined with the internal employee competencies by allocating right person to the customer projects and services.

The global staffing process was supported by new ES functionalities such as competence catalogue (CC) and resource management (RM) module. The formal staffing process and system usage seemed to be created in order to find requested resources from large resource pools organized by competencies or technologies. It aimed to reduce idle time and to mobilize free resources more easily in order to achieve higher utilization and offshoring rates. In practice the use of formal staffing process and the ES varied greatly in the organization and informal staffing networks were commonly used.

Organizational changes

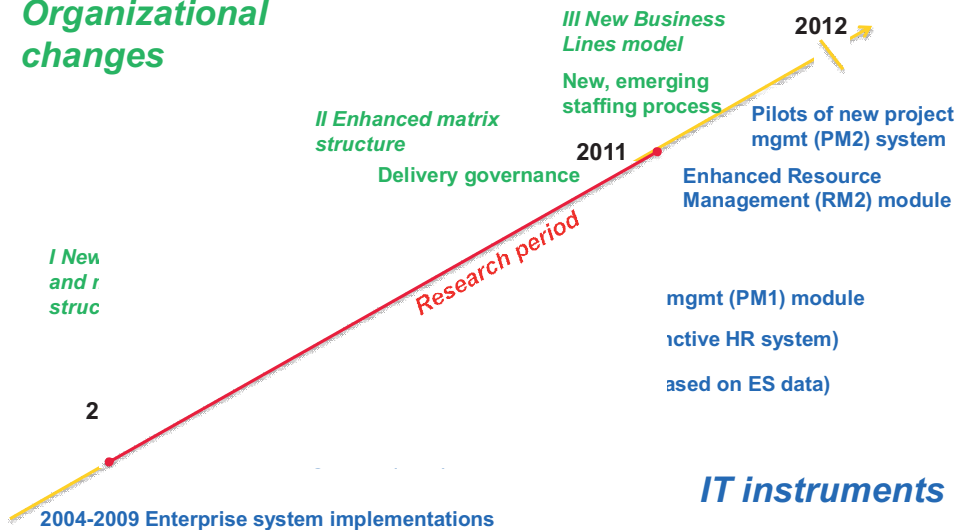


Figure 2. Organizational changes and IT instruments in Neon

4.3 Staffing process in practice

In basic staffing the prospective project management was located in the Nordic countries, while most of the project members were staffed from offshoring countries. Project members didn't know each other beforehand. In the sales phase an architect planned the first solution to the customer's problem. In this first project set-up selected technologies were mapped with requested competence profiles. Regardless of continuous transfers of employees back and forth in the organization, line managers were quite familiar with subordinates' competencies, previous project experiences or availabilities. According to this information, employees' CVs were updated with relevant competencies and project experience before sending them to the customer. Generally, a project manager and some key persons were provisionally allocated for the customer project in the ES during the sales phase. However, as the sales process was rather time consuming, the provisionally reserved persons were usually allocated for another project when the bid was converted into an agreement.

Staffing manager's role and position in the organization had been quite unclear during the organizational transformation. The business managers to whom they reported set their performance measures. In order to perform well staffing managers were expected to be familiar with the unit they worked for. Sometimes a former staffing manager transferred the knowledge about employees and competencies in the unit to his or her successor, but contacts with line managers were seen as essential:

"Usually this (mapping employees and competencies) takes place via e-mails, maybe sometimes by phone. But you know, the staffing manager needs to know the organization she or he is responsible for." Staffing Manager (Role: Staffing Manager)

Although the staffing manager was able to find the theoretically best match between requested competencies and individuals by using the ES, the staffing manager was not able to know all employees in the organization. In order find a suitable person for a certain work assignment line managers activated their own networks as one line manager described:

"First I will check my own resources (subordinates), if someone is actually free or if I am able to rotate someone, who matches better with the new work assignment. If I don't find anyone, I will ask line managers in my circle of acquaintances in JAVA practice. And if I don't get help from local line

managers in our own country, I will check HR department, if there are candidates in short term hiring process. If there is someone in the interview process, I will get the interview results, CV and so on. But if there is no candidate, I will ask staffing manager if there are available resources in other units or in other countries.” Unit Head (Role: Line Manager)

Project and customer managers relied heavily on their own networks. However, in the case of global staffing geographical distance made face-to-face interviews impossible, and the project and customer managers had to rely on a staffing manager in respective off shoring country. Sometimes the results were less than stellar.

It was found that poor staffing decisions had been expensive, caused delays and negative influences, particularly on persons who had eased out from the project. Some interviewees even suspected the sincerity of some staffing managers and accused them of offering candidates with outdated or minor competencies. Project team members were not usually involved in the staffing process. In some cases the project manager insisted on interviewing them, but usually line managers took charge of the negotiations. All employees were expected to update their competencies into the Competence Catalogue, but the discipline of filling and updating the CC was poor.

“I usually check from superior, because I cannot trust the RM completely. Sometimes a person is not assigned to the project in the RM and the RM offers a person. Then it shows us that yes, a brilliant case, now we will interview a person. But when we contact the superior, the person is not available.” Manager (Role: Customer Manager)

At the time of this research the most important deficiency seemed to be that the competencies and different roles were not integrated with each other. The level of seniority was maintained at a general level, not at the competencies level. In summary, the formal staffing process required the use of the ES, but it was omitted for various reasons.

4.4 Managing the virtual team

Interviewees considered working in a virtual customer team as business as usual. The use of Neon’s common IT tools such as Live Meetings, Office Communicator or Neon Facts was seen as important in the transformation to a virtual organization and global staffing. Even if the customer had selected a global project delivery, they usually wanted to have local contact persons, who took care of all the communication during the project. Transferring project knowledge between local contact persons and employees in the offshoring countries was challenging:

“I would lie if I said that everything goes right. At least our area is quite difficult. I have a project, whose implementation started when defining was unfinished. So a part of the definitions were missing. And employees in our offshoring country are not able to look at one corner, but they should see the wholeness. So they need a lot of support from us and we haven’t understood how much support they need.” Manager (Role: Customer Manager)

Transferring customer and industry specific knowledge was another challenge:

“Off course we should agree the role the new person takes. Anyway, we have thought here,, that we are working for a certain customer. It feels that this customer connection is looser now. And if we are teaching one person for years (in off shoring country), he can easily leave the company. In my opinion the work assignments allocated into offshoring countries should be very clear. We have done these work assignments for 10 years and it is based to a great extent on tacit knowledge.” System Analyst (Role: Project Member)

In practice the customer and industry knowledge seemed to transfer during project work even if the previous workers were unwilling to transfer their knowledge. According to the interviews employees in offshoring countries had learned a lot by doing similar projects for different customers. Employees who had worked for a certain customer for a long time were often very committed to the target customer. Expert hoarding created challenges for both the staffing and managing the project. Despite

the fact that utilization rate was heavily emphasized certain key persons were kept reserved even if they didn't have work to do at the moment.

Thus Neon's new global project staffing process consisted of different cross-boundary practices. The new process required that these practices were performed using the tools within the ES. In practice however, these cross-boundary practices were more informal and based on personal relationships. As these cross-boundary practices were very significant in the global project staffing we analyzed them in detail in the empirical analysis phase.

5 Case analysis

In our analysis, several ES components and IT tools emerged as boundary objects in cross-boundary practices. We first present these objects and discuss their limitations as boundary objects. We then extended our analysis by combining two different project phases, staffing the team and managing the team. For this, we draw on Kellogg et al., (2006) work on cross-boundary practices (display, representation, and assembly) and the concept of boundary objects. Finally, we focus on the "main roles" of key staff served as boundary spanners by improving information processing among groups through better communication and uncertainty reduction.

5.1 Boundary objects in staffing

We found six important boundary objects: competence profile; CV; "informal profile"; "MySite identity"; project resource request and work load report, which were analyzed thoroughly during our research.

In practice employees were able to decide for themselves, for example, the levels of their competencies or their visibility in the system. By filling in and updating the competency catalogue within the competence profile, employees sought to integrate their competencies, experiences and roles into a coherent image of themselves. This self-created competency profile had some limitation as a boundary object, because of the reliability of the data. The performance feedback from project managers or other team members (which could have shaped the quality of the information) were not collected and stored into the ES in a structured form. The nature of competence data was very sensitive; hence there were some limitations in defining the access rights. Further, information on the seniority levels of the staff was also missing.

Naturally the customer project team split up as the project ended. As the customer was usually willing to get the project team with project members already familiar with the previous set-ups, the efficient recreation of the customer project team was tempting. Unfortunately, due to privacy regulations, customer project information was not made visible in the employees' competence profiles in the Competence Catalogue. Customer project information was stored in the ES and it was possible to transfer this information to employees' CVs. Since these CVs were used for both selling and staffing purposes with different emphasis, case-specific revisions were needed to make the CVs more effective as Boundary objects for coordination.

The interviewees in the case company revealed that there were different informal channels, which provided information about employees' competencies, experiences, motivation, cooperation skills etc. In our analysis we distinguished two different outputs, "Informal profile" and "MySite identity". Informal profile was based on internal discussions and evaluations between different parties like project managers and team members or it was based on e.g. customer evaluation. Due to the data sensitivity this information was not systematically stored in the ES and a resource requester should have known the right channel in order to get this data. This kind of informal employee project experience data from managers was largely used in the staffing process and it provided a quite realistic evaluation about an employee. MySite identity was based on employees' own, subjective view. For example by inputting certain kind of data into intranet employees aimed to strengthen certain image of

themselves. These could have been very useful in terms of richness of information they offered about the staff, but they were seldom used for staffing.

A resource request described what kinds of competencies were needed as well as when and where those competencies were needed. It had little information about the target customer, cooperation skills or motivation. A project resource request was also searching for an individual, not a project team. As project work is based on mutual trust, project managers were not necessarily willing to take whoever was available for a project without being familiar with individual’s work experience. Obviously, a lot of informal networks and tacit knowledge outside the ES was required in project staffing. These practices required some important boundary spanners that could share information about for example resource requests, original customer agreements, persons, competencies, or technologies.

5.2 Cross-boundary practices in staffing

In this section we present our analysis on the nature, form and consequences of cross-boundary collaboration and coordination at Neon. As this organizational context was seen as a “dynamic environment” we adopted Kellogg et al.’s (2006) three cross-boundary practices as described above.

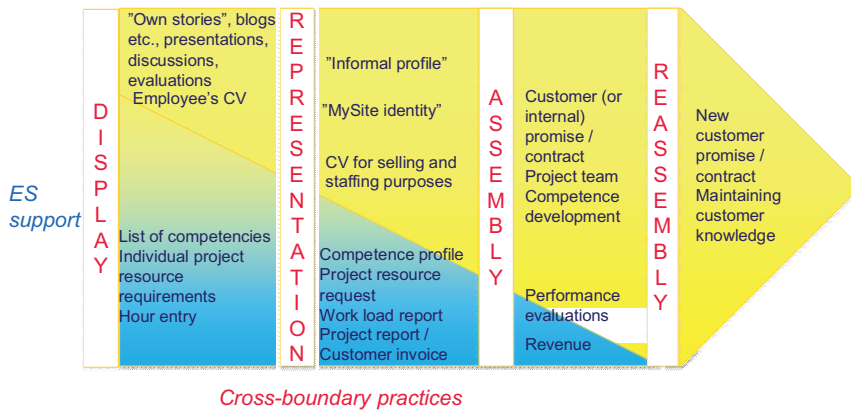


Figure 3. *Boundary objects in cross-boundary practices and the ES use in Neon*

As shown in the figure 3 the ES use (blue area) decreased fundamentally as staffing process continued and other ways in coordinating and collaborating (yellow area) became more important. Finally, the ES was only rarely used for assembly type of cross-boundary practices. In practice this meant that staffing an individual or a team was conducted by assembling loosely linked items produced by different communities. At the time of this study, the ES was not used at all for “reassembling” such as recreating global project teams. Thus the staffing process had to start over or use informal networks. Next, we analyzed boundary objects in detail in order to define how they worked in practice.

5.3 Boundary spanners

Boundary spanners and identification were analyzed by describing their main characteristics and boundary objects in use. The boundary spanners drew on key boundary objects very differently in different parts of the organization. For example sales managers rarely used the RM, while it was widely used by staffing managers. To further complicate the matters, the staffing process itself was staffed with employees who often were in low power status and it seemed that informal networks were used to bypass the official processes and this further eroded the use of the system provided boundary objects and processes. Our analysis showed that boundary spanners were identified within their immediate local working group, or organizational role group, instead of global project team.

6 Discussion

Our analysis illustrates some of the key boundary spanning mechanisms in the staffing and managing the project team. It has been shown, that key boundary objects give shape, form, and visibility to the global project staffing process. However, our case shows that it is challenging to replace local project staffing practices with global staffing process supported by advanced ES.

First, our findings indicate that in a knowledge-intensive organization, only certain parts of project staffing information can be codified and handled solely by the means of the system. Several important parts of the staffing process need informal contacts and boundary spanners to work. For example, as the knowledge about high-performers cannot be stored in the system it is challenging to recreate a new customer project team without using informal networks. Second, existing boundary spanning mechanisms are highly dependent on each other and all of the functionalities of the ES have to be in place from the start or otherwise difficult workarounds have to be found. Third, the boundary objects in the ES seem to emphasize employee's personal identity, not customer team identity. For example, the project resource request in the ES is searching for individuals, not a customer project team. Also measures in the ES often are at individual level, not at customer project team level. Finally, we argue that in this kind of large organization with flexible routines and diverse habits in different parts of organizational, there is a need for the simultaneous existence of formal boundary objects, trading zones and informal knowledge networks.

To develop this theoretical idea further we look at consulting resources needed and the ES support in four key project types at Neon: high value strategic key customer projects, ordinary renewal projects, standard system implementation projects, and maintenance projects (*Table 1*). High value strategic projects are usually tied closely to the key customer, who often asks for certain trusted workers. Staffing is handled via informal organization with direct contacts. Sales are guaranteed by known names and when projects are in trouble, certain employees are called to save the day. These projects are probably so important that they can keep their ways. The intimate relationship with customers and the reliance on key personnel gives them bargaining power against the forces of standardization within the organization. The use of key consultants requires slack, which is not supported by the staffing process and the measures used for performance measurement.

Project type/ work assignment	Resources required	Boundary problems/issues	ES support	Role of boundary spanners & informal networks
Strategic/ Key customer	“Top” competencies / High-performers	Tacit knowledge transfer Semantic	Weak	High
Renewal/ Enhancement	Customer-specific competencies	Customer references not easily available Semantic	Weak	High
Standard systems implementation	Certified, commensurable competencies (customer references)	Customer references not easily available Semantic Syntactic	Moderate	Moderate
Maintenance/ Continuous services	Technological, (commensurable) competencies	Syntactic	High	Weak

Table 1. Four project types and boundary spanning

Renewal projects usually are subject to customer-specific competencies. As customer references are not easily available in the ES, the role of boundary spanners and informal networks is emphasized. Standard system implementations request “standard” competencies. These competencies are commensurable and they can be codified quite easily into the system. Communities of knowing may

have different expressions for these competencies (syntactic issues). Further, if customer knowledge is needed, some semantic issues may also rise as different communities of knowing use different meanings, languages, have different cultures, egos, etc. In maintenance projects the key dimension is often the price of the deal. As knowledge of customer's previous set-ups is not necessary this leads into the use of e.g. technology consultants in low cost countries. Boundary objects are syntactic.

As illustrated above, staffing decision-making requires integration of knowledge from various sources. The knowledge creation within the community happens through communication. In order to present Neon's communication model we adopt two models of communication (Boland and Tenkasi, 1995) and bring them into this organizational context. Communication in a local group (community of knowing) is both a language game and a transmission of messages through a conduit (Boland and Tenkasi, 1995). Boundary objects (in the ES) are seen as conduits. The conduit model forms the core of Neon's communication model. As in this model communication is described as message sending and message receiving, it can be seen suitable for solving the routine staffing cases.

Language game model is utilized in solving more complex project staffing cases. For example staffing of strategic key customer project requires tacit knowledge transfer as persons involved refine their knowledge. Boundary problems in these cases are semantic. As these cases demand integration of knowledge from different parts of the organization the role of boundary spanners and informal networks is important. It is worth noting that the wrong model of communication inscribed into the ES may hinder perspective making and perspective taking between different communities of knowing (Boland and Tenkasi, 1995).

7 Conclusion and implications

This paper presented the findings based on an investigation of the role of ES in coordinating knowledge-intensive work. We demonstrated the key role of certain boundary objects that replaced coordination based on informal, human practices. At the same time we identified gaps, where boundary spanners and informal networks are still very much needed. Our key message and finding here is that in fast-moving, post bureaucratic organizational forms there is a need for simultaneous existence of highly codified and highly informal practices. Coordination of work in this kind of organization therefore centers on the development of "trading zones" as Kellogg et al. (2006) suggests but also centers on creation of "common knowledge" through boundary objects (Carlile, 2002). This means that boundary objects and less formal trading zones need to co-exist.

The practical problem identified by Neon was how to support the reassembly of a project team a distributed work arrangement, such as the staffing process here, through an ES. It seems that the goal of codifying all resource and competence information into the system is theoretically and practically impossible and some parts of the staffing process are based on personal networks that cannot be replaced by a system. In this case the current staffing process and its supporting tools served certain types of work assignments well, but more complex consulting assignments were poorly supported. Also the need for human boundary spanners remains. These findings call for less structured tools for informal and ad-hoc communication and support for local knowledge (e.g. mental maps of staffers).

The findings also demonstrated that the staffing process relied heavily on informal connections and knowledge sharing between communities of knowing. As for example confidentiality issues restricted the sharing of knowledge about competencies or performance via the ES. It was therefore essential to nurture the right kind of informal networks that produced good collaboration. It seems that communication of complex staffing knowledge within and between Neon's multiple communities of knowing required combination of line managers or project managers and a certain set of boundary objects to take care of the more informal knowledge sharing. We believe that this may be common in all knowledge intensive work and this could be investigated in other similar contexts in the future. Furthermore, the transfer of informal knowledge about competences could be experimented with quite easily with suitable ad-hoc communication and social media tools.

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Global project organizations seek new ways to deliver projects and services more efficiently. One way to increase efficiency is restructuring and distributing work across the globe. In this work the knowledge-intensive project organization utilizes distributed teams and several IT tools, such as global Enterprise Systems (ES) and different collaboration devices. Despite the growing literature regarding the interplay between ES and organization, this complicated interaction is not thoroughly understood. After following for two and a half years the assimilation and use of the new HR-related ES functionalities in a large project organization, I describe the interaction between the ES and the knowledge-intensive organization in a new way. The study also shows how the complexity of the company's professional services and projects creates different managerial implications and organizational responses within the company.



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