

Individual information system acceptance behaviour

An electronic ordering system case

Katarina Arbin



EFI THE ECONOMIC RESEARCH INSTITUTE



Dissertation for the Degree of Doctor of Philosophy, Ph.D.
Stockholm School of Economics 2009.

© EFI and the author, 2009
ISBN 978-91-7258-782-3

Keywords:

Information system, e-procurement, e-ordering, individual, acceptance, adoption, continued use, behaviour, structures, routines, longitudinal, case study

Cover layout:

Catrine Windh and Preben Carlsson, Windh & Co

Printed by:

Elanders, Vällingby 2009

Distributed by:

EFI, The Economic Research Institute
Stockholm School of Economics
Box 6501, SE-113 83 Stockholm, Sweden
www.hhs.se/efi

Preface

This report is a result of a research project carried out at the Center for Information and Communication Research at the Economic Research Institute at the Stockholm School of Economics.

This volume is submitted as a doctor's thesis at the Stockholm School of Economics. As usual at the Economic Research Institute, the author has been entirely free to conduct and present his research in his own ways as an expression of his own ideas.

The institute is grateful for the financial support provided by the Torsten and Ragnar Söderberg Foundations which has made it possible to fulfill the project.

Stockholm May, 2009

Filip Wijkström
Director of the Economic Research Institute
at the Stockholm School of Economics

Per Andersson
Director of the Center for Information and
Communication Research at the Stockholm
School of Economics



EFI THE ECONOMIC RESEARCH INSTITUTE

EFI Mission

EFI, the Economic Research Institute at the Stockholm School of Economics, is a scientific institution that works independently of economic, political and sectional interests. It conducts theoretical and empirical research in the management and economic sciences, including selected related disciplines. The Institute encourages and assists in the publication and distribution of its research findings and is also involved in the doctoral education at the Stockholm School of Economics. At EFI, the researchers select their projects based on the need for theoretical or practical development of a research domain, on their methodological interests, and on the generality of a problem.

Research Organization

The research activities at the Institute are organized into 21 Research Centres. Centre Directors are professors at the Stockholm School of Economics.

EFI Research Centre:

Management and Organisation (A)
Centre for Entrepreneurship and Business Creation (E)
Public Management (F)
Information Management (I)
Centre for People and Organization (PMO)
Centre for Innovation and Operations Management (T)
Centre for Media and Economic Psychology (P)
Centre for Consumer Marketing (CCM)
Centre for Information and Communication Research (CIC)
Marketing, Distribution and Industrial Dynamics (D)
Centre for Strategy and Competitiveness (CSC)
Centre for Business and Economic History (BEH)
Accounting and Managerial Finance (B)
Centre for Financial Analysis and Managerial Economics in
Accounting (BFAC)
Finance (FI)
Centre for Health Economics (CHE)
International Economics and Geography (IEG)
Economics (S)
Economic Statistics (ES)
Law (RV)
Centre for Tax Law (SR)

Centre Director:

Sven-Erik Sjöstrand
Carin Holmquist
Nils Brunsson
Mats Lundeberg
Andreas Werr (acting)
Pär Åhlström
Guje Sevón
Magnus Söderlund
Per Andersson (acting)
Björn Axelsson
Örjan Sölvell
Håkan Lindgren
Johnny Lind
Kenth Skogsvik
Clas Bergström
Magnus Johannesson
Mats Lundahl
Paul Segerstrom
Anders Westlund
Johnny Herre
Bertil Wiman

Chair of the Board: Professor Carin Holmquist

Director: Associate Professor Filip Wijkström

Address

EFI, Box 6501, SE-113 83 Stockholm, Sweden • Website: www.hhs.se/efi/
Telephone: +46(0)8-736 90 00 • Fax: +46(0)8-31 62 70 • E-mail efi@hhs.se

To Cordelia

Acknowledgements

There have been several people along the way who have played a large part in helping me finalize my dissertation. Without them, their interest, knowledge, generosity and support, I would not have managed the process of becoming a PhD.

Regarding the dissertation work and the work with gradually improving the thesis, I am most grateful to the members of my dissertation committee, who have given of their time, patiently listening to me discussing my research, and taught me how to write a dissertation. I want to express my gratitude to Björn Axelsson, Per Andersson and Mats Edenius.

I am also grateful to Jan Lindvall for giving constructive feedback at the dissertation end-seminar and contributing to an improved version of the thesis.

I am highly indebted to all the people I have interviewed and observed at the case organization. Without these interviews and observations, this dissertation would not be. There are two people I would like to extend a special thanks to: Per Hill and Thomas Westerbring, who have helped me gain access to the organization and who have played key roles in providing me with valuable insights. Thank you.

I am glad to have had the opportunity to spend my time as a PhD student at the Center for Information and Communication Research (CIC), founded and shaped by Bertil Thorngren and successfully managed and developed by Per Andersson. It has been a privilege to be part of CIC. The culture and atmosphere there have encouraged me to take my own initiatives, come up with new ideas, and collaborate with people within both academia and industry, making my research exciting and joyful.

One person who has meant a great deal to me from the very beginning is Bertil Thorngren. If he hadn't been around, I don't think I would have progressed with my research ideas. Throughout the years, Bertil has generously shared his knowledge, wisdom and time. He has also shared his contacts and information, introducing me as a PhD student to situations and people in both the research and the industry world. Thank you Bertil!

Early on in my time as a PhD student I wrote an article about the e-marketplace Covisint together with Ulf Essler. Through working with Ulf, I was introduced to how to think and write in an academic way. This has helped during my doctoral studies and has contributed to the many papers I've written during my time at Handels.

Mats Edenius has been a supporting force during my dissertation work, and I am very grateful for his help. At times when I doubted that there would ever be a dissertation, Mats gave me a pep-talk and convinced me that there would be a finished dissertation in the end. This helped me regain my energy and positive thoughts, thus driving the dissertation work forward.

My gratitude also goes to my colleagues in the CIC corridor. I have had a lot of fun with Niklas Kviselius and Jonas Lind, travelling to conferences, eating lunch together and sharing laughs.

I would also like to thank my research colleagues and friends at the Centre for Marketing, Distribution and Industry Dynamics for all the pleasant times we have had during lunch and coffee breaks.

My gratitude also goes to research colleagues and friends I have met at courses and conferences around the world during my time as a PhD Student. Thank you for providing me with new ideas, for your encouragement and for giving me new energy.

Finally I would like to thank my family and friends for their support, loyalty and patience.

To my mother Astrid, father Mats and brother Karl: Thank you for always being there, believing in me and encouraging and supporting me during my ups and downs.

Alissa, Anna, Catrine, Jenny, Johanna and Sigrid, thank you for listening, giving advice, being supportive and reminding me that there is a world outside academia. I am most grateful for our friendship and for your support during this period of my life.

Last but not least, the two most important people in my life: my husband Martin and my daughter Cordelia. Without your support throughout this period, there would never have been a dissertation. I love you so much.

Katarina Arbin
Stockholm, May 2009

INTRODUCTION	3
AIMS OF THE THESIS	5
STRUCTURE OF THE THESIS	6
THEORETICAL ROADMAP.....	7
INTRODUCTION – TWO STREAMS OF RESEARCH.....	7
LITERATURE ON INDIVIDUAL E-ORDERING ADOPTION AND USE	9
STRUCTURATION THEORY IN IS/IT RESEARCH	11
ADAPTIVE STRUCTURATION THEORY	13
<i>Prior research using AST.....</i>	<i>13</i>
<i>Overall description of AST and its constructs</i>	<i>15</i>
<i>The adapted AST model</i>	<i>18</i>
RESEARCH METHOD	21
THE RESEARCH PERSPECTIVE	21
HOW TO INVESTIGATE?	21
RESEARCH SITE.....	22
DATA COLLECTION.....	23
<i>Pre-study data collection</i>	<i>23</i>
<i>Data collection procedure start</i>	<i>24</i>
<i>Main case data collection</i>	<i>24</i>
ANALYSIS OF THE EMPIRICAL DATA.....	32
HOW CAN WE PRODUCE VALID AND LASTING RESULTS?	34
<i>Internal validity.....</i>	<i>34</i>
<i>External validity – Generalization</i>	<i>37</i>
THE E-ORDERING CASE STUDY.....	39
THE ORGANIZATION.....	39
RESEARCH SETTING	39
<i>R&D</i>	<i>40</i>
<i>E&S.....</i>	<i>40</i>
STARTING POINT.....	41
WHY A CENTRALIZED SOURCING AND AN E-ORDERING SYSTEM?.....	42
THE SYSTEM	43
<i>A more detailed system description of the individual ordering process.....</i>	<i>45</i>
PREPARATIONS BEFORE ROLL-OUT	50
PILOT ROLL-OUT/RELEASE 1A (AUGUST, 2002)	51
<i>Adoption and usage – end-user actions and reactions.....</i>	<i>52</i>
RELEASE 1B (FEBRUARY 2003).....	54
<i>Adoption and usage – end-user actions and reactions.....</i>	<i>55</i>
THE MOBILIZATION PHASE (APRIL 2003)	56
<i>Adoption and usage – end-user actions and reactions.....</i>	<i>57</i>
<i>During 2005</i>	<i>60</i>
<i>January 2006.....</i>	<i>60</i>
<i>September 2006.....</i>	<i>61</i>
THE STRUCTURE OF THE THESIS.....	63
CONCLUSIONS OF THE THESIS.....	69
CONCLUSIONS	69
DISCUSSION	71
<i>Introduction.....</i>	<i>71</i>
<i>Relating my findings to previous research</i>	<i>71</i>
<i>Theoretical implications.....</i>	<i>77</i>
<i>Practical implications</i>	<i>80</i>
<i>Framing of the empirical arena and limitations</i>	<i>83</i>
<i>Future research.....</i>	<i>85</i>
FINAL WORDS	88

REFERENCES.....	89
APPENDIX.....	94
ARTICLE 1.....	99
Arbin, K. (2003). E-procurement maturity in industry. <i>International Journal of Electronic Business</i> , 1 (4), 396-407.	
ARTICLE 2.....	113
Arbin, K. (2008). The road towards successful e-ordering implementation: Success factors and barriers. <i>International Journal of Procurement Management</i> , 1 (4), 415-429.	
ARTICLE 3.....	131
Arbin, K. (2008). The structure of determinants of individual adoption and use of e-ordering systems. <i>Human Systems Management</i> , 27, 143-159.	
ARTICLE 4.....	151
Arbin, K. Structures influencing individual acceptance of e-ordering systems: Findings from a longitudinal case study. Conditionally accepted for publication in <i>Journal of Purchasing and Supply Management</i> .	
ARTICLE 5.....	181
Arbin, K. Individual e-ordering acceptance: An analysis of literature-generated practical recommendations. Conditionally accepted for publication in <i>International Journal of Procurement Management</i> .	

Introduction

"Oracle has begun implementing electronic procurement as part of an ambitious e-business relationship worth tens of billions of dollars with US motor giant Ford."

ComputerWeekly.com (20 Jan 2000)

"The car manufacturer Ford will scrap its Oracle-based online procurement system and revert to the technologies that it used before."

www.zdnet.co.uk (19 Aug 2004)

"A \$500 million manufacturer of steel products rolled out an e-Procurement pilot project to its plants. The company did not have a change management plan or an overarching procurement strategy. Employees resisted the use of unfamiliar tools and the introduction of revised buying procedures. Despite later mandates by company executives, the lack of early focus on change management resulted in poor adoption and therefore no substantial savings."

ICG Commerce – reasons e-procurement projects fail to achieve their ROI, white paper (Jan 2009)

Organizations have spent and continue to spend millions of dollars on information systems (IS) in order to enable business success. Information systems have long been used to help managers make better decisions, better understand the nature of customers and improve employee productivity. They have enabled transformations in organizations, such as simplification and acceleration of work processes, and contributed to continued improvement and innovation in these processes. There is also a strong belief (among managers) that through implementing information systems, organizations can achieve a competitive advantage, which can lead to success for the organization.

One of the areas in organizations in which information systems are used is purchasing. Purchasing can be divided into direct and indirect, or production oriented and non-production oriented. Direct or production-oriented purchasing consists of all the material that goes directly into production. Indirect or non-production purchasing, on the other hand, includes all material and services that do not go into production, such as mobile phones, computers, cleaning equipment, travel expenses, consultant expenses and reparation tools. Electronic data interchange (EDI) systems have been in place for over two decades and are used by almost all large organizations for managing purchasing of direct or production-oriented material. Systems for managing indirect purchasing, i.e. electronic ordering (e-ordering) systems, are, on the other hand, a relatively new phenomenon. This is largely due to the fact that indirect purchasing in most organizations has not received

management attention and has consequently been undertaken in a decentralized and uncoordinated fashion (Cox et al., 2005; Croom, 2000). During the 21st century, however, indirect purchasing has received increased attention in most large organizations, and is now also recognized as an area that holds promises of cost savings, which will add to the bottom line and thus contribute to the organization's overall business economy.

Information systems for managing indirect purchasing, i.e. electronic ordering (e-ordering) systems, have also received increased attention, for much the same reason; there is a large saving potential in managing indirect purchasing in a more effective and efficient way, which can be achieved by using electronic tools such as e-ordering systems. An e-ordering system is an information system that is used by individual end-users (requestors, authorizers and goods receivers) in the organization when ordering products and services. The system is used mainly in large organizations with the purpose of reducing maverick (i.e. wild) purchases in the organization and increasing compliance with a few centrally chosen suppliers. The e-ordering system can be viewed as a system that contributes to both generic aims already identified by Zuboff (1985), namely automating and informing. On an individual end-user level, the e-ordering system tends to be perceived as a system that automates the purchasing process. On the organizational level and from a management perspective, the system is frequently viewed as one that generates information that can facilitate improved sourcing and decreased purchasing costs.

Cost savings are realized through obtaining larger purchasing volumes from fewer suppliers, thus leading to increased volume discounts, i.e. lower prices. Evidence of obtaining greater leverage in negotiation and evidence of reduced cost for processing purchase requisitions when using an e-ordering system, for example, were presented by Croom and Brandon-Jones (2007), who studied nine different organizations experiencing e-ordering system implementation.

For an organization to achieve these benefits, end-users (requestors, authorizers and goods receivers) have to adopt and continue to use the system, which empirical data show is difficult and takes time (Arbin, 2008; Reunis et al., 2005). If the e-ordering system is not adopted and used by the individual end-user, it will be of no use, and the organization will fail to achieve decreased purchasing costs, i.e. fail to benefit from the investment in an e-ordering system. It has further been argued in the research that to get individual end-users to adopt and then continue to use the e-ordering system is more difficult than many organizations first anticipate, and a large challenge for organizations implementing such a system is to get individuals to order through the system instead of phoning, visiting or e-mailing their own choice of supplier, as has been the behaviour prior to the system (Arbin,

2008; Van Raaij et al., 2007; Reunis et al., 2006; Santama et al., 2006; Croom and Brandon-Jones, 2005; Reunis et al., 2005).

Previous research has also investigated what influences adoption and use of e-ordering systems within organizations. Research looking at what influences e-ordering adoption from a managerial perspective, through a managerial lens, brings up influencing factors such as management support, having sufficient resources, the importance of involving all stakeholders in the project and old relationships to suppliers (Dooley and Purchase, 2006; Kulp et al., 2006; Croom and Brandon-Jones, 2005; Arbin, 2003). Research investigating what influences individual adoption and use from the individual's perspective, through the individual end-user that is about to adopt and use the e-ordering system, has mainly focused on the individual's intent to adopt and use the system, and on what influences that intent, building on research by Davis (1989), Venkatesh and Kohli (1995) and Venkatesh et al. (2003) (Van Raaij et al., 2007; Reunis et al., 2006; Santama et al., 2006). However, research on individual end-users' e-ordering system adoption and use behaviour is still limited, and more knowledge is needed about what influences individual adoption and use of an e-ordering system, especially focusing on what influences behaviour, which may be different from the intent to adopt and use. My ambition in the present thesis is to use a broader approach compared to previous research on individual e-ordering adoption, by investigating issues and factors influencing individual adoption and use behaviour other than the factor of intent to use. In this way, my ambition is to contribute to the body of knowledge on individual e-ordering adoption and use.

A theoretical framework in line with such an ambition is the adaptive structuration theory (AST) by DeSanctis and Poole (1994). AST is a theory that has a broad point of departure and takes into account structures and factors influencing individual information system adoption and use behaviour, facilitating a broader approach and thus promising to generate further knowledge about individual e-ordering adoption and use behaviour.

Aims of the thesis

In the present thesis, AST has functioned as a theoretical starting point and a source of inspiration, guiding the aims of the thesis and the research work conducted.

The aim of the thesis is three-fold: First, to contribute to the body of knowledge on e-ordering adoption and use in general. Second, to contribute to the understanding of what influences individual e-ordering system adoption and use behaviour, and to answer the research question:

What influences individual adoption and use of an e-ordering system and how?

Third, to contribute to the individual IS adoption and use literature in general, by providing a thick description and a close-to-practice study of individual adoption and use behaviour over time.

A longitudinal case study has been conducted at a large pharmaceutical organization in which the introduction and implementation of an e-ordering system has been followed for four years, focusing on individual end-users (requestors, authorizers and goods receivers) and their adoption and use behaviour.

Structure of the thesis

The thesis consists of this introductory chapter and five studies that are published or have been conditionally accepted for publication. In two of the articles (Article 1 and 2), I discuss e-ordering adoption and use on an organizational level, thus contributing to an increased understanding of e-ordering adoption and use in general. In article 3 and 4, my focus is on individuals' adoption and use of an e-ordering system, thus contributing to a greater understanding of what influences individual adoption and use behaviour. The fifth article presents and analyses literature-generated managerial recommendations for how to get individuals to adopt and continue to use an e-ordering system, focusing on making a practical contribution, presenting advice to persons involved in and responsible for implementing these systems.

Theoretical roadmap

Introduction – two streams of research

There are different streams of research dealing with individual IS adoption and use. Two that have received attention in the literature are the Technology Acceptance Model (TAM) and its related models, and IS research focusing on structuration and technology.

The first stream of research, TAM by Davis (1989) and Davis et al. (1989), and its related models, which I call the intention-based stream of research, focus on what influences individuals' intent to adopt and use information systems, building on the assumption that individual behaviour is a function of the intention to perform a specific behaviour. This body of literature focuses mainly on cognitive mechanisms that lead to individual adoption decisions and originates from the Theory of Reasoned Action (TRA), developed by Fishbein and Ajzen (1975). TRA claims that individual behaviour is a function of the intention to perform a specific behaviour, and that the intention, in turn, is determined by a person's attitude and the normative pressure perceived by that person. TAM and its related models are widely accepted. It has been argued that the reason for this acceptance is the robustness of its scales and the strong generalizability of the model (Venkatesh et al., 2007). The initial TAM research included valid, reliable, and easy-to-administer scales for the key constructs. The model has further been tested in a broad range of contexts. From the beginning and throughout my research work, however, I have been somewhat sceptical towards using this stream of research for understanding individual adoption and use of IS solely. My scepticism is related to the notion that intent to adopt and use may not always be synonymous with behaviour. For example, sometimes an individual has the intent to perform a certain task in a certain manner, but circumstances may exist that make the behaviour different from what was intended. I agree that intent does play a part in influencing behaviour, but argue that there are issues and factors other than the individual's intent to adopt and use an IS, issues and factors that also affect individual system use, and that need to be further investigated and taken into account. This stream of research has further primarily focused on the early phases of the usage life cycle, i.e. adoption, which is just the first step towards IS success. In order to achieve long-term viability of an IS and eventual IS success, the importance of achieving continued use after achieving initial adoption cannot be stressed enough. If people do not continue to use the system, the investment will be wasted. Unlike the initial adoption decision, continued IS use is not a one-time event, but the result of a series of individual decisions to continue using a particular IS; continued IS use refers to the behaviour following adoption.

Adoption is part of the beginning of the acceptance process, whereas continued use is part of its later phases. The continued use phase ends when the user makes the final decision to discontinue.

The second stream of research, IS research focusing on structuration and technology, which I call the behaviour-based stream of research, focuses on behaviour, providing researchers with a theoretical approach that can help in understanding how users' (individuals') interactions (adoption and use) with information systems evolve and what the implications of these interactions are. This stream focuses on structures; technology and other sources of structures (such as different task structures and organizational culture), and how they are changed/affected as users interact with technology, and in turn how users' use of the technology is affected by the changed/affected structures. The behaviour-based stream of research helps us understand how organizational phenomena affect the development and use of technologies and how technologies shape organizations. From the beginning and throughout my work, this stream of research has appealed to me as a researcher, due to its focus on behaviour (in contrast to intent), and because it offers a theoretical source of inspiration that does not view implementation and use of a new technology (i.e. information system) as deterministic, but also takes into account the users of the technology. It may be said that they both (technology and user) influence each other, which is an attractive thought; it is not just a matter of introducing and implementing an information system, and assuming that it will be a success. It is more complicated than this; the technology (i.e., the information system) has to be accepted and used by individuals, who influence the technology, which in turn influences use of the technology and so on. Further, this stream of research has a longitudinal perspective, focusing not only on initial acceptance phases such as adoption, but also on later phases, i.e. continued use.

Previous research has also questioned the notion of intent to use as the main (or sole) influence determining individual use of information systems, and called for a more comprehensive understanding of what influences individual IS adoption and use, recommending that future studies focus on a more broad and comprehensive range of behaviours and observe these behaviours over time, using longitudinal research methods (Benbasat and Barki, 2007; Limayem et al., 2007; Lucas et al., 2007; Schwarz and Chin, 2007, Hirschheim, 2007; Jasperson et al., 2005; Limayem et al., 2001). Limayem et al. (2007; 2001) has begun to explore the role of habit in the context of individual continued IS usage, arguing that continued use of information systems is not only a consequence of intention, but also of habit. Even though they did not question the assumption that intention has a direct effect on actual behaviour, they argue that circumstances may exist under which this effect is partly or even entirely suppressed, and intention can thus no longer be regarded as a reliable predictor of actual behaviour. They further argue

that future research should study actual individual IS behaviour and what influences that behaviour and recommend ideas derived from structuration theory, as they focus on behaviour over time and view IS usage as a consequence of continuous interplay between human agency and institutional context. Before continuing with ideas derived from structuration theory and its potential contribution in studying aspects influencing behaviour, such as habits and routines, I will present current literature on individual e-ordering adoption and use specifically.

Literature on individual e-ordering adoption and use

Research on e-ordering adoption and use specifically within organizations can be viewed as being conducted from two perspectives: from a managerial perspective, in which managers have been asked for their view, and from an individual end-user perspective, in which individuals' intent to adopt and use has been investigated by interviewing individual end-users and by surveys filled in by individual end-users, such as requestors.

Research from a managerial perspective presents factors influencing adoption and use of e-ordering systems within an organization, factors such as management support, having sufficient resources, the involvement of all stakeholders, composition of the implementation project team, and old relationships to suppliers (Dooley and Purchase, 2006; Kulp et al., 2006; Croom and Brandon-Jones, 2005; Arbin, 2003).

Research focusing more explicitly on individual end-users from their perspective has solely investigated end-users' intention to adopt and use e-ordering systems, and investigated what influences that intention. Santema et al. (2006) and Reunis et al. (2006) found that introducing a mandate, telling end-users to use the system, improved compliance. Peer influence, too, was very strong, according to Reunis et al. (2006). Peers had substantial influence on each other, both in a negative and positive way. A study by Van Raaij et al. (2007) also investigated what influenced end-users' intent to adopt and use from an individual end-user perspective. They found that processing (including order processing speed, order lead time, on-time delivery and order accuracy) and usability (including covering system availability, ease of navigation and screen loading) had the largest total affect on users' intent to adopt and use an e-ordering system. Research related to e-ordering adoption and use within organizations is summarized in Table 1, showing factors found to influence adoption and use of e-ordering systems.

Authors	Major findings/suggestions
Arbin (2003)	Discusses the impact of resistance to breaking up old business relationships on adoption behaviour. The impact of management support on e-ordering adoption was identified, and it was concluded that lack of management support negatively affects adoption of an e-ordering system.
Croom and Brandon-Jones (2005)	Discusses composition of the implementation project team. It was found that project teams that incorporated representatives from purchasing, finance, IT and HR were more successful than were those driven only by the IT function.
Dooley and Purchase (2006)	Discusses the importance of encouragement from management and other departments, and the importance of having sufficient financial and resource backing as internal support for achieving adoption. It is argued that adequate resources in training, staffing levels and systems support are necessary if intentions to use the e-ordering system are to be realized.
Kulp et al. (2006)	Describes a case in which it was difficult to motivate employees to create new supplier relationships due to already established relationships with local suppliers. It was argued that because employees are familiar with particular manufacturers and their products, they may be reluctant to change suppliers, i.e. order from new suppliers in the e-ordering system. Alternatively, it is argued that employees who travel frequently to and from various locations may fall into the habit of staying at the same hotel, trip after trip, rather than trying a different hotel.
Reunis et al. (2006)	Mandating systems were found to influence the intent to adopt the system. Also peers were found to have substantial influence on each other, influencing adoption both in a negative and a positive way. Enforcement was found to result in initial system usage only. One conclusion presented is that the prerequisites should be in place before a mandate is initiated. The authors found that nearly all of the influence tactics presented by Venkatesh et al. (1995) (request, information exchange, recommendation, promise, threat, and legalistic plea) had an effect on the cognitive mechanisms presented by Venkatesh et al. (2003).
Santema et al. (2006)	Discusses the need for enforcement or a mandating system. One conclusion presented is that the prerequisites should be in place before a mandate is initiated.
Van Raaij et al. (2007)	Van Raaij et al. (2007) examined the relationship between perceived e-procurement quality (processing, content, usability, training and professionalism) and user acceptance of e-procurement. Their research model uses the five e-procurement quality factors as external variables to the technology adoption model (TAM) model by Davis (1989). The study confirms that user-perceived usefulness and ease of use of the system are key determinants of the user's attitude towards the system and intention to use it. Perceived usefulness and perceived ease of use, in turn, were influenced by user-perceived order processing performance of the system, system usability, and the professionalism of the user support function.

Table 1. Research on e-ordering adoption within organizations.

Previous research on individual e-ordering adoption and use behaviour from the individual end-user perspective is however still limited. The research thus far appears fragmented and mainly views factors influencing end-users from a managerial perspective, despite the fact that other perspectives are also conceivable. Further, research that does focus on individual adoption merely investigates what influences the intent to adopt and use, thus neglecting what affects actual behaviour. Due to my ambition to take a broad approach, focusing on what influences individual adoption and use behaviour, in contrast to intention, adaptive structuration theory (AST), being one of the ideas derived from structuration theory in combination with technology, has been used as a starting point, and has guided the research. Before AST and its contents are presented, however, structuration theory in IS/IT research will be briefly described, with the purpose of giving an increased understanding of the potential contribution of ideas derived from structuration theory.

Structuration theory in IS/IT research

As said before, ideas derived from structuration theory in IS/IT research focus on investigating actual behaviour in contrast to intention-based research, which solely focuses on the intent to adopt and use and what influences that intent, facilitating knowledge also about structures, such as habits and routines, and their influence on individual IS use behaviour. Ideas derived from structuration theory further have a longitudinal approach, studying information system use over time, thus facilitating a deeper understanding of what influences information system usage.

Previous research has argued that structuration theory is one of the most influential social theories in the information systems field (Jones and Karsten, 2008; Poole and DeSanctis, 2004). The theory, which originates from the sociologist Anthony Giddens's work (1984; 1979), is a general theory of social organization rather than a theory specific to IS. The central concern of structuration theory is the relationship between individuals and society. Human agents draw on social structures in their actions, and at the same time these actions serve to produce and reproduce social structure. In this way, structure and agency mutually constitute a duality; social phenomena are thus not the product of either structure or agency, but of both. Thereby, structuration theory avoids the historical division between determinist and voluntarist views. Jones and Karsten (2008) illustrate this duality by giving the example of the clothes people wear to work. Work clothes reflect the influence of social structures that are reproduced by individuals' conformance with accepted practice. The structures underlying dress codes are not implacable or immutable; they are sustained by their ongoing reproduction by social actors, but can be changed. Traffic is another example illustrating this duality. Everybody gets into their cars and drives along the road. If you observe the behaviour of the system, people stay in

lanes and stop at traffic lights, follow the rules of the road. If you step back from the system, there is a pattern, a structural arrangement that is constituted through people individually and collectively, enacting the particular rules and resources of the road. In the traffic example, the duality of structure could be shown if people were to start neglecting red traffic lights, driving on the sidewalk, etc., thus leading to a change in structure. People driving would then try to adapt to that changed structure, not stopping for red traffic lights, etc. The theory of structuration in this way recognizes that human actions are enabled and constrained by structures, yet that these structures are the result of previous action, which is illustrated above.

Structuration theory's appeal in relation to IS lies in its focus on structure and on the processes by which structures are used and modified over time (Poole and DeSanctis, 2004). Technology is here seen as one source of social structures (i.e. sets of rules and resources), which are embedded in technology by designers during development and then changed as users interact with technology. Pozzebon and Pinsonneault (2005) argue that the value of structuration theory to the IT field is that it provides IT researchers with a theoretical approach that can help them understand how users' interactions with IT evolve, what the implications are and how to deal with the intended and unintended consequences. In addition to this, Poole and DeSanctis (2004) argue that IS research employing a structuration research agenda must include longitudinal studies, as this is the only sure way to determine the nature of a structuring process.

When identifying research in the IS field that has employed structuration ideas, two important variants of Giddens's work were identified: duality of technology (Orlikowski, 1992) and adaptive structuration theory (AST) (DeSanctis and Poole, 1994), and further work based on these theories.

Orlikowski (1992) presented the structuration model of technology, which takes into account both the deterministic and the voluntaristic perspective, thus not viewing the technology as an objective, external force that has deterministic impacts on organizational structures, nor viewing technology as the outcome of strategic choice and social action. Instead, technology is viewed here as flexible, created and changed by human action as well as used by humans to accomplish some action. It was claimed that technology was physically constructed by actors working in a given social context and was socially constructed by these actors through the different meanings they attached to it and the various features they emphasized and used. In her later work, Orlikowski extended the structuration perspective on technology by proposing a practice-oriented understanding of the interaction between people, technologies and social action, in order to explain emergence and change in both technologies and their use (Orlikowski, 2000). The focus of the more practice-oriented work was on how people's interaction with

technologies enacted structures of technology use, and she showed that there was a duality between people's usage and the technology.

The second important variant of Giddens's work in IS research – adaptive structuration theory (AST) by DeSanctis and Poole (1994) and Poole and DeSanctis (1990) – views IT as only one source of structure and argues that other sources of structure, such as work tasks and the organizational environment, also need to be considered. Thus given my ambition to take a broader approach, AST provides a promising theoretical roadmap for my thesis work. I will elaborate on AST in some depth below.

Adaptive structuration theory

AST takes into account technological constraints and possibilities, management's role in implementation and other sources of structure in order to find explanations for users' appropriation of an advanced information technology system. The change process (i.e. the adoption and use process) is examined from two vantage points: the types of structures that are provided by advanced technologies, and the structures that emerge in human action as people interact with these technologies.

Prior research using AST

The principles of AST were illustrated by DeSanctis and Poole (1994) through an information system, which is generally used by a small group of people for communicating and managing projects within their work environment: a group decision support system (GDSS). In research building on or inspired by AST, there is a large body of work that has used AST to analyse different issues of usage of GDS systems, such as how group attitudes and outcomes evolve over time, conflict and conflict management, creativity and idea generation, and the impact of anonymity on receiver perceptions of sources and messages (Rains, 2007; Limayem et al., 2006; Chidambaram, 1999; Nagasundaram and Bostrom, 1994/1995; Miranda and Bostrom, 1993-1994; Gopal et al., 1992-1993). Scales to measure faithfulness of appropriation and scales for capturing consensus on appropriation have also been discussed in previous research investigating GDS systems and building on AST (Allport and Kerler, 2003; Salisbury et al., 2002; Chin et al., 1997). AST has also been used for analysing information systems other than GDS systems. Peters (2006) utilized AST to develop a framework for the conceptualization of computer-mediated communication (CMS) technologies in organizational use. Schwieger et al. (2004) proposed a modified AST model that explained the appropriation process of a medical electronic billing system, and Avolio and Dodge (2001) proposed a framework based on AST that can be used to study how advanced

information technology could be and is influenced by leadership. Chenoweth et al. (2006) examined the interaction of context and technology with a focus on data warehouses. AST has also been used to investigate global virtual teams (Burkhard and Horan, 2006; Maznevski and Chudoba, 2000). Maznevski and Chudoba (2000) built a theory template based on AST to guide their research aimed at finding out more about global virtual teams' dynamics and effectiveness, and Burkhard and Horan (2006) utilized key elements of AST to investigate the effects of virtual organizations on academic disciplines.

Although AST has been used to study appropriation of different information systems, it has mainly been used to study group use of GDS systems. Thus far, AST has not been used to investigate appropriation of other information systems to the same extent as for GDS systems.

Overall description of AST and its constructs

AST can be used to analyse appropriation (i.e. adoption and use) of a range of advanced information technology systems (Chenoweth et al., 2006; Peters, 2006; Schwieger et al., 2004). However, in the original model proposed by DeSanctis and Poole (1994), AST and its major constructs and propositions were illustrated by a GDS system. Examples given for system spirit, decision processes and decision outcomes thus derive from a GDS context, which is different from an e-ordering system context. In an e-ordering system, for example, the individual user (requestor, authorizer or goods receiver) orders products or services, while in a GDS system, several individual users use the system simultaneously as a communication tool when working on a project or solving a task together. Below, in Figure 1, a summary of the major constructs and propositions of AST is presented.

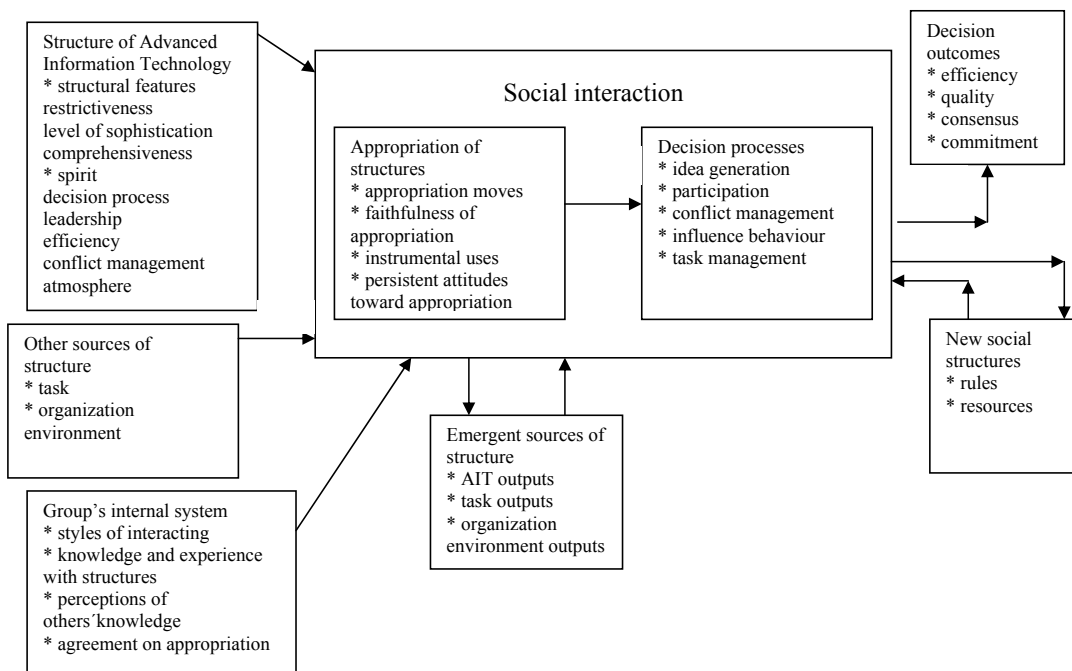


Figure 1. Summary of the major constructs and propositions of AST (DeSanctis and Poole, 1994).

To begin with, the social structures of an advanced information technology consist of the structural features of the given technology and the spirit of this feature set.

Structural features are the specific types of rules and resources, or capabilities, offered by the system, and a given advanced information technology can be described and studied in terms of the specific structural features that its design offers.

The social structures of an advanced information technology can also be described in terms of their spirit, which is the general intent with regard to the values and goals underlying a given set of structural features. The spirit in AST is the “official line” that the technology presents to people regarding how to act when using the system, how to interpret its features, and how to fill in gaps in procedures that are not explicitly specified. Spirit can also function as a means of signification, helping users to understand and interpret the meaning of the technology. How managers introduce the system is viewed as an important part of the spirit. An example illustrating spirit in the e-ordering case is when managers in introduction sessions state that large savings will be obtained through using the system, which is then viewed as part of the system’s spirit. Both a coherent and an incoherent spirit may be communicated. Some managers may be positive and others sceptical towards the possibilities of realizing large savings by using the e-ordering system, for example, and communicate their point of view to end-users, which may make some users critical of the system’s spirit, which in turn can influence appropriation of the system. A coherent spirit would be expected to channel technology use in definite directions, while an incoherent spirit would be expected to exert a weaker influence on user behaviour.

There are other sources of structure that affect appropriation in AST. The content and constraints of a given work task, for example, constitute another major source of structure. Also the organizational environment provides structures that affect appropriation of the information system. Current pressures to reduce spending or circumstances that favour certain projects over others may be brought into interaction as participants are confronted with using an information system. Corporate information, histories of task accomplishment, cultural beliefs, etc., also provide structures to invoke, in addition to the advanced information technology.

The major sources of structure for groups (remember that AST was illustrated by a GDS system) as they interact with an advanced information technology are: the technology itself, the tasks and the organizational environment.

There are also factors influencing how the group appropriates available structures such as:

- Members' style of interacting. For example, an autocratic leader may introduce and use technology structures very differently than a democratic leader. Other stylistic differences, such as differences in group conflict management styles, may also influence appropriation processes.
- Members' degree of knowledge and experience of the structures embedded in the technology. For example, understanding of possible pitfalls and pratfalls in the structures may contribute to more skilful use by certain members.
- The degree to which members believe that other members know and accept use of the structures. The better known the structure is, the fewer members may deviate from the typical form of use. This is consistent with the notion of "critical mass", whereby the perceived value of a technology shifts as it spreads rapidly through a community; later adopters are influenced by the values and behaviours of earlier adopters and vice versa.
- The degree to which members agree on which structures should be appropriated. There may be uncertainty about which structures are most appropriate for the given situation or power struggles over which structural features should be used. Greater agreement on appropriation of structures should lead to more consistency in the group's usage patterns.

In AST, appropriations are not automatically determined by technology designs, rather people actively select how technology structures are used. Four aspects of appropriation are identified and presented by AST that illustrate variation in interaction processes.

First, groups may choose to appropriate a given structural feature in different ways, invoking one or more of many possible appropriation moves. Groups may choose to: a) directly use the structures; b) relate the structures to other structures (such as structures in the task or environment); c) constrain or interpret the structures as they are used; or d) make judgements about the structures (such as affirm or negate their usefulness).

Second, groups may choose to appropriate technology faithfully or unfaithfully. Faithful appropriations are consistent with the spirit and structural feature design, whereas unfaithful appropriations are not.

Third, group members may choose to appropriate the features for different instrumental uses or purposes. Examples of purposes can be to accomplish task activities, to manage communication, or to exercise power or influence.

A fourth aspect of appropriation is the attitudes the group displays as technology structures are appropriated, such as a) the extent to which groups are confident and relaxed in their use of the technology (comfort); b) the extent to which groups perceive the technology to be of value to them in their work (respect); c) their willingness to work hard and excel at using the system (challenge).

AST is a widely used theory and has proved appealing to a significant number of IS researchers, and has thus had an important influence on structural IS research (Jones and Karsten, 2008). It offers a broad framework that focuses on end-users and their interaction with technology and other structures. Due to this and due to its longitudinal focus – and the fact that the framework takes into account technology constraints and possibilities, and other sources of structure in order to find explanations for users' appropriation of information systems – this is a highly appropriate theoretical roadmap to inspire me in my search for an increased understanding of individual end-users' adoption and use of information systems, and what influences this and how. If AST is to function as a starting point, however, it first needs to be adapted to the research question under investigation here: "What influences individual adoption and continued use of an e-ordering system and how?"

The adapted AST model

Some previous research building on AST has used the full AST model, and other work has only used parts of the AST model by adapting AST constructs to investigate specific questions. One example is the work of Burkhard and Horan (2006), which utilized elements of AST to investigate the effects of virtual organization on academic disciplines. In their research, the adapted AST model focused on appropriation of structure and specific additional sources of structure and did not extend to decision processes or outcomes. In a similar manner, in the present research work, the AST model has been adapted, focusing on the structures of technology, other sources of structure, and the groups' internal system and their influence on adoption and use, not extending to decision processes or outcomes.

In the present research, the model was adapted to the type of information system under investigation, a standardized e-ordering system. AST was developed for investigating appropriation of social information systems, i.e. information systems that have a social interaction orientation. When looking at decision processes and decision outcomes in the original AST model, what is included there illustrates the focus on social systems. When using a GDS system, decision processes such as idea generation, participation, conflict management, influencing behaviour and task management can be observed, but in an e-ordering context such social interaction does not take place. An e-

ordering system has more of a task orientation, not a social orientation. Decision processes and decision outcomes are thus difficult to translate into an e-ordering context. In order to adapt the AST model, I have examined the different structures and factors in the original AST model and translated these structures and factors to make them appropriate to an e-ordering system context. How this “translation” was conducted is described in more detail in the methodology section. When carrying out this translation, I found that decision processes and decision outcomes could not be applied to an e-ordering system, and these were therefore removed. Emergent sources of structure were further not included in the adapted AST constructs in the present research from the beginning. It was first after having empirically observed modifications and changes of structures that also this construct was added. Figure 2 shows the adapted AST constructs used in the present thesis.

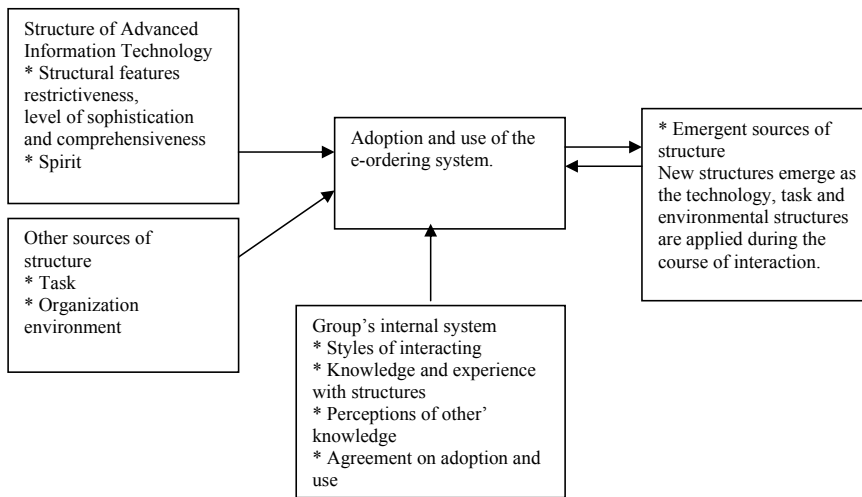


Figure 2. Adapted AST constructs in the present thesis.

Research Method

The research perspective

The research perspective taken here assumes that the social world (e.g., social relations, organizations, division of labour) is not given. Rather, the social world is produced and reinforced by people through their action and interaction. I agree with what Orlikowski and Baroudi (1991) claimed, namely that in a social world that is not given, organizations, groups and social systems do not exist apart from human beings, and hence cannot be apprehended, characterized, and measured in any objective or universal way. I further believe that the social reality can only be interpreted, and in order to understand the social process, we must enter the world of those generating it. According to Orlikowski and Baroudi (1991), the research methods appropriate to generating valid interpretative knowledge are field studies, as these examine human beings within their social settings. I wanted to conduct an in-depth examination of the phenomenon of interest (why it was difficult to get potential users to adopt and continue to use an e-ordering system, and what influenced their behaviour) and to understand human behaviour from the point of view of the human actors themselves. Thus, the chosen methodology was to conduct a field study in the form of an interpretative case study.

How to investigate?

Researchers investigating adoption and use of information systems in organizations have suggested that observations should be made of the micro-processes of adaptation over time, allowing us to see what leads to successful outcomes (in this case, a successful outcome is use of the e-ordering system) (Majchrzak et al., 2000; Barley, 1986). Such studies should not be limited to short time spans of technology use, as adaptations may occur over time, and such studies should further avoid obtaining data retrospectively, as this encourages respondents to gloss over details associated with variations in adaptation events over time and may induce response bias (Majchrzak et al., 2000; Barley, 1986).

A case study including extensive observations of end-users' adoption and use behaviour has been conducted by following the implementation of an e-ordering system in a large pharmaceutical organization starting in January 2002, when decisions were made for an e-ordering system, throughout the implementation, until September 2006, when the organization had reached its compliance goal of 70% of ordering through the e-ordering system.

Research site

The research site, hereafter referred to as “the organization”, was chosen because it met the requirements presented above: the data should not be collected retrospectively and the study should be conducted over time. The organization was about to roll out an e-ordering system (enabling real time observations, observing potential users adopting and using the e-ordering system) and was willing to grant access to the organization over a longer period of time.

I came in contact with the chosen organization through an interview study conducted in 2002. The interview study (which consisted of 13 interviews with people responsible for purchasing, logistics or e-procurement/eBusiness at eight large organizations) aimed at collecting empirical data regarding electronic procurement (e-procurement) maturity in industry at the time. This investigation was conducted by looking at how far the eight organizations had come in their e-procurement (i.e., e-ordering) implementation, and what kind of barriers to e-ordering they were experiencing. The research, which is presented in Article 1, can be viewed as a pre-study because it gave me a first insight into barriers to e-ordering, and because it was my first meeting with the case organization. The chosen organization was one of the eight organizations investigated in 2002. At that time, in January 2002, when interviewing the e-ordering project manager, they were planning for a roll-out of an e-ordering system, which according to plans would take place in June 2002. The project manager at the time had a positive attitude towards having a PhD candidate follow the introduction and implementation, and promised access to the organization. This pharmaceutical organization was used to PhD candidates conducting research (not business administration PhD candidates, though, mostly PhD candidates within medical research) and understood the importance of giving access to the organization for a longer period of time. From the beginning (January 2002), the plan was to follow the organization for one year. This changed, however, due to delays in different parts of the project and difficulties in getting potential users to use the e-ordering system. In the end, I followed the organization for a longer period of time than first anticipated, from January 2002 (first interview) to September 2006 (last interview). Looking back, I am grateful that I had the opportunity to follow the organization for such a long time (4 ½ years), as this enabled me, for example, to empirically observe the duality that Giddens (1984) and DeSanctis and Poole (1994) have discussed theoretically. The changes in structure due to users' adoption and usage behaviour in this case, however, have not been observed in the e-ordering system (the technology) per se, but in another structure: the ordering routine structure. Observing a change in a structure other than the technological structures in the advanced information technology system (the e-ordering system) due to adoption and usage behaviour would not have been possible if I had only studied the e-

ordering implementation (including project, roll-out) process in the organization for a year, for example. Being able to observe this structure changing and then changing again, depending on potential users' adoption and use of the e-ordering system, took more time, in this case about four years.

The empirical data was collected at the Swedish organization outside Stockholm, the capital of Sweden. The Swedish organization consists of approximately 12,800 persons, of whom approximately 7,000 are situated in the Stockholm area. The corporate research headquarters are located here together with three production centres (tablet production, bulk production and liquid production), an engineering and support division (E&S), the Swedish marketing division, the administrative headquarters for Sweden, and a research and development centre (mainly in the fields of the central nervous system and pain control) (R&D). In order to conduct a study including observations, a division had to be chosen as the focus group. As it happened, the purchasing manager at the E&S division and the system administrator (responsible for administrating the system, thus overseeing new users, passwords, roles, for supporting users in using the e-ordering system, and for holding training sessions for potential new users) for the division were interested in having an additional person study e-ordering system use in their division. The e-ordering system was also just about to be rolled out in the division, and preparations and planning were underway regarding how to best introduce the system, and when and for whom to hold training sessions and so on.

Data Collection

Pre-study data collection

An interview study consisting of 13 interviews with personnel involved in and responsible for eBusiness and purchasing at eight large global organizations was conducted, stretching from December 2001 to February 2002. Organizations and roles interviewed are found in the appendix and in Figure 1 in Article 1. The interviews were all semi-structured and lasted from one to two hours. Notes were taken on paper during the interviews. Interview protocols were sent back to the person interviewed for comments in order to ensure that the protocol was adequate. The respondents were also asked to read the final version in order to ensure that the text was adequate.

Data collection procedure start

When I started my field study, I knew I was interested in investigating adoption and use of an e-ordering system. The research question was however not crystal clear in 2002 (it has been developed and thought through during several years). I knew that a problem I wanted to look into was potential users' resistance to adopting and continuing to use an e-ordering system. At the outset of the field study, I went into the organization with an open attitude and the ambition to learn as much as possible about the e-ordering project and implementation, collecting data relatively widely (observing not only potential users when adopting and trying to use the e-ordering system, but also observing and participating in meetings on different levels regarding the e-ordering system, and talking to and observing as many people as possible in their daily work) in order to obtain as rich a picture as possible of the e-ordering project and of adoption and use of the e-ordering system. Other sources used were comprehensive documentation about the e-ordering project and semi-structured interviews. The e-ordering project had its own website on the intranet where protocols from meetings were collected and presented together with other information regarding the project; at this site all documentation belonging to the e-ordering project was collected. Upon arrival, I was given my own desk and a computer to use, and I was also given a user name and access to the intranet.

I was mainly interested in investigating how people 'from below' (i.e. end-users/requestors) viewed this change in ordering routines and in what influenced their adoption and use behaviour. As a researcher, it was important for me not to look at managers' views on e-ordering adoption only (which are easy to obtain through interviews), but also to gain knowledge about 'ordinary' persons' (end-users/requestors) views on the e-ordering system, persons working out in the organization, and to gain knowledge about their actual actions (is he or she using the e-ordering system, if not why is this the case and if he or she has adopted and continued to use the system, what has influenced this behaviour?).

Main case data collection

Interviews, observations and documentation studies have been conducted at the case organization over a 4-year period. Observations (both participating and only observing) during daily work, at lunch and coffee breaks, at meetings and training sessions, together with informal interviews, viewing e-mail correspondence and documents from the project group and from the intranet, were mainly conducted from June 2002 to Dec 2003. After Dec 2003, the main data sources have been semi-structured interviews and

viewing documentation. An overview of the persons/roles interviewed and the conducted observations can be found in the appendix.

Observations

One issue was whom I should observe among the approximately 400 persons working at the E&S division during the time of the study (2002-2006). I had to make a selection, and I also had to decide how to practically conduct the observations. When talking to the purchasing manager and the person responsible for system administration, they thought it would be a good idea if I functioned as a kind of mobile helpdesk, in the sense that people would be able to call me, and I would then go and help them use the e-ordering system on their own computer. It was my own suggestion, which was positively received. The idea was that end-users (requestors, authorizers and end-users who were receiving goods in the system) would be able to turn to me when they had difficulties using the e-ordering system. By functioning as a helpdesk person, I would make contact with potential users and regular users of the e-ordering system, be able to observe the problems they were experiencing, and gain insights into the reasons why they were experiencing these problems. The selection of whom to observe was thus those who turned to the help desk for assistance during the observation periods.

Physically, I was placed with people working with purchasing administration at level two in the E&S house (the purchasing manager had his room at level four, together with purchasing people at the division working with sourcing). The system administrator had his room next to mine. For the first couple of months, I shared a room with one of the women at purchasing administration, and after that I was placed in a larger room that I shared with three other women, all working with purchasing administration. Sharing a room with them helped me understand how the e-ordering system was perceived and accepted from below, from potential users working with tasks other than purchasing. This understanding came from observing and listening when the purchasing administration women helped and talked to persons working at the division, who visited the room. The visiting persons often had problems with using the e-ordering system and needed help for the order to go through. When people ordered the 'old way' (phoning or visiting the supplier), which was common, the purchasing administration staff had to phone them and ask for additional information in order to registrar orders in an internal system. These were often questions about price, which most people could not answer, so the purchasing staff then had to call the supplier and ask for the right price. These 'conversations' between the purchasing administrating staff and potential users from the E&S division functioned as a source of information.

My main other informant was the system administrator, who I followed to meetings (and who gave me information about and access to meetings and persons), to potential users at their work stations, to training sessions, and we

also had lunch together. Through the system administrator, I also got access to e-mail correspondences between him and users of the e-ordering system discussing usage issues regarding the e-ordering system.

Observing at training sessions was another source of information. I took part in nine classroom training sessions, each of which lasted for three hours. The training sessions were led by the system administrator. A 20-minute introduction was given before starting to go through the practicalities of how to order. This introduction was made by one representative of the central e-ordering team, one of the purchasers working with sourcing or the purchasing manager at the division. After the introduction (which contained a standardized presentation created by the central e-ordering project team, informing about the benefits of using an e-ordering system), the system administrator continued with the training session. Different departments that were about to start using the e-ordering system attended the sessions, at most there were nine people and the fewest number of participants was six (the system administrator and myself not counted). During the sessions, there was an open and informal atmosphere, and it was a good opportunity to observe potential users first-time experience with the e-ordering system. During these sessions, I also came in contact with potential users who a few days after the session asked me for help in using the system. I also came in contact with potential users who were interested in talking further as well, but in a more formal way through semi-structured interviews.

The plan that I should function as a helpdesk (a mobile helpdesk) person was a good one, but in reality it was too soon for the division to have such a support function. There were several issues that had to be solved before potential users would be able to use the system when ordering (e.g., how to manage their current working routine and at the same time order products and services needed through the e-ordering system).

At the Swedish organization, there are two coffee breaks during the day; one in the morning and one in the afternoon, which most people attend, drinking coffee and socializing with their co-workers. Lunch is either purchased at one of the two restaurants in the organization area, or brought from home and eaten at the department where people work. The women working with purchasing administration usually brought their lunch from home and took a half hour lunch break, sitting in the kitchen at level two. The purchasing manager at the division usually had lunch at the restaurant closest to the E&S building. The system administrator sometimes skipped lunch, or had lunch at the closest restaurant. To have contact with both the purchasing administration staff and with the purchasing manager and the system administrator, I brought lunch a few times a week and had lunch at the closest restaurant a few times a week. At R&D, they usually went to the large restaurant in the main building in a group, and I joined them a couple of times as well, in order to socialize and to informally get an understanding of

what they thought of the e-ordering system and why. I did not take any notes during coffee breaks or lunches. If something particularly interesting was brought up, I wrote it down afterwards, and in some cases contacted the person who brought it up for more information.

On the 13th of June 2002, the entire project organization for the e-ordering project (including representatives from different functions such as purchasing, finance and information technology, and from different geographical areas) was brought together. The purpose of the day was to function as a kind of starting point for the e-ordering project. Attending on this day helped me understand the extent of the project, the roll-out plan, issues discussed and what were considered to be important questions.

Observations at a meeting with system administrators from all divisions (also from Lund and Mölndal) on the 3rd of October 2002 provided knowledge about the status of the e-ordering roll-out at different divisions and sites (including insights into problems that different divisions and sites were facing at the time).

At the meetings and training sessions I attended, I sat in the back of the room, listening to and watching the conversation going on, taking notes.

One November afternoon (2002) I sat together with two helpdesk experts at the central helpdesk (containing of two consultants from WM-data) for three hours, listening to phone conversations between the helpdesk experts and users out in the organization. I also asked the helpdesk experts what they felt was influencing adoption and use of the e-ordering system. This session gave me my first picture of the problems users were experiencing when using the e-ordering system.

Participating observations were conducted at a two-day training session in the e-ordering system for expert users, purchasing and finance people. During this session (25/11-02 and 26/11-02 8.30-16.43), I was educated in the system as a representative for the E&S division. I also listened to and participated in conversations about the e-ordering system, learning more about the project in its entirety, and more about expert users' and purchasing and finance people's attitudes towards the e-ordering system.

Observations were also conducted at a so-called 'practice in swimming on land' training session at the E&S division on the 7th of May 2003. This session was aimed at potential users who had already received training once or twice, but who still did not use the system when ordering products and services, or rather who ordered as they had prior to the system, using the phone, or visiting the supplier. By watching participants and their behaviour at this special 'training' session, I became aware of factors and structures that were influencing their adoption and usage behaviour. In some cases, they felt

it was impossible to perform their working tasks as before if they had to order the products they needed using the e-ordering system.

I also attended eight 'normal' training sessions, where potential users and authorizers tested the e-ordering system for the first time, watching and listening to them. Through my access to these sessions, which lasted approximately three hours, and consisted of a maximum of 9 participants, I was able to observe potential users' first-time use of the e-ordering system and their reactions and actions, leading to insights into why, for example, some thought it was difficult and others thought it would work to order and authorize through the system.

I also watched and listened to people in the context of daily work (including coffee breaks and lunches), as described above, on 28 full days, spanning from the 5th of November 2002 to the 25th of August 2003, focusing on their adoption and use/non-use of the e-ordering system. As described above, I was physically placed with people working with purchasing administration at the E&S division. Sharing a room with them helped me understand how the e-ordering system was perceived and accepted from below, by potential users working with tasks other than purchasing. By following the system administrator in his daily work, I also had the opportunity to watch users in their own working environment using the e-ordering system for the first time, thus observing actual use of the system and the problems experienced at that moment.

Observing and note taking

On days when I only sat with the woman/women at purchasing administration, I took notes when potential users came with their problems or questions regarding the e-ordering system, and at the end of the day, I often (but not always) wrote a couple of sentences about the day. If I were to do the study again, I would probably be stricter about taking notes, especially on days when 'nothing' happened. There were actually a few days when I did not take any notes, writing down what was happening. At first it felt like I had not started with the data collection yet. I felt I had to get to know the people, get my computer, password and so on.

During the training sessions, and during observations at the helpdesk and meetings, detailed notes were taken about what was said and what happened. These notes were then transcribed the same day. Directly after the session or meeting, I went to my computer to transcribe the handwritten notes.

On occasions when I (or the system administrator and I) visited potential users, trying to help them use the e-ordering system, notes were taken in parallel with helping them or just after helping them. These notes were also transcribed on the same day.

Interviews

Thirty-three semi-structured interviews have been conducted at the organization. I had written down topic I was interested in discussing, but also left space for the interviewed person to take his or her own initiative regarding subjects to discuss. I took notes at all interviews, which I transcribed the same day. At most interviews, I also used a tape recorder, which was useful when transcribing, because if I was unsure of a statement, quotation and so on, I listened to the tape. In some cases when I asked if it was acceptable for me to use a tape recorder, I noticed some resistance and insecurity. I then informed the person who was going to be interviewed that the purpose of the tape recorder was to help me transcribe my handwritten notes. If after giving that information I still felt some resistance on the part of the interviewee, I turned the tape recorder off and took notes only by hand. In some cases, I sent the interview protocol back for comments, to ensure that I had represented our conversation correctly.

The first interview was conducted with the e-ordering project manager employed at the time, at the end of January 2002, and the last interview was with the Swedish purchasing manager and the e-ordering project manager at the time, at the end of September 2006.

The roles covered in the interviews were: Swedish purchasing manager, project manager for the e-ordering project, division purchasing manager, Swedish information manager, person responsible for system administration, system support persons, person responsible for measurement model for e-ordering, external consultants involved in the e-ordering project, purchasers (working with sourcing), purchasing administration staff, system administrator at the division level, potential users of the e-ordering system, actual users of the e-ordering system, caretaker, and authorizers.

The interviews lasted between one and two hours. Notes were taken during the interviews and were transcribed the same day into a Word document.

Documentation

Another main source of information was documentation about the e-ordering project, and information about the project (including project organization, training session schedule, notes on meetings, training material and so on) presented on the project's own webpage at the Intranet. There was an extensive amount of documentation regarding the e-ordering project, largely owing to the number of people involved (people from different functions, from different geographical organizations, and from the central e-ordering project team) in different groups (steering groups with managers, groups for the system administrators and so on), leading to several protocols from meetings and instructions from the central project group. Also probably

owing to the fact that the organization is a research company with employees who are used to documenting everything – a norm also translated to other functions and projects not directly related to pharmaceuticals research and development. Thus, there was a large number of documents, describing issues discussed, decisions taken, and future plans regarding the project. One source of information for understanding the technology structure, according to DeSanctis and Poole (1994), for the e-ordering system was the education material file, which consisted of pictures of the different ‘pages’ in the e-ordering system, showing structures, functions, and the information needed in order to order, authorize and receive goods in the system.

The website was updated continually during the e-ordering project. It was updated regularly with new information early on in the project, but it was rarely updated with new information at the end of my data collection (end September 2006). The material on the site has contributed to my understanding of the project in its entirety. The material presented and distributed on the site has had a managerial perspective, presenting information from above. Looking at the site has been a good way for me to keep track of the different persons and groups involved in the project. It has also been interesting to compare plans in relation to actual outcomes, which in many cases have differed. For example, the planned/estimated number of users at a certain time has not been achieved, which shows the difficulties in getting potential users to use the e-ordering system. The first thing I did when I came to the organization was to look at the website to see whether there was any new information about the project compared to last time I had visited the company.

Other sources

Another source of information was a meeting arranged by a young purchasing professional network at the organization the 17th of May 2004, where the global purchasing manager at the time talked generally about purchasing within the organization. This informal session provided information and knowledge about purchasing and e-ordering at the organization from a global managerial perspective, giving a larger picture of, for example, why purchasing was moving towards centralization within the organization.

In Table 2 following, data collection activities, their purpose and obtained insight/knowledge are collected and presented.

Activity	Purpose	Result
Pre-study interviews	To investigate potential research areas/questions within e-ordering and to find a suitable case organization.	Achieved an overview of the status of e-ordering in large organizations, how far they had come, which barriers they were facing and how they viewed the potential of e-ordering. One potential research area was found: individual acceptance of e-ordering systems. Also a suitable case organization was found to which contact had already been established.
Interviews with people in the central project group	The purpose of interviewing different people with different roles in the e-ordering project group was to get a general picture of the e-ordering project. I also wanted to investigate how well different divisions were doing and if there was a division that was interested in having me there observing their e-ordering implementation.	Through interviewing different roles within the e-ordering project group, knowledge was obtained about how the project was progressing in the entire organization and how different divisions were doing. Through interviews with the e-ordering project manager and the person responsible for administrative issues, I also came in contact with people working with implementing the system at different divisions.
Interviews with purchasing people at the two studied divisions	The purpose of these interviews was to get purchasing professionals' views on how adoption and continued use were progressing from their point of view, and to get a general picture of how implementation of the system was progressing at the different divisions in more detail.	Through interviews with purchasing managers, purchasers involved in the e-ordering project and persons working with administrative tasks related to purchasing, knowledge was obtained about how implementation was progressing at the different divisions, and which problems they as purchasing people were facing. Through talks with purchasing administrative people, I also gained knowledge about how individual end-users out in the division understood this new way of ordering and better understood some reasons for end-users not using the system.
Interviews with individual end-users at the two studied divisions	The purpose of these interviews was to better understand why they resisted using or used the e-ordering system.	Through these interviews in which end-users told me about their everyday work, their working tasks and how they bought what was needed prior to the system, I gained knowledge about why they found it difficult to use the system.
Observations in the daily work	<p>The purpose of these observations was to observe end-users at the moment of ordering, and to better understand their acceptance or non-acceptance of the e-ordering system.</p> <p>The purpose of participant observations at lunch and coffee breaks was to socialize and to gain through informal talk increased knowledge about what end-users thought about the system – if they used it or not, and why.</p>	<p>Through observing end-users' daily work, I gained knowledge about current routines and other issues influencing acceptance of the system. Through both (in interviews) hearing someone describing a routine and observing it, greater insights were obtained concerning what was actually affecting system use and how. Visiting and observing end-users in their working environment also contributed to increased insights into the reasons for system acceptance or non-acceptance.</p> <p>During lunch and coffee breaks, through informal talks, I gained increased knowledge about different people in different roles and their attitudes towards the project and the system. I also gained knowledge about their everyday life at the organization, their issues and problems.</p>
Observations at training sessions	The purpose of observing at training sessions was to observe end-users trying out the system for the first time,	Observing and listening to end-users' reactions and questions when confronted with the system for the first (or in some cases second time) contributed to knowledge about their previous knowledge and how they viewed the possibility of

	gaining knowledge about their adoption and use of the system.	using the system in their everyday work. These reactions and questions contributed to knowledge about how routines worked currently and showed that end-users had difficulties seeing how to combine work with ordering in the system.
Observations at meetings	The purpose of these observations was to obtain a general picture of the e-ordering project, how implementation was progressing, issues currently discussed, issues at different divisions etc.	By observing at different meetings involving participants from different divisions and roles, knowledge was gained about the project (the size of it, people involved, their roles, etc.) how implementation was progressing, issues that were problematic etc.
Observations at the IS central help-desk	The purpose of observing at the IS central helpdesk was to gain an initial understanding of the problems end-users needed help with.	By listening to conversations between end-users and help-desk staff, knowledge was gained about problems with use of the system, such as difficulties with login, difficulties with filling in information, so that the order would go to the supplier, etc. Through informal small talk with the help-desk persons between these conversations, further knowledge was obtained about how they viewed the e-ordering system and how they perceived end-users' adoption and use, and what problems they felt hindered use of the system.
Viewing documentation	The purpose of going through an extensive amount of meeting protocols, documentation describing the project, time tables, budgets, etc., was to gain as a extensive picture as possible of the e-ordering project.	By looking at the documentation, I got a picture of how the implementation was planned, which I could compare to actual action. By examining meeting protocols, I also acquired knowledge about what was currently being discussed and which individuals were involved in the project.

Table 2. A list over data collection activities, their purpose and obtained insight/knowledge.

Analysis of the empirical data

The analysis was divided into three different steps.

The first step was to translate the original AST model (which was developed for the study of information systems with a social interaction orientation) to the system under investigation in the present research (which is a more task-oriented information system). This translation resulted in an adapted AST model.

I began by printing out interview protocols, observation notes and documentation (such as meeting protocols, reports, information material, training material, etc.), placing them in files, beginning with the first interview protocol, from January 2002, and ending with the last interview protocol from September 2006. I thereafter categorized and coded the text according to the AST constructs. All text belonging, for example, to the category spirit was marked and small post-it notes were placed next to the text with the category name 'spirit' on them. When I had coded all the text, I collected text belonging to a certain category, making it easier to find empirical data related to that category. I continued by examining the

empirical data for each construct in the AST model, investigating whether the construct also was relevant in an e-ordering context and what it meant in such a context. (Structural features in an e-ordering system, such as how to create an order, follow up an order, authorize an order and receive products and services (in the system) were identified by, for example, viewing training material in which technical structural features of the system were described.) By carrying out the “translation” in this way, I found support for and examples of structures and factors in the AST model that were applicable to an e-ordering system. I did not find, however, any data related to decision processes or decision outcomes. I also had problems finding data related to all of the different aspects of appropriation. In my data, I found text on individual use or non-use of the system. I did not find, however, that the system had been used for different purposes, or that the system had been used unfaithfully, for example.

The second step was to analyse whether the structures and factors in the adapted AST model had influenced adoption and use of the e-ordering system and how. I also analysed whether the factors found in previous research on e-ordering adoption and use also had influenced use or non-use in this case, and how.

I began examining the data on different structures and factors, looking for a connection to individual adoption and use behaviour. In order not to miss any explanatory factors not presented in the adapted AST model or in previous research, a new category was also marked: adoption and use behaviour. All text belonging to this “new” category was marked and small post-it notes were placed next to the text with the name of the structure and factor, etc., that had influenced adoption, non-adoption, use or non-use. Quotations and observations in which there was a connection between adoption and use behaviour and structures/factors, etc., were collected according to category. I carried out the double coding in order to identify any further structures and factors influencing adoption and use behaviour than those currently in the model and in previous research.

In order to analyse if and how structures and factors had influenced behaviour over time, I viewed and compared text regarding each structure and factor from different periods of the e-ordering case study. This comparison, together with statistics (i.e., statistics on usage of the e-ordering system) and quotations from people talking about usage rates in interviews, during observations, etc., resulted in knowledge about how structures and factors influenced individual adoption and use behaviour over time.

When observing at training sessions and in “helping” situations, knowledge about why persons used or did not use the e-ordering system was acquired, in large part by listening to the conversations taking place and observing the behaviour in the actual physical environment in which people worked. This

created an understanding of the conditions under which usage of the e-ordering system was or would be taking place. For some craftsmen at E&S, for example, there was only one designated computer situated in a kind of engineering workshop that was to be used when ordering, authorizing and receiving goods. Notes from observations, together with interview protocols and more quantitative supporting data (information from the e-ordering system itself on statistics covering different divisions usage of the system) were examined to increase my understanding of what influenced adoption and use behaviour and how.

By examining statistics on different divisions' usage, I received confirmation of things I had already seen on an individual basis, for example that the E&S division showed very low usage of the system compared to the R&D division. The observation notes and interview protocols were then used to identify possible reasons for this.

The third step involved investigating and analysing differences and similarities between the two studied divisions. By examining notes from observations and interview protocols, structures existing prior to the e-ordering system implementation were identified, showing for example how people at the division used to order (order structure) prior to system introduction. At the R&D division for example, they had a system with paper notes. When a researcher needed something, he or she wrote down the product or service on a pink piece of paper and gave it to the porter at the department, who then ordered the product and service needed, received it in the system and brought it to the person in question. At the E&S division, the person who needed a product or service ordered it him- or herself (often by phone) or visited the supplier store. Another structure prior to system implementation that was found by examining notes from observations and interview protocols was how to authorize orders. At the E&S division, there were no clear authorization rules, craftsmen at E&S had great freedom in their choice of purchase, and the purchase was almost always authorized afterwards, when the product had already arrived.

How can we produce valid and lasting results?

Qualitative case study research, too, aims to produce valid and lasting results, but how do we know that the results are valid and lasting, how do we assure the quality of the research design?

Internal validity

The literature on case study research argues for the importance of achieving internal validity to ensure that the results actually capture what has been

studied, i.e. that the results truly capture what is there (Merriam, 1994; Yin, 2003). According to Merriam (1994), there are different kinds of strategies a researcher can use to secure internal validity, of which three have been used in the present research: triangulation (both in regards to different methods and different sources of data), letting respondents view descriptions and results to see whether they agree with them, and making observations of the situation and the studied environment over a longer period of time.

Triangulation

Beginning with triangulation, throughout the case study I have used different data collection methods: interviews, observations and documentation studies. The aim of the triangulated approach is to draw on the particular and different strengths of various data collection methods. Interviews can provide depth, documents can provide facts and direct observation provides access to processes and can help the researcher see discrepancies between what people have said in interviews and what they actually do (Huber and Van de Ven, 1995). By using different types of methods, I have been able to obtain a rich picture of the context, the situation and how the situation has progressed. The extensive amount of documentation that has been viewed has contributed, for example, to an overall picture of the project, what has been planned, what has been accomplished, and what and how it has been communicated. The interviews have added different persons' pictures of the situation, which has also contributed to an overall picture of the situation and how it has progressed over time. The interviews have also provided more detailed knowledge of initial acceptance and continued use behaviour, and the causes of such behaviour from the interviewees' different perspectives. The extensive amount of observations carried out has provided more detailed knowledge about, for instance, how people work, their work context, how they carry out purchases, reasons for adoption, non-adoption, use and non-use. Together, the data generated from the three methods have facilitated a rich understanding of the introduction and implementation of the e-ordering system at the case organization. If only interviews and documentation had been used as data sources, less insight would have been gained about the working context, different routines, and attitudes towards the system, and why people used or did not use it. Attitudes and reasons for use or non-use have been brought up and discussed in the interviews, but through observations of daily work, a greater understanding has been achieved.

Interestingly, there were few discrepancies between what people said in interviews and their behaviour. The direct observations, however, facilitated knowledge about, for example, working, ordering and authorization routines and difficulties for individual requestors to combine these routines with ordering through the e-ordering system. Through the interviews, I understood that some individuals resisted using the system, and by visiting for example a group of craftsmen in their working environment, observing them in action,

looking at their working environment with only one computer to be shared by ten persons, and listening to them describe their day, I understood much better why they initially resisted using the system; it was difficult for them to combine conducting their work in a satisfactory way with ordering products needed through the system, instead of visiting or phoning the supplier directly.

It was interesting to compare the documented scheduled plan with the actual roll-out. By examining the original scheduled plan and comparing it with actual roll-out, I could see that the project had been delayed, and that it took longer than first anticipated. The delay was not great, but every phase was delayed by a few months in relation to the initial time plan. This is an example of how I could compare different sources, thus improving my knowledge of what was happening. In this case, evidence that the project was initially delayed during the first year, compared to plans, was found by comparing documented plans with actual action.

Triangulation has also been used in the sense that persons in different roles and on different levels have been interviewed and observed. Also several persons with the same role in the organization have been interviewed. By interviewing many respondents on different levels, and with different roles, it has been possible to compare answers and to check that answers did not contradict each other. Some contradictions were found, however. For example, initially, when conducting the first interviews with the project manager for the e-ordering project at the time, I got the impression that everything was going according to plan, that there were no problems related to individual end-users and their use of the system. When I visited the E&S division, however, the purchasing manager there together with the responsible system administrator said that they had problems using the e-ordering system in their division, much due to the tasks that were to be performed; this picture was later confirmed by the individual end-users I interviewed and observed. In the same way, when interviewing a consultant involved in the project, I got the impression that there were no problems at the R&D division, and that usage of the system was progressing very well there. When interviewing a purchaser involved in the project, however, I understood that they also had issues with usage of the system, which was further confirmed when interviewing individual requestors at one department at the R&D division. By interviewing and observing people in different roles at different levels within the organization, I could compare what they said, and when discrepancies such as those above were revealed, I continued to talk to and observe more people, in this case end-users, who really knew what was going on in regards to adoption and use behaviour. Reasons for giving different answers to the question of how implementation was progressing could depend on where in the organization the interviewee person was: The central project manager may not always realize which problems are being faced and experienced further down in the organization.

For persons further down in the organization, a problem that is small in the eyes of the project managers may be experienced as large by the individual end-user. It may also be the case that, when questioned by me – an external person/researcher, the first central project manager and consultants involved in running the project initially wanted to present the implementation/project as going well, as being successful.

Respondents viewed descriptions and results

When interviewing respondents, I have tried to test my findings by asking them more about, for example, the structures and factors I have found to influence use and non-use, thus discovering whether the respondents agreed or disagreed with the importance of these structures/factors. This was a way of testing my description, how I experienced the situation, and of confirming that both I and the respondents viewed the situation in similar ways.

At one point in time, in September 2006, I presented my findings to the Swedish purchasing manager and the e-ordering project manager, by showing a picture of the different structures and factors that I had found influence use or non-use. We discussed the findings for an hour, during which they confirmed that I had understood the situation and was on the right track. I remember that they did have some questions, however, regarding what I meant by different structures and factors, and I had to explain this further.

Before my final seminar, which was held in December 2008, I also sent a draft of the present thesis to the Swedish purchasing manager and the e-ordering project manager asking them to inform me if they did not agree with what I had written and/or if they thought my description was incorrect. I did not receive any complaints or suggestions for changes, which I interpreted as meaning that I had not described the situation incorrectly.

Observations over a longer period of time

Observations have further been conducted over a longer period of time, which has enabled me to observe the structures and factors and their effects over time, also allowing me to observe their influence on adoption and use several times, thus increasing the internal validity.

External validity – Generalization

The question may arise of whether the results are also applicable in other cases in which organizations are introducing and implementing an e-ordering system. External validity refers to the extent to which the results from a certain study can be generalized to situations other than the investigated situation (Merriam, 1994). Merriam (1994) argued that in order to increase

the possibility that results from a case study can be generalized, the researcher has to give a detailed description of the context in which the investigation was carried through. Based on this description, the reader or user of the present research should be able to capture what aspects can be applied to a certain situation.

The influencing structures and factors found in the research have affected adoption and use of the e-ordering system in this specific organization, a large pharmaceutical company. I chose the case methodology in order to gain rich insights into what influenced adoption and use in this specific case, as the aim was to understand the deeper structure of the phenomenon. Generalization from this specific setting to a population was not the objective, however. As Lee and Baskerville (2003) claim, interpretive research places no particular emphasis on generalizability or the search for universal laws. However, according to Orlikowski and Baroudi (1991), the present findings can be used to inform other settings, and I agree with them.

I also argue, however, that the results could also be applied to cases in which the case organization is similar to the case organization and is facing a situation similar to that faced by the case organization. Such generalization is justified, in my opinion, because of the relatively rich description of the case organization and its situation, which will follow in the next section. This description gives opportunities to learn about the problems and possibilities of this type of organization. To be clear, I make no claims on statistical generalization (the way of generalizing when doing surveys). The mode of generalization is instead analytic generalization. Through the rich description that will follow, a more intuitive, empirically grounded generalization that sees a harmonious relationship between the reader's experiences and the case study itself is possible.

The e-ordering case study

The organization

The organization is one of the world's leading pharmaceutical companies, with 65,000 employees worldwide, 58% in Europe, 28% in the Americas and 14% in the rest of the world. Sales in 2005 totalled \$24 billion, with an operating profit of \$6.5 billion. The corporate headquarters are in London, UK, and the R&D headquarters are in Södertälje, Sweden. The company has manufacturing sites in the UK, Sweden, France, Puerto Rico and a bulk drug purification plant in Germany. The organization makes various product formulations: tablets, capsules, injectables and inhalers.

The organization focuses its skills, experience and resources on six therapy areas: cardiovascular (treating the causes and symptoms of heart disease), gastrointestinal (treating heartburn, Losec and Nexium), infection (treating infectious diseases), neuroscience (treatment of pain, disorders of the central nervous system, schizophrenia therapy and migraine), oncology (the battle against cancer), and respiratory and inflammation (treatment of asthma, etc.).

Around 12,800 persons are working for the organization in Sweden, of these over 7,000 are people employed by and working at the organization situated in Södertälje, which is outside Stockholm. At the organization in Södertälje, the corporate research headquarter is located together with an administrative headquarter for the Swedish organization, the Swedish marketing division, three production centres (one for tablet production, one for bulk production and one for liquid production) and an engineering and support division (E&S). The research and development division (R&D) in Södertälje focuses mainly on the fields of therapy for the central nervous system and pain control.

Research setting

The research setting chosen for the study was the Swedish organization, with a focus on activities in the Södertälje organization. The present author followed preparations before system roll-out and followed the implementation of the e-ordering system at the organization in Södertälje from January 2002 to September 2006, with a special focus on two divisions and their end-users' adoption and use behaviour: the R&D division and the E&S division. The author's main research site has been the E&S division.

R&D

Approximately 1,500 persons were working at R&D, contributing to a research centre that covered all disciplines within medical research such as pre-clinical, toxicological, chemical process, pharmaceutical developments and clinical trials. At R&D, there was one function in which end-users have been interviewed and observed: the analytical function. At the function, approximately 50 persons were working with analytical and pharmaceutical development of new products.

Persons working at the studied function mainly consisted of highly educated researchers, and of secretaries and one caretaker. All persons working at R&D and at this function had their own computers situated at their own workstation. Their work was performed either in the laboratory or in front of the computer. They were used to use the computer in their daily work and were also using information systems for other purposes than purchasing, such as a laboratory information management system (LIMS) (an information system in which all incoming samples are registered and all results are recorded and distributed to their assigner).

Prior to the e-ordering system, the order routine for indirect products and services functioned as follows: If a researcher needed an indirect product or service, he or she wrote the information on a pink piece of paper and gave it to the caretaker, who ordered the product via phone, e-mail or by visiting the supplier store. When the product arrived, the caretaker received it and delivered it to the right person. The invoice was sent directly to the person needing the product, i.e. the researcher and not the caretaker, who gave it to the manager for authorization.

Authorization rules were in force at the R&D division, which meant that purchases needed approval before invoices were sent to the financial department for payment, and that there was an amount limit up to which purchases could be made without authorization. The purchase, however, was formally authorized only after it had been made, when the manager was signing the invoice.

E&S

The E&S division, which supplies other divisions with project and maintenance services in the areas of construction work, engineering plant, electricity and automation, also sees to it that the divisions' infrastructure, such as electricity, steam, water, coldness, heating, etc., is in working order. Approximately 400 persons worked at E&S, which consisted mainly of craftsmen and engineers, and administrative staff (such as human resources, finance, information technology, purchasing, etc.).

The craftsmen working at the E&S division had mobile jobs, meaning that they did not conduct their work by sitting at a desk. They instead repaired and maintained construction work, etc., on the organization premises, performing various tasks when needed. Often a group of colleagues (could be groups between five and fifteen persons) shared a computer, which was stationed at their common space from which they proceeded in the mornings. In their work, the craftsmen did not always know from day to day which tasks were going to be performed. Perhaps a fast repair was necessary for part of the production to run smoothly, and then one or two persons would take care of that directly.

Prior to the e-ordering system, purchases of indirect material were decentralized; people largely ordered from their own choice of supplier, often by phone, fax or by visiting the supplier store. Everyone was allowed to order, and colleagues often took the car up to the supplier store during working hours, seeing it also as an enjoyable and social event. They sometimes bought several items each day.

There were no common authorization rules at the E&S division. At one department, for example, end-users received an order number that was equivalent to a project number, which was tied to all products and services bought during that project/assignment. They were further allowed to buy products and services up to 300,000 SEK, i.e. they did not have to ask for managers' approval for purchases up to 300,000 SEK. The order number also functioned as follows when visiting the supplier store: The craftsman bought the items needed, which could be many, and then they got a final sum on the delivery note, which was connected to the order number. At other departments, end-users were used to buying what was needed up to different amounts; then the manager would authorize the purchase when the invoice arrived. Thus, managers had a great deal of confidence in their colleagues.

Starting point

Purchasing at the organization had been decentralized for many years; The different divisions had managed both direct and indirect purchases by themselves with no interaction with other divisions.

In January 2002, purchasing for both direct and indirect material belonged organizationally to the respective divisions. Both the R&D and the E&S division had, for example, their own purchasing manager, responsible for both direct and indirect material. Limited co-operation and coordination regarding sourcing and purchasing existed among the divisions. When discussing purchasing with two persons working with purchasing at different divisions, it came up that these divisions had made agreements with the same supplier, ignorant of the other's agreement, resulting in different prices and

terms, such as service and payment terms, for the two different divisions. Further, purchasing processes and policies, authorization rules and accounting procedures varied between divisions.

Why a centralized sourcing and an e-ordering system?

There were different reasons for why the organization began to investigate the possibilities of a centralized purchasing function for indirect spending combined with implementation of an e-ordering system. Looking at factors influencing the decision outside the organization, there was a demand from shareholders to reduce costs and at the time to make an even greater profit. At the same time, the pharmaceutical market was not growing as rapidly as before, leading to higher costs for developing new products, which led to pressure to better manage other processes within the organization, such as purchasing. Further, the organization was the result of a merger between two organizations in 1999. The merger led to increased pressure by owners to reduce costs in order to show that the merger had been profitable, which in turn led to finding areas such as purchasing, in which lower costs could be achieved, contributing to the organization's profitability. It should also be remembered that the decision to implement an e-ordering system was taken during the IT-hype era, when these kinds of systems were introduced and argued for by system suppliers (such as Ariba, Oracle, Commerce One, SAP), system application service providers (such as Procedeo, IBX), consultants and the business press.

Looking more in detail at what was going on internally in the organization, it was found that the organization bought indirect products and services from many similar suppliers. At the time, the organization had approximately 15,000 suppliers, from which indirect products and services were bought. This situation had contributed to high prices (compared to negotiated prices), guarantees that were not optimal, such as terms of delivery, service, etc. Having many and similar suppliers also had led to high costs for administrating them. Moreover, orders at the time often lacked information, which demanded a great deal of time from the purchasing administration and purchasers, who needed to find out who had ordered, what had been ordered and from which supplier and at what price. The limited cooperation between purchasing departments at different divisions further led to more suppliers and non-optimal negotiated volumes (some divisions bought from the same supplier without knowledge about this, i.e., they negotiated with the supplier independently, not aggregating the volume bought by the entire organization, resulting in a higher price than would have been negotiated with higher purchasing volumes). There were further unclear routines regarding authorization rules at some divisions, i.e. lack of authorization in the current process. There was also low usage of the purchasing departments; a great

deal of purchasing professionals' time was spent on purchasing out in the organization, instead of achieving coordination advantages, for example.

In 2001, the Swedish organization bought products and services for approximately 1520 million Euro, of which half consisted of indirect spending. A business case was carried out in autumn 2001, in which yearly savings were estimated to 20-30 million Euro. It was estimated that indirect purchases to a value of 500 million Euro would be purchased using an e-ordering system. The organization further received approximately 280,000 invoices yearly from suppliers, and approximately 325,000 Euro was paid in penalty interest due to delayed payments each year. The estimated yearly savings of 20-30 million Euro would come from reduced purchasing prices (fewer suppliers, larger volume discounts and lower prices) and from a more efficient purchasing process. Approximately 90% of the savings would come from reduced purchasing prices and 10% from a more efficient purchasing process.

An e-ordering system was thought to facilitate web (electronic) catalogues from which end-users should order. Through these catalogues, it should be easy to follow agreements, because only suppliers with a centrally negotiated agreement were accepted as catalogue suppliers. Further, purchasing did not have to be involved, because the order was to go directly to the supplier. This would give purchasing more time for analysis and strategic supplier agreement work and give purchasing the time for cooperation between sites. By end-users following the instructions in the e-ordering system, the right information about the purchase would be obtained, authorization secured and there would be the possibility of automatically matching invoices. Buying from fewer suppliers would further increase discounts, reduce prices and improve terms connected to the purchase. Fewer suppliers would also lead to lower administration costs.

The initiative taken to centralize indirect purchasing in the organization and to implement an e-ordering system came from the executive managerial group, and at the end of 2001, a decision was taken by the executive managerial group to implement an e-ordering system, and a standardized e-ordering system from the software supplier Oracle was bought.

The system

The Oracle system contains functions for ordering, authorization, goods reception and payment. It works as follows. Purchasing orders are made directly through the system, either from a supplier catalogue or through a descriptive free-text order. Price and account coding are registered in the system when making a purchase order. Authorization is conducted in the system before the order goes to the supplier, and the authorizer is to ensure

that the correct account code has been used. When the authorizer is absent, the right to attest the order is delegated to another person. Agreements and suppliers are given in the system, and people working with purchasing are responsible for updating this information. Goods reception is carried out in the system. When the person responsible for goods reception is absent, the task is delegated to another person. Invoices are matched by accounts payable ledger and are not physically sent to the persons involved. Figure 3 below provides an overview of the description given above.

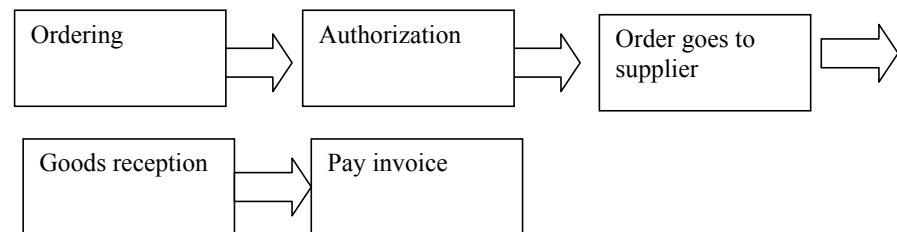


Figure 3. Actions performed in the e-ordering system.

The system is a standardized system, i.e. it cannot be tailored to fit this specific organization's detailed needs and wishes. However, limited modifications based on the user organization's requests have been made. One example of a modification was that the organization wanted it to be possible to order a report showing all purchase orders that had been created and approved by the same person. A second example is that the organization wanted purchasers (professional purchasers) to be able to create a purchasing order in different operating units (i.e., E&S and R&D for example) without having to login again as another user, which was the case from the beginning. Following is a more detailed description of the e-ordering system under investigation.

A more detailed system description of the individual ordering process

The following detailed description of the information system under investigation aims at giving the reader a more detailed understanding of the structures within the e-ordering system and the restrictiveness and comprehensiveness of these structures, i.e. what information needs to be filled in and how to fill it in for an order to go through.

The personal starting page

The user finds the e-ordering home page on the organization's intranet. In order to get access to the e-ordering system, the user has to log in using his/her user name and password. The first page the user sees is the personal starting page. From here, different activities can be carried out: Find a product, browse categories, browse lists, shop supplier site, create non-catalogue request, purchasing news, to do list, requisitions at glance, check frequently asked questions, review purchasing policies and purchasing process.

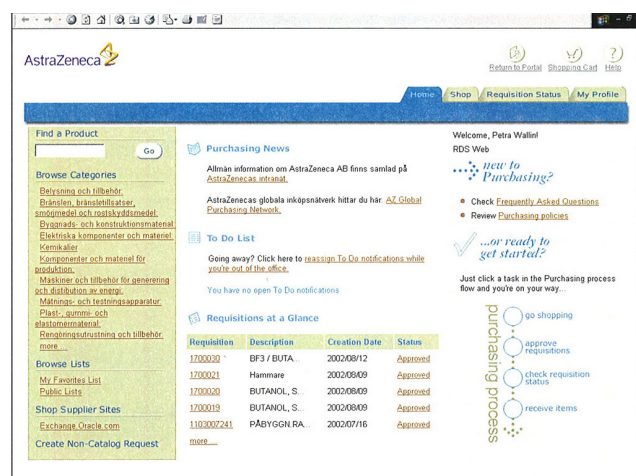


Figure 4. Extracted from the training material: the personal starting page.

Ordering from a catalogue

Under the heading shop and then under the heading catalogues, the user can search for products in all supplier catalogues within the system. It is also possible to search for products by category. When the user has found the item that he or she wants to order, he or she clicks on the square under the heading 'select' and then on 'add to cart'.

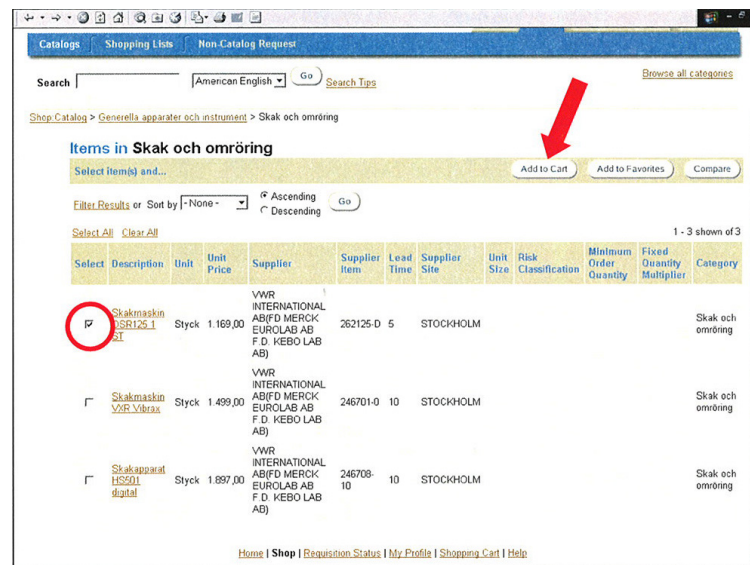


Figure 5. Extracted from the training material: ordering from a catalogue.

Ordering by free text

If the product or service cannot be found in the supplier catalogues, the user can make a non-catalogue request, i.e. a free-text order. In order for the order to go through, all information in the picture below has to be filled in, such as item type, category, item description, unit of measure, quantity, currency, and unit price. The user can also propose a supplier.

The screenshot shows a web application window titled "Non-Catalog Request". Below the title is a brief instruction: "Create a non-catalog request to order goods and services that you can't find in the Catalog or Shopping Lists." A note indicates that an asterisk (*) denotes a required field.

The form is divided into two main sections: "Describe your item" and "Propose supplier".

Describe your item section:

- Item Type:** A dropdown menu with "Goods billed by quantity" selected. Examples provided are "10 books @ (SEK) 250 each" and "10 hours of consulting @ (SEK) 1000/hour".
- Category:** A dropdown menu.
- Item Description:** A text input field.
- Unit of Measure:** A dropdown menu with "Styck" selected.
- Quantity:** A text input field.
- Currency:** A dropdown menu with "SEK" selected.
- Unit Price:** A text input field.
- Exchange Rate Type:** A dropdown menu with "Corporate" selected.
- Exchange Rate Date:** A text input field showing "2002-05-24".

Propose supplier section:

- New Supplier:** A checkbox.
- Name:** A text input field.
- Site:** A text input field.
- Contact Name:** A text input field.
- Phone:** A text input field.
- Supplier Item:** A text input field.

At the bottom of the form are three buttons: "Clear All", "Add to Cart", and "Add to Favorites". A navigation bar at the very bottom contains links: "Home | Shop | Requestion Status | My Profile | Shopping Cart | Help".

Figure 6. Extracted from the training material: ordering by free-text.

Delivery information

Delivery information has to be filled in by the user for the order to go through, such as need-by date, delivery address and sometimes suggested buyer. Need-by date is predefined with a date based on the lead-time given by the supplier in the catalogue. If the user is ordering for someone else, the requestor has to be filled in.

Enter Delivery Information

* Indicates a required field

1. When do you need the items on your requisition?
☐ Urgent requisition
* Need-By Date 2002-05-09
(Example: 2003-04-30)
2. Who is requesting the items?
* Requester Lersson, Stefan
3. Where are the items going?
* Deliver-To Location 6205
Need to have your items delivered to a special address that hasn't been predefined?
[Enter a one-time address...](#)
4. Who is the buyer?
Suggested Buyer
5. Does this delivery information apply to all the items on your requisition?
☒ Yes
☐ No, delivery information differs by item

[Clear Checkout Changes and Return to Shopping Cart](#) [Continue](#)

Figure 7. Extracted from the training material: delivery information.

Billing information

The user must also fill in billing information for the order to go through.

The screenshot displays the AstraZeneca checkout interface. The top navigation bar includes the AstraZeneca logo, a 'Return to Portal' link, a 'Shopping Cart' icon, and a 'Help' link. Below this is a 'Checkout' section with a progress bar showing steps: 'Billing', 'Notes', 'Approvers', and 'Review & Submit'. The 'Billing' step is currently active.

Enter Billing Information

Are the items taxable?

1. Taxable Tax Code

Does this billing information apply to all items on your requisition?

2. ☒ Yes ☐ No, billing information differs by item

[Clear Checkout Changes and Return to Shopping Cart](#) [Continue](#)

[Home](#) | [Shop](#) | [Requisition Status](#) | [My Profile](#) | [Shopping Cart](#) | [Help](#)

Review Charge Accounts

Click on a Charge Account link to edit or allocate the item cost to multiple accounts.

Line	Item Description	Unit	Quantity	Price	Total (SEK)	Charge Account
1	Skakmaskin OSR125 1 ST	Styck	1	1169,00	1 169,00	5010-K0101000-0-0-0-028
2	Kyld centrifug CR 3.12	Styck	1	11500,00	11 500,00	5010-K0101000-0-0-0-028
				Total (SEK)	12 669,00	

[Clear Checkout Changes and Return to Shopping Cart](#) [Continue](#)

Figure 8. Extracted from the training material: billing information.

If the right account has been charged, the user can click on 'continue', but if not, or if no account number is automatically charged, the user must enter charge account information for the selected item, such as division, account, cost centre, project activity, specification, personal, etc. An example of what this looks like is presented below.

Enter charge account information for the selected line item and press the OK button when you're finished.

Charge Account	Bolag	Konto	Kostnadsställe	Projektkategori	Specifikation	Personal	Objekt
	010	5462	51070	0	0	0	0

Need to allocate the cost of this item to multiple charge accounts? Click here to [select multiple charge accounts](#).

☐ Apply this account to all requisition lines

[Clear Checkout Changes and Return to Shopping Cart](#)

OK Cancel

Figure 9. Extracted from the training material: account number.

The user can then click on 'ok' and the order will go either directly to a supplier (catalogue orders) or to a buyer (free-text order) who controls the order and then forwards it to the supplier.

Preparations before roll-out

The e-ordering project group was in place at the end of February 2002, and consisted of the project manager and consultants from the consultancy company Acando. The project group also had a steering group consisting of the Swedish purchasing manager and other managers representing different divisions and functions. A large project organization further crystallised during the spring, including representatives (mainly from purchasing and finance) from the different divisions within the organization.

During the preparation phase, seminars and workshops were conducted in which persons from different parts of the organization participated, representing different divisions, and different functions (such as purchasing, IS/IT, finance etc), with the purpose of informing and involving the rest of the organization. The aim was to find one purchase-to-pay process that could be used by the entire organization. At the time, purchases were made differently at the different divisions; they all had their different needs and purchasing processes for products and services bought. For example, a workgroup was conducted in June 2002 in which people working with purchasing and finance at different divisions met to discuss the coming centralized sourcing combined with using the e-ordering system. Besides providing information, the purpose of the full day was to act as an inspirational day for people who were going to be involved in the e-ordering project. Approximately 40 persons attended the information and inspirational day offered by the project group and the Swedish purchasing manager.

Eighty suppliers were further invited at one occasion to discuss the organization's use of an e-ordering system instead of ordering via the phone, fax, e-mail or store. The project group asked questions, for example, about the suppliers' attitude towards offering electronic catalogues. Of the 80 invited suppliers, approximately 10-13 would later be selected by the central purchasing function as preferred suppliers, exposing their products through a

catalogue in the e-ordering system. The suppliers were positive towards supplying electronic catalogues and interested in becoming a preferred supplier.

The project group divided the e-ordering implementation into two phases: Release 1A and Release 1B. The plan was to start on a small scale with Release 1A, rolling out to a limited number of users, and the objective of Release 1B was to roll-out the e-ordering system to all organizational units within the organization.

Pilot roll-out/Release 1A (August, 2002)

In Release 1A, the e-ordering system was rolled out to 320 users including requestors, authorizers, purchasers and goods receivers (who in many cases were the same person as the requestor) at three divisions: E&S, Tablets and R&D. The users could order from seven catalogue suppliers or by free-text in the system, filling in their own choice of supplier and product. Only catalogue orders went directly through to the supplier; free-text orders were checked by purchasers to ensure that the organization had agreements with the chosen supplier before the orders were sent on to the supplier. Training was offered to requestors and authorizers.

Training and support at the different divisions were managed by persons working with purchasing at that division together with people from the e-ordering project group.

At E&S, the users received a classroom training session that lasted approximately 3 hours, in which they were informed about the project, potential savings, the common purchase-to-pay process and different product purchasing streams (1. purchases with purchase order and purchaser involvement, collaboration with a professional purchaser, 2. purchases with purchase order without purchaser involvement, transactional purchases, electronic catalogues are used, 3. purchases without purchase order, emergency and supplier managed call-off (i.e., elevator service, refill of gas), 4. purchase without purchase order, company card and expense reporting (i.e., taxi, hotels, travel)). During this training session, they also went through the system functions with a teacher. At the R&D division, department managers and other managers within the division were first invited to an information meeting in which they were informed about the e-ordering project. Information about the e-ordering system was also sent out by e-mail. Users (requestors) at R&D were given access to web-based training, through which they were expected to teach themselves how to use the e-ordering system.

Adoption and usage – end-user actions and reactions

End-users (requestors) at the time were sceptical about changing their purchasing behaviour, having to order themselves through an information system. It should be remembered, however, that Release 1A was considered as the first roll-out of the system on a small scale. Looking at usage figures for the divisions included in the Release 1A roll-out and considering week 34 to week 49 (2002), the E&S division had lowest usage figures, only 330 orders (compared to 17,026 purchases made outside the system) had gone through the e-ordering system during this time, of which 22 orders had been catalogue orders and the rest (308 orders) had been free-text orders. For R&D, usage figures were higher, 2758 orders had gone through the system (which should be compared to 9028 orders made outside the system), of which 1000 were catalogue orders and 1758 free-text orders.

At the E&S division, there were no problems in getting end-users to show up and participate in classroom training sessions. The problem was that when the end-users who had received training were supposed to continue ordering by themselves, this did not happen. They instead continued to order from their choice of supplier and to use their old way of ordering (via the phone, e-mail or by visiting the supplier store). A couple of quotations from craftsmen who had received training but did not continue to use the system when ordering by themselves illustrate some reasons for this.

“When we are working, we often have to go up to the supplier by car to buy our products. It may be urgent and important for the internal customer that the repair is made as fast as possible, and then you don’t have time to use the e-ordering system, you don’t have time to wait for the products to arrive.”

(Craftsman, November 2002)

“I am rather cautious about using computers. One of the first times I used e-mail I received a “love letter” e-mail, that I opened, and it turned out to be a virus. After that I am much more careful and do not really have the courage to try and test new things on the computer.”

(Craftsman, November 2002)

“They have to put in suppliers the ones we currently actually buy from, otherwise why should we use it?”

(Craftsman, November 2002)

“Now it works like this that you receive an order number that corresponds to a project number, everything you buy is then connected to that number. You go down to Ahlsells (the supplier) and gather together your products, which can be approximately 20-30 different products for example. You then get a total amount sum that you write down on the order number that corresponds to the project number. As it works today, everything is on one number. We can buy products up to a value of 300,000 SEK per project. When ordering by phone, we receive a delivery note with the products, which I send up to the girls at purchasing or actually deliver myself by visiting the purchasing department. In the e-ordering system, you have to order product by product and orders over a certain amount have to be authorized before they are forwarded to the supplier. I’m worried about this, it won’t work if you have to write in every item you buy, it will be too much every day, and it will take too much time.”

(Craftsman November 2002)

The craftsmen who had received training had difficulties seeing how they could perform their work in a satisfying way when ordering through the system; this was because some of their tasks were sometimes urgent, and accordingly difficult to plan ahead. Ordering routines different from ordering through the system also existed. For example, when ordering in the system, the user had to make an order for every product compared to (when going to the supplier store) just getting one amount that was transferred to a project number. The craftsmen estimated that filling in orders for 20-30 items in the e-ordering system would take them several hours. Another difference was the amount they could spend themselves without asking a superior. In the e-ordering system, orders needed manager authorization before being sent to the supplier. Computer literacy was relatively low, and for end-users who were used to use the computer, the transition from ordering by phone and visiting the supplier store to ordering through the computer interface was difficult. Or as the purchasing manager at the division at the time put it:

“How IT experienced you are affects adoption of the e-ordering system a lot. Our largest problem at this division is the varying degree of computer literacy.”

(Purchasing manager E&S, December 2002)

At an interview in December 2002, the purchaser manager at the division further brought up the issue of how well current processes (routines) corresponded with ordering through the system:

“We are working on looking over processes in our division and how these may correspond to processes in the e-ordering system. Now we are investigating what we can do at our division to make this work.”

(Purchasing manager E&S, December 2002)

One reason for requestors not continuing to use the system after the training session was also that the products needed were often not in the current catalogues, which was a problem, both for the end-users using the system (i.e., they could not find the product needed in the electronic catalogues in the system) and for the e-ordering project (i.e., the idea behind the e-ordering system was to use catalogues to the greatest extent possible when ordering).

Looking at the R&D division, it was communicated by the central e-ordering project group that all people should order indirect products and services by themselves, using the e-ordering system. This confused some of the researchers at the analytical function (analytical department) who prior to the system had had an ordering system in which they wrote what they needed on a post-it note and gave it to the caretaker, who ordered, received the product and brought the product to the researcher's room. Quotations such as “I am a researcher, here to conduct research and not to spend time ordering products and services.” were overheard when researchers were discussing the e-ordering system/project over lunch. Compared to the E&S division, however, end-users at R&D were used to working with computers and had experience of using other similar information systems, thus their computer literacy was relatively high. Persons working at this department further had the possibility to plan their work in advance, i.e. they were not worried about having to wait a longer time for products ordered through the system than for products ordered by phone, fax or e-mail, nor were they worried that ordering through a computer interface would delay or affect their work.

Release 1B (February 2003)

In Release 1B, the system was modified to some extent on the basis of demands made by the organization (feedback regarding the system from end-users was collected and discussed in different groups representing the central e-ordering project group and different divisions and functions. The e-ordering project group and the project's steering group was the final body to choose the modifications to be made in the system.). There were limits, however, to what could be changed, because the system was a standardized information system. One example of a change that the organization could not make, which had to be driven by the software supplier Oracle for the next system

release, was to add fields in the system, in which gross price and discounts could be filled in, allowing the system to calculate net price automatically. One change that was made was that, for certain IS/IT categories, the system in Release 1B required that information such as installation address (building/level/room) should be filled in, which was not the case in Release 1A. A second example of a change in the system is that, in Release 1B, the system automatically suggested an internal delivery address based on where the requestor worked (building, department, and room). The requestor could also modify the address in the system, if the delivery was going to be made to another department. In Release 1A, there were no delivery addresses in the system and the requestor often forgot to fill in delivery address (or did not know one should), resulting in packages without a delivery address.

The objective of Release 1B was to roll-out the e-ordering system to all organizational units, to get at least 2000 end-users to use the system, and to achieve catalogue orders to a minimum of 25 million Euro through the e-ordering system (i.e., the number of catalogue suppliers was increased to 20-25).

Introduction of the e-ordering system, and training in how to use the system, was given differently at different divisions. Within the divisions Tablet, Bulk, Liquid and E&S, classroom training sessions were given that lasted around 3 hours each. R&D started with a large information meeting for all end-users within the division, to which people were invited through e-mail invitations. After the first information meeting, end-users were offered to attend smaller information meetings (i.e., classroom training sessions) that were led by a purchaser. People responsible for the roll-out (i.e., purchasing people at the division together with people from the central project group) booked computer rooms for classroom training, and 500 persons were invited to sign up for a training session, but only two out of these 500 signed up. People were also given access to an interactive training programme on the e-ordering project's website, on the Intranet, through which they could learn how to use the system by themselves. A total of approximately 2800 persons were to be trained in how to use the e-ordering system, in Release 1B.

Adoption and usage – end-user actions and reactions

The system had now been rolled-out to end-users (requestors, authorizers and goods receivers) in a large scale. At the end of March, all divisions within the organization had access to the system. Looking at e-ordering statistics, however, there were few catalogue and free-text orders made in the system up until the end of March 2003 compared to purchases made outside the system. During January to March 2003, for example, E&S had only made 11 catalogue orders. R&D had made 1239 catalogue orders (which should be

compared to 5889 orders outside the system, that purchasing administrative staff registered after the purchase had been made).

The mobilization phase (April 2003)

At the beginning of April 2003, the mobilization phase started. The central project group that had managed the e-ordering project so far handed over the project to the organization, to people working with purchasing at the different divisions. The central project group still existed, though, but now with fewer people (now with a project manager, a project coordinator and a couple of consultants helping the divisions with giving training sessions to requestors, authorizers and goods receivers). It still supported the organization, helping it to achieve use of the system and to reach the compliance goal of orders to a value of 500 million Euros through the system on a yearly basis.

In the mobilization phase, emphasis was placed on change management to ensure changes in purchasing behaviour (i.e., to get end-users to use the system when ordering instead of phoning their own choice of supplier and ordering through the phone), new forms of cooperation (working with increasing communication and cooperation about supplier agreements between divisions, and moving towards a central sourcing function), and compliance (making sure that end-users in the organization continued to order through the system, not reverting to their old habits).

The transition in responsibility for the e-ordering project, from the central project group to purchasing professionals in the organization, however, took more time than first anticipated by the central project group. It took approximately a year for the central project group to hand over responsibility to the organization. For example, consultants who were going to leave the organization after Release 1B continued to work for the organization, helping with implementation and the increase in end-user system use, for 1 ½ more years after Release 1B.

During the mobilization phase (early autumn 2003), a centralized purchasing function was developed and formed, consisting of 70 persons, most of whom were people who had worked with purchasing at different divisions prior to the centralization. This was a centralized function managing mainly indirect products and services; purchasing of direct material was still conducted in a decentralized fashion, out at the different divisions where purchasing could be conducted close to production. During this time, there was continuous activity directed at deciding on catalogue suppliers and putting them in place, thus creating, updating and maintaining supplier catalogues. At this time, the organization had two persons working full time with creating, updating and maintaining supplier catalogues. Initially, at the beginning of the project (creation of the first supplier catalogues in Release 1A), the organization had

help from an e-ordering application service provider with great experience of creating, updating and maintaining supplier catalogues.

Adoption and usage – end-user actions and reactions

In December 2003, 4,000 end-users had been trained in how to use the e-ordering system, usage of the system was gradually increasing, but there were still end-users who resisted using the system and they needed to be persuaded.

At divisions that had not succeeded in getting potential users to use the system, more effort was put into further information and training sessions. One problem at E&S was still that people who already had received information and attended training sessions did not continue to use the system when ordering. Persons who had attended two training sessions still felt it was difficult to use the e-ordering system. One potential user, who had received training twice but not continued to use the system, said that:

“I haven’t started to use the e-ordering system yet, mostly because when I order a contract I don’t really know how much I have to order in advance. After you have made the first order there are always extra things that are needed, more consultancy hours for example, and it’s not clear what to do in the system, when you don’t have the correct amount and price at the moment of ordering.”

(Person ordering contracts at E&S, May 2003)

Other reasons for not using the system were that it would take too much time for a given individual to order through the e-ordering system compared to phoning or visiting the supplier, and people were worried about their ability to perform their working tasks if they had to wait days for products to arrive.

“Instead of a five-minute talk over the phone, it will certainly take at least 25 minutes, we get more work and the purchasing department gets less.”

(Craftsman, May 2003)

“We will be sitting in front of the computer, not being able to conduct our ordinary work.”

(Craftsman, May 2003)

A further problem was that there were no clear authorization rules in force at the division, and many of the craftsmen needed instant authorization when ordering through the system, because the products were needed as soon as possible. This was a problem, as the managers who were supposed to do the authorizing also had other working tasks to perform out in the field, and did not have time to sit in front of the computer the entire day waiting to authorize their colleagues’ orders.

At this time, craftsmen at E&S had difficulties in seeing how they could perform their work in a satisfying way if they had to order through the e-ordering system. They were mobile in their work, making repairs all over the organization premises. These repairs often had to be made in a hurry, and material was needed as fast as possible. Thus, some craftsmen were ordering up to 50 items a day, which would take too long time to do in the system. Another issue was that there was a resistance to leaving their old suppliers and to ordering from new centrally chosen suppliers. How authorization would take place was also unclear, and there were worries that there would be a bottleneck, leading to long waiting time before the products arrived. Some of the craftsmen also had limited experience of using computers. They also had no previous experience of using similar information systems. One further problem was that even if they tried to order through the system, there were problems when filling in fields. A statement made by one of the purchasing administration staff describes the “delivery day” problem, which illustrates the problems and consequences of failing to fill in all the fields.

“One problem that has received many complaints is that the delivery time in the system was set to 10 days automatically, and if end-users did not change to less time they had to wait 10 days for the product to arrive, even though the supplier had the products in stock, because they thought that the customer wanted the product in 10 days not less. Many end-users forgot to change the number of days, and then had to wait 10 days for the product to arrive, which at the E&S division was too long, resulting in end-users having to visit the supplier store and there buying what had already been ordered in the system.”

(Purchasing administration person, August 2003)

An effort was made to increase use of the e-ordering system among craftsmen at E&S. It was decided by the central project group and representatives from the E&S division that E&S should be allowed to have a special solution, owing to the difficulty of combining working tasks with ordering through the system. Instead of saying, as before, that there is only one ordering process for the organization (and for the division), an effort was made to facilitate use of the system also for craftsmen working at this division. They were allowed, for example, to order up to an amount of 20,000 SEK by phoning the supplier, if they needed the material immediately. The order, however, was to be registered afterwards in the e-ordering system and the purchase should still be made from suppliers with a central agreement.

Another special solution for the division was that authorization of orders up to a value of 100,000 SEK could be made by the purchasing administration staff at the division, considering the importance of getting the product right away. (The purchasing administration was always present and could authorize immediately when an order arrived in the system, compared to the managers who themselves were often out working in the field.) This was an adjustment to the working conditions at E&S. The normal procedure in other

divisions was that it was always the manager who authorized the request (order) in the system.

If a person at the division had to order a product or service to a value extending 100,000 SEK, he or she had to discuss the purchase with a professional buyer (purchasing professional) and get help with performing demand specification and an offer inquiry.

The more pragmatic view on how to order within the division was presented during the training sessions that followed during the spring. Looking at usage figures for the division after introducing these new possibilities for end-users at E&S, however, they were still relatively low compared to other departments.

At R&D, use of the system was higher, but the goal was to use the e-ordering system and especially the supplier catalogues to a larger extent.

Users at R&D initially thought ordering through the system was strange, as they had not ordered themselves before and as the researchers complained.

“There are researchers who say they cost too much and should focus on conducting research, which is the core business, not spending time on training sessions for how to order products and services.”

(Consultant from Acando involved in the e-ordering project, June 2003)

Researchers at the analytical function (analytical department), who had a routine in which the caretaker ordered and received goods for the entire department prior to the system introduction, initially resisted using the system, because they now had to order themselves and spend time on information sessions, on reading e-mails with information about the e-ordering project and on ordering in the system. But instead of ordering themselves, i.e., doing what they were told from above, they asked the caretaker to order for them, which resulted in orders going through the system. The only difference compared to before the system was that the caretaker now ordered from the suppliers through the e-ordering system instead of ordering by phone or e-mail.

One problem at the R&D division, however, was that users who were ordering by themselves preferred to use free-text orders, even though the products were to be ordered in the supplier catalogues. This is illustrated by a statement made by a purchasing professional at the R&D division.

“They do place orders in free-text, though, even when the products can be found in the catalogue. This is because they know which supplier they want to order from, they start by choosing the supplier, not by finding the product. They should focus on the product, not on their old supplier buddies. Now we have to do the work with checking if their products from the free-text orders can be found in the catalogue. If that is the case, we phone them up or send them an e-mail, saying that next time you have to order in the catalogue instead. The users are not really aware of the procedure; they have difficulties with searching after products in the system.”

(Professional purchaser R&D, January 2004)

The R&D division had largely succeeded with getting orders through the system, however they still had the problem that end-users tended to use the free-text order function instead of the catalogue function, thus creating more work for purchasing (i.e., because purchasing had to view all free-text orders to see whether the products ordered in free-text could also be ordered in a supplier catalogue).

Throughout 2004, the work with getting end-users to continue to use the system after the adoption phase continued, resulting in increased use of the system when ordering indirect products and services at most divisions.

During 2005

The E&S division still had problems with getting potential users who had received information and training (some even twice) to order through the system. During 2005, the division made an extra investment that was initiated by the highest management at E&S. During a six-month period, extra resources supported potential users out in the division when ordering through the system. Two persons were involved from the central purchasing function and one consultant who only focused on supporting end-users. Training was given again in small groups, and help at the moment of ordering was offered. This kind of support and persistent work in combination with a more pragmatic use of the process resulted in an increase in orders through the system. During this period, users at E&S mainly learned how to use the free-text order to a greater extent.

January 2006

A third version of the e-ordering system was released in January 2006. The Oracle e-ordering system was upgraded (by Oracle), including an improvement of the user interface. A new functionality was introduced aimed at contributing to increased flexibility when ordering by free text order. The functionality consisted of the possibility to offer different forms for different kinds of orders, making it possible to send the order direct to the supplier without help from a purchaser, even when sending a free-text order. If the

new forms are filled in, there is enough information for the order to go directly to the supplier, without involvement of a purchaser.

The new functionality, however, was not as appreciated by everyone, which is illustrated by a statement made by a researcher at R&D who ordered chemical substances through the system.

“I think the system is worse now, new routines have been introduced to keep the number of suppliers down. If you have to order new substances for example from a new supplier, you now have to fill in very detailed information in an electronic form. Information that should be written down is for example the company’s organization number and sales turnover. Filling in this information is not part of my job. I think they ask us to fill in this form so we won’t have the energy and time to fill it in, in order to keep the number of suppliers at a low level. It has been more difficult to use the free-text order with this new version.”

(Researcher at R&D, September 2006)

In January, the e-ordering project got its third project manager since the start in 2001. The former project manager (2003-2006) had advanced within the organization, and a former consultant in the e-ordering project, now employed by the organization, was recruited to be responsible for the e-ordering system.

A helpdesk focused only on purchasing related issues, such as problems and how to solve them when ordering through the system, was installed in January. The helpdesk consisted of two full-time professional purchasers (fourteen persons who alternated) answering questions by phone and e-mail. The aim of the helpdesk was to give advice by phone and e-mail on purchasing issues and to answer questions related to the e-ordering system. There had been a helpdesk before, but that helpdesk consisted of technical experts, responsible for also answering questions regarding other information systems and their use in the organization.

End-user use of the system at the E&S division, however, decreased after the support resources were removed, though it was higher than before the extra investment in 2005 was initiated.

September 2006

The number of users was between 3000 and 3500. 4000 potential users were trained in the e-ordering system, but many of them were not ordering themselves, rather asking a secretary, assistant, caretaker or co-worker (who knows how to use the system better) to order for them. From the beginning, the plan was that all people in the organization should use the e-ordering system when they needed to buy an indirect product or service. As it was September 2006, the people ordering are the same people who were ordering

before introducing the system (secretaries, assistants and caretakers ordering for their departments). This is nothing that the e-ordering project group has influenced; it happened in a natural way after first having tried to get all people to order through the system.

Looking at usage of the system, it is stable and has been so since January 2006. Compliance with supplier agreements is approximately 80% for indirect material (including products and services), 70% of all orders of indirect material goes through the e-ordering system and 10% are estimated to go to suppliers with agreements, but not through the system.

According to interviews with the Swedish purchasing manager and the e-ordering project manager, several issues have contributed to the stable compliance rate of 80%. The first is persistence: It takes a long time to achieve usage and compliance. Second, there has been an attitude and ambition that all indirect products and services shall be available to order through the e-ordering system. Even though that is not the case, most indirect products and services are available for ordering in the system. Third, the project has had support from the highest management throughout the project (2001 and forward). Fourth, an external driving force has been the requirement to follow SOX (the Sarbanes-Oxley Act). This law implies increased demands for insight into and the transparency of companies listed on the American stock exchange. For AZ, this means that there are demands on ordering within the organization; documentation should exist on what is happening within the organization, and this applies to purchasing as well. There are unannounced controls, and it is important on such occasions to be able to show that there is order within the company. SOX has meant that it is important for the organization to use the e-ordering system, in order to see which suppliers the organization is buying from and where the money is going.

The structure of the thesis

The thesis consists of five articles that deal with e-ordering adoption and use. In Table 3, a summary of the main conclusions/suggestions found in the articles and a brief overview of how they fit into the whole are presented.

Article number and title	Major findings/suggestions	Belonging in the dissertation
Article 1 E-procurement maturity in industry	Seven barriers to e-ordering were found, of which one was the difficulty in getting end-users to use the e-ordering system.	Article 1 has functioned as a pre-study, in the sense of inspiring the dissertation research question, and by finding a suitable case organization. Empirical data consisted of 13 interviews at eight large organizations.
Article 2 The road towards successful e-ordering implementation: Success factors and barriers	Through an analysis of success factors of e-ordering, one area was revealed that influenced implementation success to a larger extent: end-user uptake.	Article 2 further investigated what is important in order to succeed with an e-ordering system implementation. This article argues that getting end-users to adopt and use the system is the most important factor for success, and more research is needed about what influences end-user uptake and the nature of that influence, further supporting the importance of the subject under study here. Empirical data in this article came from the longitudinal case study, and the case is presented and described in a relatively comprehensive way.
Article 3 The structure of determinants of individual adoption and use of e-ordering systems	Article 3 proposes an analytical framework inspired by adaptive structuration theory (AST), which shows structures and factors that influence end-users' adoption and use of an e-ordering system.	Article 3 responds to Article 2's call for more research on end-user uptake and develops a theoretical framework, which is tested using empirical data from the longitudinal case study. The framework aims at helping us understand what influences adoption and use of a standardized e-ordering system.
Article 4 Structures influencing individual acceptance of e-ordering systems: Findings from a longitudinal case study	Article 4 focuses on structures that inhibit and enable individual adoption and use of an e-ordering system. Structures found to influence end-users' adoption and use of the e-ordering system are: the restrictiveness and comprehensiveness of the technical system's structural features, the order, working and authorization routine in place prior to the e-ordering system, and how well these routines correspond with how to order and authorize in the system. Organizational culture was also found to affect end-users' acceptance of the e-ordering system.	In Article 4, thoughts have been developed further, resulting in an increased focus on the structures introduced in Article 3 and their influence on individual adoption and use behaviour over time, showing how they inhibit and/or enable behaviour. This article criticizes IS research that focuses on the intention to adopt and use an IS as the sole (or main) predictor of adoption and use, and argues that structures such as those presented in the article also affect individual IS adoption and use.
Article 5 Individual e-ordering acceptance: An analysis of literature-generated practical recommendations	Article 5 analyses practical literature-generated recommendations on individual e-ordering adoption and acceptance, thus increasing our knowledge of the possibilities managers and others have to influence adoption and acceptance behaviour.	Article 5 focuses on practical recommendations given by previous research and analyses them by looking at empirical data from the longitudinal case study. The article aims at aggregating literature-generated practical recommendations and to developing knowledge related to those.

Table 3. Article overview.

The first article, “E-procurement maturity in industry”, was published already in 2003. This paper provided an initial insight into both theoretical and empirical knowledge about e-ordering systems (which at the time was called e-procurement for indirect material, both in industry and research). An interview study was conducted, consisting of 13 interviews with people involved in and responsible for eBusiness and purchasing within eight large organizations. The aim of Article 1 was to investigate how far the studied companies had come in their e-ordering implementation, whether they were experiencing problems, and if they were, what these problems were. A second aim of the paper was to investigate potential case organizations to find one that was about to roll-out an e-ordering system and that was willing to grant access to the organization over a longer period of time. The theoretical framework used was based on research on factors limiting the value of electronic information technology investments (Chircu and Kauffman, 2000). A summary of such factors, by Chircu and Kauffman (2000), was used when analysing empirical data from the interview study. Barriers specific to the valuation process (industry and organizational barriers) and to the conversion process (resources, knowledge and usage barriers) were investigated. The result showed that five companies were at a preliminary stage (had not started yet). One did a pilot with 5-15 users. Two of the companies were past the pilot stage and had rolled out the system to a larger group. (One of the companies had decided not to implement an e-ordering system.) None of the companies in the interview study were close to achieving the planned level of compliance regarding system use. Barriers to e-ordering found in the study were: lack of technological standard, different IT maturity among suppliers, getting suppliers to update and control the electronic product catalogues and to monitor the catalogues, differences in language, culture and legal systems, lack of support from top management, resistance among users to leaving old suppliers and getting the users in the organization to use the system. The main challenge, according to the interviewees, was the user barrier, getting users to use the system. This article has functioned as a pre-study in which potential research areas and potential case organizations were introduced. As a result of this article, my research focus was directed towards the user issue and its importance. Through this paper, I made contact with the organization that was later chosen as the main case organization.

The second article, “The road towards successful e-ordering implementation: Success factors and barriers”, has been published in *International Journal of Procurement Management* and analyses success factors found in previous research. The success factors found by Puschmann and Alt (2005), Vaidya et al. (2006) and Angeles and Nath (2007) were analysed using data from the 4-year longitudinal case study, which is described in the methodology section, conducted in one of the organizations studied in Article 1. In Article 2 the case is presented, giving an overview of the case course of events. The paper frames the subject of interest by discussing MRO (maintenance, repair and operating expenditure) and its importance to organizations. (In this paper,

MRO is equivalent to indirect material (including both indirect products and services)). The paper describes an organization's e-ordering journey, from deciding on the system to achieving the planned compliance rate for system use, discussing the problems faced and how the organization overcame them. The paper thus gives a description of an organization's e-ordering journey. It also provides an overview of the barriers and success factors related to e-ordering success, at this point in time (autumn 2007). The success factor areas analysed in the paper are: end-user uptake and change management, redesign of the procurement process, managing suppliers, technological issues and managing catalogues, of which end-user uptake was revealed as one area that influenced implementation success to a larger extent. The paper stresses the need for more knowledge about what influences end-user uptake and the nature of that influence, due to its importance for achieving success with the e-ordering system investment.

The third article, "The structure of determinants of individual adoption and use of e-ordering systems", has been published in Human Systems Management (HSM). Article 3 responds to Article 2's call for more knowledge about what influences end-user adoption and use of e-ordering systems. The paper develops a framework that helps us understand what influences adoption and use of a standardized e-ordering system. The framework is inspired by adaptive structuration theory (AST), proposed by DeSanctis and Poole (1994), which was supplemented with factors of influence found in previous purchasing research. The focus of the paper is on developing a theoretical framework, and here, empirical data (from the longitudinal case study) are used to test the framework. The focus is also on end-users and their adoption and use behaviour over time, and what influences that behaviour. The framework, which is tested using empirical data from the longitudinal case study, is presented in Figure 10.

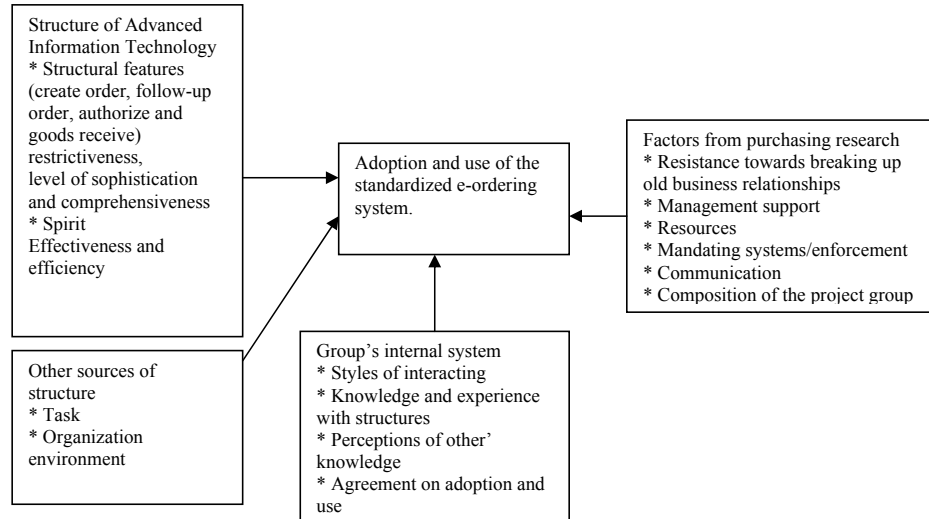


Figure 10. Adapted AST constructs for an e-ordering system context, with the addition of factors of influence found in previous purchasing research.

Tests of the framework showed that it correspond relatively well with the empirical data. For some of the structures and factors, however, empirical data supporting a direct connection between acceptance of the system and those structures and factors was not found. Regarding the system spirit, there was no direct evidence that adoption and use were affected by a communicated coherent or incoherent spirit. Regarding factors given by AST, representing the influence of the group's internal system, the empirical data only confirmed one of the four factors: knowledge and experience of structures, i.e. knowledge and experience of similar information systems and computer literacy. For three factors identified from previous purchasing research – mandating systems/enforcement, communication and composition of the project group – the empirical data did not support a direct influence on end-user adoption and use in this case.

The fourth article, “Structures influencing individual acceptance of e-ordering systems: Findings from a longitudinal case study”, investigates structures influencing individual e-ordering adoption and use behaviour and how they influence behaviour over time. Article 4 has been conditionally accepted for publication in the Journal of Purchasing and Supply Management (JPSM). Article 4 further responds to Article 2's call by investigating structures that affect individual adoption and use of the e-ordering system. This article focuses on the structures presented as influencing adoption and use of an e-ordering system in Article 3, and investigates these structures further, by looking at their influence over time, focusing on how they influence individuals' adoption and use behaviour. The

paper criticizes previous research on individual adoption and use that focuses on cognitive mechanisms leading to adoption decisions, as such research treats the intention to perform a specific behaviour as a predictor of behaviour and focuses on what influences individuals' intention to adopt and use an IS. The paper argues that issues other than individuals' intention to use an information system influence use of the system. Structures found to influence end-users' adoption and use behaviour of the e-ordering system are: the technical system's structural features and its restrictiveness and comprehensiveness, the order, working and authorization routine in place prior to the e-ordering system, and how well these routines correspond with how to order and authorize in the system. Also organizational culture was found to influence end-users' adoption and use of the e-ordering system.

The fifth article, "Individual e-ordering acceptance: An analysis of literature-generated practical recommendations", has been conditionally accepted for publication in the *International Journal of Procurement Management* (IJPM). This paper analyses practical recommendations given in the literature on individual e-ordering adoption and acceptance. Literature-generated practical recommendations are placed into six different recommendation themes: management support, composition of the project team, resources, mandating systems, processing and usability, which are analysed using empirical data from the 4-year longitudinal case study. All recommendation themes proved relevant when looking at the case organization. The analysis exemplified, however, that mandates are not always necessary in achieving individual use of the system. The analysis also showed that the themes processing and usability needed to be expanded further in order to help organizations understand the complexity of dealing with end-user resistance to using the system. The article ends with a discussion and recommendations section in which recommendations are given to persons involved in and responsible for implementing e-ordering systems. The fifth and last article is thus more practically oriented than are the other articles in the present dissertation.

When looking at the five articles, two of them are about e-ordering adoption and use on an organizational level, and three are about e-ordering adoption and use on the individual level. In my opinion, Article 3 and 4 are the most central articles in the present dissertation. In Article 3, the AST model is tested and the influence of structures and factors on individual adoption and use behaviour is investigated for the first time. In Article 4, which focuses on structures and how they influence over time, I have worked more with bringing out the longitudinal view, i.e. worked more with showing how structures have had an influence and been influenced over time.

Conclusions of the thesis

This part presents the conclusions of the thesis and a discussion containing theoretical and practical implications, the framing of the empirical arena and limitations, and a section on future research.

Conclusions

When considering the conclusions that are to be drawn by aggregating the content of the articles, four main insights emerge.

The first is that achieving individual initial acceptance, i.e. getting end-users to participate in training sessions and getting them to try out the system, is not difficult. The problem is getting end-users to use the system after having participated in training sessions and getting them to continue to use it.

Most end-users have the intention to accept the system and are willing to participate in training sessions and try out the new system. The problems arise when end-users are using the system by themselves in the context of their work.

The second conclusion is that the acceptance process does not have to happen gradually and continuously. The process of individual use can instead be discontinuous.

Use does not always increase consistently over a period, the increase in individual use can rather be concentrated to short spurts during the period.

The third conclusion is that routines play a central role in affecting individual use of an e-ordering system by either enabling or inhibiting use.

One finding that became clear to me during this thesis work is the importance of having structures, i.e. routines, that enable individual use of the system. For instance, regardless of whether the e-ordering project team has the highest management support, if working routines at a division or department do not enable use of the system, it will not be used. The organization can further use different enforcement methods, but if it is not possible to conduct everyday work when ordering products and services in the system, the system cannot be used. In the present thesis, it is argued that there are three different routines that influence individual acceptance of an e-ordering system, by either inhibiting or enabling use. These three routines, which are the ordering, authorization, and working routine prior to system implementation, are closely connected. Both ordering and authorization routines must facilitate a

well-functioning working routine, and thus be adapted to the working routine. These routines can further (or rather have to if they inhibit use) be modified or adapted to enable system use. In such cases, adaptation is influenced by both the end-user and his or her working routine, and the structures within the e-ordering system (i.e., how to order and authorize in the e-ordering system).

It is difficult to say which of the routines influence individual acceptance of the system the most, and thus can be viewed as being most important. If a routine inhibits use of the system, it inhibits it, it cannot inhibit use more or less. The routine can be varyingly easy to modify, however. The routine that is most difficult to adapt/change is the working routine. Work has to run smoothly, and demanding a change in working routine because employees must use a new e-ordering system is not a good idea from the organization's point of view. Both ordering and authorization routines are easier to adapt/modify so that ordering in the system can be performed at the same time as working routines. Ordering and authorization routines can thus be modified to suit both the individual's working routine and ordering through the system. Of these two routines, the authorization routine is argued to be easier to modify, because it does not involve such great changes in behaviour, compared to the ordering routine. The ordering routine is argued to be more difficult and time-consuming to change/modify, depending on the initial position of course. Because of the request to change purchasing behaviour, i.e. instead of phoning or visiting one's own choice of supplier, one must now order through the system and from new, non-preferred suppliers.

We can ask why routines, inhibiting or enabling, play such a large role in e-ordering system use. One answer may be that there are many people involved who perform different tasks, and that most important for organizations is that operations work well and run smoothly. Routines can be understood as being more or less stable, historically developed and partially unacknowledged. They are thus not easy to change to begin with and can be difficult to become aware of, because they are partially unacknowledged.

Getting end-users to participate in training sessions and/or learn how to use the system through an interactive version on the intranet or similar was not affected by inhibiting or enabling routines. It was first when end-users were using the system in their everyday working life that they found out whether their routines enabled or inhibited use of the system.

The fourth and last conclusion is that routines and influencing factors are dependent on each other for individual use of the system to be achieved.

Another finding was the relation between routines and other influencing factors, such as previous experience of similar information systems, level of computer literacy, historical/current relations to suppliers, management support, resources and the use of different enforcement methods. If the

factors are to influence use, enabling routines that facilitate work practices have to be in place. If there are routines in place that inhibit use of the system, then factors such as management support, adding extra resources or using different enforcement methods will not lead to increased use of the system. If routines enable use, i.e. work practices can be performed, other influencing factors also have to be used, however, to get end-users to use the system. Enabling routines for achieving individual usage are not enough. The thesis concludes that routines and the other influencing factors are dependent on each other for achieving use of the system and that both enabling routines and further influencing factors are needed in order to achieve use of the system.

Discussion

Introduction

I will start by relating my conclusions to already established research by discussing how my findings relate to previous research on individual IS acceptance. This discussion is followed by a presentation of theoretical and practical implications. The framing of the empirical arena and limitations are thereafter discussed. The thesis ends with a section on future research.

Relating my findings to previous research

Initial acceptance = no problem, use = the problems begin

There is research arguing for the importance of individual continued use for information system success; this research claims that it is a relatively neglected research area compared to research on individual adoption (Premkumar and Bhattacharjee, 2008; Limayem et al., 2007; Burton-Jones and Straub, 2006; Jasperson et al., 2005; Kim and Malhotra, 2005; Bhattacharjee, 2001; Karahanna et al., 1999). The present research supports the argument that continued use is important for succeeding with the IS investment by revealing the difficulties involved in getting individuals to continue to use an e-ordering system. It also supports the need for further research on individual IS use over time, by claiming the relative ease of getting individuals to initially accept and adopt an IS compared to getting them to continue to use it. Most individual end-users have the intent to use the system and are willing to participate in training sessions and to try out the system. It is when they are using the system by themselves for the first times in the context of their normal work activities that problems start to arise. The difficulty does not lie in getting individuals to initially accept and adopt the IS, which historically has been a popular research subject. The difficulty

instead lies in getting individuals who have initially accepted the system to continue to use it. That the difficulty lies in getting people to continue to use IS (and that it is not difficult to get them to initially accept it) is a new argument in research on individual IS continued use. This suggests that it is now important to focus on continued use and what influences it instead of conducting research on adoption. The argument made in research to date is that comprehensive research has been conducted on adoption, but not on continued use and what influences it. Previous research has not claimed, however, that due to the ease of achieving initial acceptance and adoption, and the difficulty of achieving continued use, the focus of research efforts should be on continued use.

The acceptance process

The thesis has come to the conclusion that individual acceptance of an e-ordering system does not have to happen gradually and continuously. The process of individual acceptance can instead be discontinuous. In other words, use does not always increase consistently over a period, instead increases in individual use can be concentrated to short spurts during the period. This finding can be related to the research of Tyre and Orlikowski (1994), who investigated the process of technological adaptation focusing on the timing of adaptations. Two main differences can be seen, however, between the research of Tyre and Orlikowski (1994) and the present research. Tyre and Orlikowski did not investigate the timing of acceptance, but instead the timing of technology changes, i.e. the timing of technology adaptation. As in other work by Orlikowski (see, e.g., Orlikowski, 2000), the focus is on technological adaptations in which the technology is modified and changed according to users' wishes and needs. An assumption is thus that the technology can be modified and changed by users. The second main difference to the present research is that, in the cases studied by Tyre and Orlikowski, the technology studied is used in the production process and there were no problems associated with getting users to use it. The subject of interest is instead whether there was a pattern of technological adaptation, i.e. a pattern for when users took the initiative to modify/change the technology to better suit their needs. Tyre and Orlikowski (1994) concluded that the technology adaptation process is discontinuous, or episodic rather than a gradual continuous process of modification. Adaptation attention and the effort exerted by users are further not applied consistently over a period, nor do they taper off gradually. They are rather concentrated in short spurts during the period. Viewing the present research, parallels can be drawn to the conclusions of Tyre and Orlikowski (1994), the difference being that the present research presents conclusions regarding the acceptance process (i.e., adoption and use over time) and not regarding the technology adaptation process (i.e., modifications and changes of the technology over time). In the present research, the implemented information system was a standardized system, meaning that possible modifications and changes to the technology

were limited. The individual end-user alone could not modify or change the system. They could, however, communicate wishes to the central project group that investigated and decided which modifications were possible to make and which modifications were to be carried through. It is interesting, however, that the pattern of technology adaptation studied by Tyre and Orlikowski (1994) is episodic and happens in short spurts, which is similar to the acceptance process observed in this thesis. Acceptance was initially high (i.e., people participated in training sessions and tried out the system), people then tried to order by themselves, which was followed by non-use of the system for a long time (between 2003 and 2005), then at beginning of 2005, usage increased drastically and remained on a stable level. The “episode” leading to increased system use was increased attention by management, leading to extra resources in the form of persons who could provide help at the moment of ordering, etc. It should also be pointed out that what facilitated increased use during this “episode” was that inhibiting routines were modified/changed, leading to new routines that enabled individual use. However, the finding that also the acceptance process can be discontinuous and does not have to happen gradually and continuously indicates that technology adaptation and the acceptance process follow similar patterns, which is a subject to be further explored.

Routines play a central role in affecting individual system use

The thesis, judging from my case, argues that most end-users have the intention to adopt and continue to use an information system. It also shows that even if the individual has the intent to use the system, he or she for some reason may not continue to use it after having participated in training sessions and having tried to use the system independently. Previous research looking into individual continued IS use has mainly focused on the intent to continue to use an IS and what influences that intent, building on research by Davis et al. (1989) and Davis (1989) (Kim and Malhotra, 2005; Bhattacharjee, 2001; Karahanna et al., 1999). This research further relies on intention as the primary predictor of IS continued use behaviour. There is, however, research that has begun to investigate the role of other issues affecting individual continued use, such as habit, prior use and a feature-centric view of technology (Limayem et al., 2007; Jaspersen et al., 2005).

Routines and habits

Limayem et al. (2007) have begun investigating the role of habit in the context of continued IS usage, proposing that IS habits moderate the influence of intention. It should be noted that what is investigated is IS habits, i.e. habits regarding using IS, for example, habits concerning frequency of checking e-mails (once a week, twice a day, every five minutes, etc.).

When I discuss routines and their role in affecting individual IS continued use, these are routines that originally have not been used in connection with the IS under investigation. Limayem et al. (2007) further separated habits from routines, claiming that routines describe a certain behavioural pattern, but in contrast to habit, do not determine it. They give the example of an employee who may be asked by her supervisor to follow a certain routine to get her work done. But it so happens that the employee considers the routine to be inadequate. Therefore, no matter how often the employee performs the routine, she is unlikely to turn it into a habit, because performing it does not satisfy her. Satisfaction is argued to be a critical antecedent to habit development. Thus, when performance of a routine does not result in satisfying experiences, it will not turn into a habit.

In the present thesis, however, the routines found to affect individual e-ordering system use were routines that the end-users were satisfied with. It was these routines that the end-users wanted to continue with. The routines presented can thus, in the eyes of Limayem et al. (2007), also be considered as habits, but not as IS habits. They are instead habits for how to conduct work, how to order and how to authorize prior to the system. Following the reasoning by Limayem et al. (2007), however, it can be argued that when introducing the e-ordering system, a change was required in both ordering and authorization routines. The new ordering and authorization routines were initially not perceived as satisfying at both studied divisions and may thus be considered as routines rather than habits.

Anyhow, the present research supports Limayem et al. (2007) in that there are issues affecting use of the system other than the individual's intention to use the system that can both moderate and in some cases also nullifying the effect of intention. The present research also adds knowledge by showing that routines too, as described here, affect individual use behaviour by either enabling or inhibiting use. Inhibiting routines are further argued to nullifying the effect of intention on individual information system use.

IS habits, computer literacy and previous experience of similar IS

Interesting to note is that IS habits, as described by Limayem et al. (2007), have also been considered as an influencing factor in the present research, but here they are called computer literacy and previous experience of similar information systems. In the present research, computer literacy and previous experience of similar information systems affected use of the system mainly initially, during the first couple of times using the system. When the individuals learned what and how to fill in information, often through a trial and error process, this was no issue. In this case, IS habits influenced use of the system during the initial acceptance process. After the individual had used the system a couple of times, he or she knew what to fill in and how. The present research also illustrates, however, that individuals can forget how

to use the IS, when they have not used it for some time (depending on inhibiting routines), and may require further training sessions and help at the moment of ordering when using it again (after the inhibiting routine now has been transformed into an enabling routine). One reason why Limayem et al. (2007) argued for the importance of IS habits for continued use and not for initial acceptance may be that their empirical study was limited to thirteen weeks, which can be compared to the length of the present case study. It may be that a longer empirical study is required to reveal behaviour patterns over time and what these patterns depend on. The findings of the present research, showing that IS habits in the sense of computer literacy and previous experience of using similar information systems influenced use initially, during the first couple of times of usage (but when end-users learned how and what to fill into the system this was no issue any longer), show that this is not as easy as Limayem et al. (2007) claimed. IS habits and their influence on continued use can vary over time, playing a larger role initially until individuals learn how to use the IS, and playing a smaller or no role afterwards. Another explanation for the extended finding related to IS habits in the present research may be that Limayem et al. (2007) tested their model empirically in the context of students' voluntary continued WWW usage. In the present research, adoption and use of an e-ordering system in an organizational context were studied, and in such circumstances, use can hardly be viewed as voluntary. One can assume that there was a larger pressure on individual end-users in the organization to learn how to use the e-ordering system than there was on students who voluntarily used the WWW. The students, I assume, had greater freedom to follow their IS habits established prior to the study than did people working in an organization that had to adapt their IS habits to the use of the new e-ordering system.

Jasperson et al. (2005) focused on current IS users and what caused them to learn about, use and extend the full range of features built into applications. The focus of Jasperson et al. (2005) is different compared to the present research, in that they focus on current users and their extended IS use. The present research, however, focuses on use and what influences it. The system under study in the present research is further a standardized e-ordering system, in which certain information has to be filled in, in a certain manner for the order to go through. There are few features that are voluntary in the standardized e-ordering system. There are a few choices for end-users to make, however. One is the possibility to save ordered products as favourites, which makes it easier to order the product the next time. Another is the choice between ordering through free-text or catalogue.

Jasperson et al. (2005) argued that there are factors not yet adequately explored in prior research that may influence post-adoptive user behaviours. They focused on three aspects that they argued have been under-researched. These are prior use, habits and a feature-centric view of technology. Prior use is described as IT use experience and habit is described as past behaviour in

general. A feature-centric view of technology is described as examining IT use at a feature level of analysis. A feature-centric view is further argued to be valuable because the set of IT application features recognized and used by an individual likely changes over time. The present research supports the influence of prior use (i.e., computer literacy and experience of similar information technology), habit (in the sense of past ordering, authorization and working behaviour/routines) and a feature-centric view (in the sense that level of comprehensiveness and restrictiveness of the technology features influence use the first couple of times until the end-user has learnt how to use the system) on post-adoptive use behaviour (i.e. continued use behaviour).

Organizational routines

The area of organizational routines is a research area that has received attention for a long period of time (Cyert and March, 1963; March and Simon, 1958; Simon, 1947). Therefore, to relate the findings from the present thesis to this area as well seems appropriate. Although this area of research has long interested researchers, empirical studies of organizations focused on routines are still relatively rare (Becker and Zirpoli, 2008).

Recent research on organizational routines have focused on how work is actually carried out in organizations, comparing for example written down routines with actual routines, and revealing discrepancies in the hope of better understanding the behaviour of organizations (Becker and Zirpoli, 2008; Barley and Kunda, 2001). In the work by Becker and Zirpoli (2008), organizational routines are used as an analytical perspective to examine how a packaging task is carried out. In their work, studying organizational routines proved to be helpful in uncovering details that would otherwise have remained largely hidden to the firm's management, particularly in contrasting how tasks are carried out in practice with how they should be carried out. When relating my work to the work of Becker and Zirpoli (2008), I have also identified a "governance gap" by contrasting how tasks are actually carried out in practice with how they should be carried out according to the IS structures. I found a "gap", to use Becker and Zirpoli's term (2008), between current routines and routines with the IS that affected use of the system; through this "gap", I could identify the causes of use performance/behaviour. Thus, through my findings I have illustrated and supported what has been claimed in research using organizational routines as an analytical perspective, supporting the importance of understanding routines in order to better understand certain performance effects and how organizations accomplish tasks.

Theoretical implications

The AST framework

In this thesis, AST has been used as a starting point to find explanations for e-ordering system end-users'/individual requestors' adoption and use behaviour. Looking back at the conducted research, it can be questioned how suitable a framework based on AST is for investigating adoption and continued use of an information system such as a standardized e-ordering system. There is no doubt that the use of AST has led to conclusions that increase our understanding of end-user information system (e-ordering system specific) adoption and use behaviour. Through AST, findings such as the influence of the technical structural features restrictiveness and comprehensiveness on adoption and use behaviour, and the influence of routines prior to the system – such as how to order, authorize and work – have been brought into light. Also findings such as the effect of culture on behaviour, and the influence of previous knowledge and experience of similar systems and of computer literacy on behaviour have been found due to the inspiration offered by AST. But if we take a closer look at AST, it was developed as a means of understanding technologies that were specifically designed to facilitate social interaction, such as GDS systems. The e-ordering system has more of a task orientation, not a social interaction orientation. When trying to relate the present findings to the full AST framework, I am reminded that AST was designed to investigate social systems such as GDS systems, even though other systems have been investigated through an AST lens, such as medical electronic billing systems, by Schwieger et al. (2004), and data warehouses, by Chenoweth et al. (2006). Looking at AST as a starting point for investigating what influences end-users' adoption and use of an e-ordering system, some of the influencing factors have been difficult to translate into an e-ordering context. The factors 'members' style of interacting' and 'degree to which members agree on which structures should be adopted and used' were difficult to translate into a purchasing context: 'members' style of interacting' (because there is no interaction between users when ordering through the system, one individual end-user uses the system at a time) and 'degree to which members agree on which structures should be adopted and used' (management had already decided that the structures in the e-ordering system were to be adopted and used, it was nothing to be discussed among end-users). Further, it was difficult to translate the sophistication of a GDS system into the sophistication of an e-ordering system. This is probably because standardized e-ordering systems from different suppliers (i.e., Oracle, SAP, etc.) and e-ordering systems offered by application service providers (ASP) (i.e., the buying organization rents access to the system, which is managed by the ASP) are all relatively similar, offering similar functions in the systems (create order, follow-up order, authorize order and receive product or service). Thus, no different general

levels of sophistication can be identified, which according to DeSanctis and Poole (1994) was the case with GDS systems.

Further, looking at the different propositions of AST (Figure 1), they are difficult to adapt to an e-ordering information system, due to AST's focus on social information systems. With certain modifications, however, such as removing the implications of social interaction from the propositions, they can also work for a more task-oriented information system.

Looking at the full framework, decision processes are also difficult to translate due to the difference in the information system under investigation by DeSanctis and Poole (1994) and the information system investigated here. The decision process in the e-ordering case has already happened when the end-user decided to either order through the system (use the system) or not to order through the system (non-use of the system). In the e-ordering case, decision outcomes can be efficiency and effectiveness: efficiency through the purchasing process (which from a managerial perspective is simplified and reduced) and effectiveness through the extent to which end-users are buying from suppliers in the system (compliance with centrally chosen and negotiated suppliers). Looking at emergent sources of structure, an empirical example illustrating them is the change in ordering structure by a department at R&D (going from a routine in which individual researchers wrote what they needed on a pink piece of paper and gave it to the porter, who then ordered the product or service, to a routine in which the individual researcher him- or herself should order through the e-ordering system, and then a change back to the old routine with a certain modification: The porter now orders through the system and not by phoning suppliers). The change in ordering routine was first initiated by the structure of the advanced information technology (that all employees should place order themselves through the system), and then influenced by the resistance to using the system.

Some may argue that the work of Orlikowski (1992) would have been a more suitable theoretical roadmap for guiding the present research, due to its focus on organizational aspects of adoption and use of information systems. Orlikowski (1992), however, claimed that technology is flexible, thus assuming that technology can be adapted to individuals' (end-users, in this case requestors) needs. She recognizes that there is flexibility in the design, use, and interpretation of technology (Orlikowski, 1992). The system under investigation here is a standardized e-ordering system, in which the technology is not flexible. For example, it is not possible to adapt the information system to end-user routines (e.g., how to order, authorize and work). The technology in that sense cannot be viewed as flexible, however end-users do play a large part in the outcome of technology use, i.e. in this case compliance with centrally chosen suppliers, lower purchasing prices and lower transaction costs. Orlikowski (1992) also took into account the

technology designers (and users and decision-makers) and their interaction with the technology and the organization. In the empirical example given here, however, the case organization bought a standardized e-ordering system from Oracle designed without any contact or interaction with the case organization. Oracle had independently developed a standardized system to sell to different organizations, with no considerations for this organization and its users. The system, however, did undergo some limited modifications in accordance with the organization's request: For example, the language was changed from English to Swedish, and number of delivery days was changed from users having to fill it in themselves to 2-day delivery appearing automatically. The possibility to make changes in accordance with the specific organization's wishes and needs was relatively limited, though, the system being relatively deterministic, i.e. end-users did not have much influence over technology design.

A further advantage (which could be argued to be a disadvantage) of using AST as a starting point is the relatively detailed framework, compared to Orlikowski (1992). Using the AST framework as a starting point, a relatively detailed roadmap could be developed that helped in navigating the search for answers to the research questions. With a wider roadmap, further findings could have been revealed, but the result could also very well have been a less comprehensive understanding of what influences end-user adoption and use of e-ordering systems.

Contributions to AST

When considering how the present findings contribute to a development of AST, one main contribution is the conclusion that there are routines that both inhibit and enable appropriation of an information system. The named structures (titles of structures and their descriptions) in AST are relatively overarching. For example, AST uses the titles "Other sources of structure" and "Task" and has relatively overarching descriptions of what they mean and of what can be included. The source of structure "Task" is hardly further elaborated on or investigated in more detail. What kinds of structures are hiding behind the structure title "Task" or how these potential structures affect appropriation is hardly touched upon in AST. What I have done in my research is that I have further investigated what underlies the structure title "Task", and found that routines (in the e-ordering case, routines for how to order, authorize and work) are structures that affect use.

What has been found in the present thesis is in large part thanks to the chosen methodology – the longitudinal case study including extensive observations, which have made it possible to gain more in-depth knowledge about what can be hiding behind the structure "Task" in AST. Routines is not a conception used in AST, and "Task" is merely described as "the content and constraints of a given work task". In the present thesis, however, it is argued that

routines play a central role in affecting use of an IS, either by enabling use or by inhibiting it. The additional knowledge that routines, i.e. “Other sources of structure” and in turn “Task”, play such a central role in affecting use further shows that “Other sources of structure” may affect appropriation of an information system to a larger extent than do “Structure of advanced information technology” and “Group’s Internal System”, a finding that also adds new knowledge to AST and reveals the relative importance of the different structures.

Practical implications

In this section, I focus on how the findings can enlighten, inform and make easier the work of managers and others responsible for and working with implementing an e-ordering system in a large organization. There are many organizations today that face large investments for transforming manual purchases into electronic. For instance, the Swedish public sector has been instructed by the Swedish Government that purchasing processes within the public sector should be managed electronically in the near future. Even though the present case organization is a private company, the present findings are also relevant to the public sector and can help to enlighten, inform and make it easier for them to implement e-ordering solutions. Some of the practical implications can also be generalized to other information systems used by individuals in an organization. I also want to remind the reader about Article 5, which focuses on managerial implications and provides suitable reading for those interested in further practical recommendations and advice.

Do not use up all resources at once

Beginning with the first conclusion presented, it is not difficult to get end-users to initially accept, i.e. participate in training sessions or try the system, the difficulty is getting them to use the system after training sessions, etc. The practical implication following from that conclusion is that you cannot solve the use problem with further training sessions and more resources and energy focused on initial acceptance solely, the problem is deeper than that. The solution is therefore not solely increased training sessions, etc. Another insight is that the people responsible for implementation should be aware of the difficulties in getting individuals to continue to use the system after initial acceptance and not devote all resources to initial acceptance. Instead, they should plan on having resources available that can help/support individuals in continuing to use the system after the initial acceptance phase.

A chance to concentrate efforts to short periods of time

Considering the second conclusion that individual use of an e-ordering system does not have to happen gradually and continuously, instead the acceptance process can be discontinuous and concentrated to short spurts, it can be of value for managers to have a general picture of what the acceptance process can look like. That increased use of the system does not always happen gradually and continuously. Knowing that increased use of the system can happen in short spurts, and knowing what influences these spurts, can give management the ability to concentrate efforts to short time periods instead of spending resources continuously. It can also give management the ability to concentrate those efforts to periods when users are ready, i.e. when routines no longer inhibit use, but instead enable it. Management no longer needs to be distressed by the fact that usage does not increase gradually, because increased usage can also occur in short spurts. When there is limited or non-use of a system at a division or department, the important task of management is to investigate why. It may be, as in the present case, that there are routines inhibiting use of the system that have to be modified in order to facilitate use, and at the same time employees must be able to perform working tasks in a satisfying way.

Be aware of the structures that affect use

The third conclusion is that routines play a central role in affecting individual use of an e-ordering system by either enabling or inhibiting use. I have already touched upon the importance for managers to be aware that achieving continued use can be difficult and can depend on relatively deep problems derived from inhibiting routines.

The present thesis argues that when there are large discrepancies between how to order, authorize and work prior to the system, and how to order and authorize within the system, these discrepancies will require changes in behaviour on the part of end-users, which will affect system use. Before rolling out the system, responsible persons are recommended to investigate and possibly map out ordering, authorization and working routines prior the system for different divisions and departments. This knowledge can help in determining which divisions and departments that have ordering, authorization, and working routines in place that correspond well with routines when ordering in the system. Knowledge about discrepancies and similarities can help to determine which divisions and departments have routines that are suited to ordering routines when ordering through an e-ordering system.

A further advice when rolling out the system is to first roll the system out to those end-users who have ordered for others prior to the system (e.g., assistants, secretaries and porters). By rolling out to such persons, there is no

demand for change in the order routine structure, the only change required is that these individuals order through the e-ordering system instead of phoning, e-mailing or visiting supplier stores. A further piece of advice is to make sure that authorization rules (such as who authorizes whom, and up to which amount end-users can order without asking their manager for authorization) are well known and in force at the division or department before rolling out the system.

Advice on how to achieve the planned compliance rate

A fourth area of advice to managers concerns the influencing factors and their role in affecting individual acceptance of the system. The fourth conclusion is that in order to achieve use of the system, both enabling structures and other influencing factors must be in force. Only having routines that enable is not enough, different enforcement methods, management support and extra resources are for example also needed for usage to take off.

In the present thesis, it is argued that end-users' previous experience of similar information systems and their computer literacy influence acceptance. One piece of advice to persons responsible for or working with e-ordering implementation is to provide extra support at the moment of ordering to end-users who lack experience of working with similar information systems and who have low computer literacy. Extra support can for example consist of persons functioning as mobile helpdesks, helping end-users to order at their own computer.

Current supplier relationships and the will of the individual to make the supplier choice by him- or herself are also argued to influence individual use of the system. In relation to this, one piece of advice to persons responsible for an e-ordering project is to collect information on which current suppliers are used a great deal before deciding on catalogue suppliers. In that way, potential users know that their voices have been heard and the central purchasing function has better information about suitable catalogue suppliers. A further suggestion for getting individuals to use the system in the beginning is to have a pragmatic approach, telling end-users that it is ok to phone and talk to the supplier when one needs expertise help, but all orders should be placed in the system.

The present thesis has argued that having the support of highest management and of other managerial levels is important in getting individuals to use the system. Management support is argued to be closely connected to enforcement methods and allocated resources, which are argued to affect use. Advice to persons responsible for the e-ordering project is to assure highest management support from the beginning and onwards, and to locate lack of middle management support and address that lack with attention and/or

enforcement (one suggestion is to compare usage figures, and to make them public in the organization). Having enough resources throughout implementation also plays a part in succeeding with individual use of the e-ordering system.

Framing of the empirical arena and limitations

The thesis has used empirical data from a pharmaceutical organization implementing an e-ordering system, an information system in which end-users/individual requestors are told to place their orders for indirect products and services. The conclusions described above have contributed to theory on IS adoption and use in general, but what is specific to these kinds of systems and indirect purchases in this type of organization (decentralized culture) and in this type of company (a large pharmaceutical company)? In this section, I will define the context on a more principal level, in terms of the empirical context: the purchasing characteristics, the logic of the e-ordering system, the organization logic and the individual logic. In this way, it may be easier for the reader to compare his or her context to mine. It may also be easier for others to judge which situations and which organizations the present results are applicable to, and to judge the possible limitations of the study.

Purchasing characteristics

In many organizations, indirect spending still suffers from a lack of internal support, maverick purchasing and fragmentation of spending within the organization (Cox, 2005). Managing indirect spending, however, is argued to be one of the key responsibilities of the purchasing function, and in recent years many companies have begun to take a more structured approach to managing this area. One recommended strategy for managing indirect spending is to use a category management strategy combined with an e-ordering system (van Weele, 2005). This implies increased centralized sourcing carried out by category (e.g., for office supplies, consultants, cleaning equipment and travel expenses, etc.) in combination with an e-ordering system for steering purchasing in the organization towards centrally chosen suppliers. One of the main reasons for implementing an e-ordering system is the desire to reduce maverick or off-process purchases in the organization and to increase compliance (Croom and Johnston, 2003). A compliance rate as low as 25-50 percent for indirect spending is not uncommon in large organizations in which people tend to buy from the suppliers they prefer (Cox et al., 2005). Through a reduction in maverick buying in the organization and an increase in the compliance rate regarding selection of fewer suppliers, direct purchasing costs in the form of lower prices can be achieved. Decreased costs due to increased purchasing volumes from fewer suppliers will often result in an increased volume discount.

The purchasing characteristics of indirect spending are an important part of the context, and the thesis results are applicable to situations in which the purchasing characteristics and the purchasing situation are similar to those described. The characteristics of and situation for direct spending differ from the characteristics of and situation for indirect spending. The present results are therefore mainly applicable to indirect spending, as opposed to direct spending.

The e-ordering system logic

Specific to e-ordering systems is that they affect the entire organization by demanding that indirect purchases be made through the system; this implies that all end-users who ordered indirect products prior to the system, at all divisions within a large organization, must change their purchasing behaviour. This can be compared to GDS systems, for example, which only affect the small group of people communicating through the system. Implementing an e-ordering system is a relatively large project, which affects a large number of persons with different tasks and roles, and situated at different divisions. End-users can further not choose how to use the e-ordering system, i.e. which features to use etc. They have to fill in the requested information in the right manner for orders to go to the supplier. The choice they have when using the system is the choice of catalogue or free-text supplier.

Moreover, e-ordering systems as described in the present thesis are most suitable for large organizations, in which end-users are many and it is difficult to reach end-users with information about which suppliers to order from. In a smaller organization, there are fewer persons ordering, and it is easier to discuss which supplier to choose and to find out if the organization has bought from a supplier previously with a good result, and if an agreement exists. Further, in a small organization, indirect purchasing costs are not high enough to motivate investment in an e-ordering system or investment in using an ASP (application service provider) e-ordering solution.

The results are applicable to e-ordering systems as described above. The question may arise as to whether the results also can be generalized to other e-procurement systems, such as electronic auctions. It may very well be the case that some of the findings can be applicable to e-auctions as well. I have not investigated this further, however, and therefore cannot claim that my results are applicable to other e-procurement systems.

The organization and individual logic

The case organization is a large pharmaceutical organization, which largely consists of highly educated people focused on conducting research in order to discover new medical products that can cure and help people suffering from

different diseases. The organizational culture has long been decentralized, which can be considered important, as researchers need a certain amount of freedom to take on initiatives and act on those initiatives if they are to succeed with their research. Take the example of the gastric ulcer medicine Losec, which became a huge success. However, the project, which started already in 1966, was threatened to be closed down several times, and it was thanks to a couple of individuals' unique efforts and to creative teamwork that Losec finally became a reality. During these periods, when the project was almost closed down, these individuals continued to argue for their work; they were highly committed, had a vision, and were not afraid of going against the group executive board. It may be the case that these individuals were unique, but this also shows the importance of a decentralized culture, in which pharmaceutical researchers are not afraid of taking their own initiatives or of arguing for their intuition and work. Researchers who feel they can go their own way may be a prerequisite for successful research results, and this may require a decentralized organizational culture in which such behaviour is accepted. Implementing an e-ordering system in this environment with researchers (and others) who are used to deciding for themselves has been challenging. However, by being persistent and patient, the case organization has succeeded with e-ordering implementation (i.e., achieved the planned compliance rate concerning use of the system). The decision not to use a mandating system can be viewed as congruent with the organizational culture, thus not forcing persons working in this environment to do as they are told.

The organization and its culture are important parts of the context, and it would therefore be appropriate to generalize the present results to similar organizations with a similar organizational culture. The thesis results may be less appropriate to apply to organizations that have a different culture and in which people tend to do what management tells them to do.

Future research

There are many exiting, interesting and promising subjects that I want to suggest for future research. These are subjects connected to issues that I have touched upon, directed attention to and begun to investigate in the present thesis.

Initial acceptance = no problem, use = the problems begin

A first subject that I want to suggest for future research is to further investigate the conclusion that it is not difficult to get individuals to initially accept (i.e., participate in training sessions, try out the system, etc.) the information system, the difficulty lies in getting them to continue to use it after having learnt how to use it in a training session or by themselves. This

issue has not been brought up or discussed in previous research on individual IS continued use, or in research on individual IS adoption (which is more understandable). I would recommend that future research use the present conclusion as a hypothesis, testing the hypothesis using quantitative methods rather than a qualitative case study, in order to find further support and evidence.

The acceptance process

A second subject for future research that has been brought up and discussed here is that the individual IS acceptance process can be discontinuous and does not have to happen gradually and continuously. The present discussion argues that the individual technology adaptation process and the individual IS acceptance process follow similar patterns, which is a subject to be further explored and tested in future research. It would also be exciting to investigate patterns of different individual IS acceptance processes to see whether they are similar or different depending on the IS under investigation, and to investigate what different potential patterns may depend upon.

Intention and routines

The third subject to be suggested is related to the finding that routines enable or inhibit individual IS use behaviour, and that in the present thesis inhibiting routines are argued to nullify the effect of intention on individual information system use. A suggestion for future research is to further investigate the interplay between structures, i.e. routines, and intentions. Structures can both stand between intention and action, as presented here, and impact an individual's intention. One suggestion for future research is to try to further increase our understanding of the relationship between intention and structures, and its influence on individual IS use. I would also recommend testing the present conclusion related to the influence of routines on individual IS use behaviour, that inhibiting routines nullify the effect of intention, by using a quantitative method. A quantitative method is recommended because most studies on individual IS continued use to date have found empirical support for their argumentation in survey results, and quantitative data would make it easier to communicate the important and interesting knowledge presented here to the IS research community.

Routines, IS habits, prior use and their influence on individual IS acceptance

A fourth topic that I suggest for future research is to continue to further elaborate on routines (from the thesis), IS habits (from Limayem et al., 2007) and prior use (from Jaspersen et al., 2005) in order to better understand how they are related and their influence on individual IS acceptance, thus further contributing to the field of IS acceptance.

Standardized IS

Another subject that I want to suggest for future research has to do with the limited research on individual use of standardized IS and the increase in standardized systems used by organizations. Today many organizations are buying, implementing and using standardized information systems provided by large software companies such as Oracle and SAP. The e-ordering system under study here is a standardized system from Oracle. These standardized systems offer limited possibilities for end-users to make modifications and changes in the technology. Unfortunately most IS research to date that focuses on individual IS acceptance assumes that end-users have the possibility to modify and change the information system under investigation, which is rare when discussing business systems today. A suggested area for future research that can be viewed as important considering the increased use of standardized systems by organizations is to begin to review previous research on individual IS use and relate it to findings on standardized systems. The present research has begun to relate findings on continued use of a standardized system to previous findings on continued use of more tailor-made systems that could be modified and changed by end-users. But future research should compare and investigate this further. One suggestion is to take the research of Orlikowski (2000) and investigate whether her research is also relevant when investigating standardized systems, and what needs to be added to make it relevant. Another suggestion for future research is to go through the IS literature on information systems that can be modified and changed by end-users and compare it to the literature on standardized systems. One can assume that this comparison would result in some similarities and some differences, which can contribute to an interesting discussion, leading to modifications and changes of theories provided by previous research focusing solely on IS that can be modified and changed by end-users. The result may also be that studies on modifiable IS are extensive and studies on standardized systems are difficult to find. If this is the case, there is further argument for the importance of increased knowledge (both theoretical and practical) of standardized systems and individual use of such systems.

The supplier

Finally, my last suggestion for future research is to change the focus of research from the individual and organization using the IS to the supplier, and to instead investigate how the implementation of an e-ordering system affects the supplier. Suppliers can be divided into catalogue and free-text suppliers, into suppliers of products and services, and into suppliers of different services such as services related to human resources and marketing. One question for future research is:

“How are different suppliers affected by the buying organization’s centralization and its implementation of an e-ordering system?”

Final words

The journey of researching and writing this thesis has felt like an uphill battle, a straight stretch and, at a few occasions – when all the thoughts flying around in my head have suddenly fallen into place like pieces of a puzzle – like sailing downhill. But it has been worth all the uphill battles and wrong turns. Because of them, my knowledge has increased and new insights have emerged. My interest in acceptance of information systems will not end with this thesis, nor will my interest in purchasing and technology.

References

- Allport, C.D. and Kerler, W. A. (2003). A research note regarding the development of the consensus on appropriation scale. *Information systems research*, 14(4), 356-359.
- Angeles, R. and Nath, R. (2007). Business-to-business e-procurement: success factors and challenges to implementation. *Supply Chain Management*, 12 (2), 104-115.
- Arbin, K. (2003). E-procurement Maturity in Industry. *International Journal of Electronic Business*, 1 (4), pp. 396-407.
- Arbin, K. (2008). The road towards successful e-ordering implementation: Success factors and barriers. *International Journal of Procurement Management*, 1 (4), 415-429.
- Avolio, B. J., Kahai, S. and Dodge, G. E. (2000). E-leadership: implications for theory, research, and practice. *Leadership Quarterly*, 11 (4), 615-668.
- Barley, S. (1986). Technology as an occasion for structuring: evidence from observations of CT scanners and the social order of radiology departments, *Administrative Science Quarterly*, 31(1), 78-109.
- Benbasat, I. and Barki, H. (2007). Quo vadis, TAM?, *Journal of the Association for Information Systems*, 8 (4), 211-218.
- Bhattacharjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly*, 25 (3), 351-370.
- Burkhard, R. J. and Horan, T. A. (2006) The virtual organization: evidence of academic structuration in business programs and implications for information science. *Communications of AIS*, Article nr 17, pp. 2-48.
- Chenoweth, T., Corral, K. and Demirkan H. (2006). Seven key interventions for data warehouse success. *Communications of the ACM*, 49 (1), 115-119.
- Chidambaram, L. (1996). Relational development in computer-supported groups. *MIS Quarterly*, 20 (2), 143-163.
- Chin, W. W., Gopal, A. and Salisbury, W. D. (1997). Advancing the theory of adaptive structuration: the development of a scale to measure faithfulness of appropriation. *Information Systems Research*, 8(4), 342-367.
- Chircu, A. M. and Kauffman, R. J. (2000). Limits to value in electronic commerce-related IT investments. *Journal of Management Information Systems*, 17 (2), 59-80.

- Cox, A., Chicksand, D., Ireland, P. and Davies, T. (2005). Sourcing indirect spend: a survey of current internal and external strategies for non-revenue-generating goods and services. *Journal of Supply Chain Management*, 41 (2), 39-51.
- Croom, S. R. (2000). The impact of web-based procurement on the management of operating resources supply. *Journal of Supply Chain Management*, 36 (1), 4-13.
- Croom, S. R. and Brandon-Jones, A. (2005). Key issues in e-procurement: procurement implementation and operation in the public sector. *Journal of Public Procurement*, 5 (3), 367-387.
- Croom, S. R. and Brandon-Jones, A. (2007). Impact of e-procurement: Experiences from implementation in the UK public sector. *Journal of Purchasing and Supply Management*, 13 (4), 294-303.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, 13 (3), 319-340.
- Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 35 (8), pp. 982-1003.
- DeSanctis, G. and Poole, M. (1994). Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory. *Organization Science*, 5(2), 121-147.
- Dooley, K. and Purchase, S. (2006). Factors influencing e-procurement usage. *Journal of Public Procurement*, 6 (1&3), 28-45.
- Fishbein, M. and Ajzen, I., *Attitude, intention and behaviour: An introduction to theory and research*, Addison-Wesley, Reading, MA, 1975.
- Giddens, A., *Central problems in social theory: Action, structure and contradiction in social analysis*, Berkely, California Press, 1979.
- Giddens, A., *The Constitution of Society: Outline of the Theory of Structuration*, University of California Press, Berkely, CA, 1984.
- Gopal, A., Bostrom, R. P. and Chin, W. W. (1993). Applying adaptive structuration theory to investigate the process of group support systems use. *Journal of Management Information Systems*, 9 (3), 45-69.
- Hirschheim, R., (2007). Introduction to the special issue on “Quo vadis TAM – issues and reflections on technology acceptance research”, *Journal of the Association for Information Systems*, 8, 4, 203-206.
- Jasperson, J. S., Carter, P. E. and Zmud, R. W. (2005). A comprehensive conceptualization of post-adoptive behaviors associated with information technology enabled work systems. *MIS Quarterly*, 29 (3), 525-557.

Jones, M. R. and Karsten H. (2008). Giddens's structuration theory and information systems research. *MIS Quarterly*, 32 (1), 127-157.

Karahanna, E. and Straub, D. W. and Chervany, N. L. (1999). Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*, 23 (2), 183-213.

Kulp, S. L., Randall, T., Brandyberry, G. and Potts, K. (2006). Using organizational control mechanisms to enhance procurement efficiency: how GlaxoSmithKline improved the effectiveness of e-procurement. *Interfaces*, 36 (3), 209-219.

Limayem, M., Banerjee, P. and Ma, L. (2006). Impact of GDSS: opening the black box. *Decision Support Systems*, 42 (2), 945-957.

Limayem, M., Hirt, S. G. and Chin, W. W. (2001). Intention does not always matter: the contingent role of habit on IT usage behavior. In conference proceedings of the 9th European Conference on Information Systems: Global Co-Operation in the New Millennium, Bled, Slovenia.

Limayem, M., Hirt, S. G. and Cheung, C. M. K. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS Quarterly*, 31 (4), 705-737.

Lucas, H. C., Swanson, E. B. and Zmud, R. W. (2007). Implementation, innovation, and related themes over the years in information systems research. *Journal of the Association for Information Systems*, 8 (4), 205-211.

Majchrzak, A., Rice, R. E., Malhotra, A. and King, N. (2000). Technology adaptation: the case of a computer-supported inter-organizational virtual team. *MIS Quarterly*, 24 (4), 569-600.

Maznevski, M. L. and Chudoba, K. M. (2000). Bridging space over time: global virtual team dynamics and effectiveness. *Organization Science*, 11 (5), pp. 473-492.

Merriam, S. B. (1994). Fallstudien som forskningsmetod. Studentlitteratur, Lund.

Miranda, S. M. and Bostrom, R. P. (1994). The impact of group support systems on group conflict and conflict management. *Journal of Management Information Systems*, 10 (3), 63-95.

Nagasundaram, M. and Bostrom, R. P. (1994). The structuring of creative processes using GSS: a framework for research. *Journal of Management Information Systems*, 11 (3), 87-114.

Orlikowski, W. and Baroudi, J. (1991). Studying information technology in organizations: research approaches and assumptions, *Information Systems Research*, 2(1), 1-28.

- Orlikowski, W. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, 3 (3), 398-427.
- Orlikowski, W. (2000). Using technology and constituting structures: a practice lens for studying technology in organizations. *Organization Science*, 11 (4), 404-428.
- Peters, L. D. (2006). Conceptualising computer-mediated communication technology and its use in organisations. *International Journal of Information Management*, 26 (2), 142-152.
- Poole, M. S. and DeSanctis, G. (1990). Understanding the use of group decision support systems. In J. Fulk and C. Steinfield (Eds.), *Organizations and Communication Technology*, Beverly Hills, CA:Sage, 173-193.
- Poole, M. S. and DeSanctis G. (2004). Structuration theory in information systems research: methods and controversies. In *The handbook of information systems research*. Ed. Whitman, M. D. and Woszczynski, A. B. Idea Group Publishing, Hershey, US.
- Pozzebon, M. and Pinsonneault, A. (2005). Challenges in conducting empirical work using structuration theory: learning from IT research. *Organization Studies*, 26 (9), 1353 – 1376.
- Premkumar, G. and Bhattacharjee, A. (2008). Explaining information technology usage: a test of competing models. *Omega*, 36 (1), 64-90.
- Puschmann, T. and Alt, R. (2005) Successful use of e-procurement in supply chains. *Supply Chain Management*, 10(2), pp. 122-133.
- Rains, S. A. (2007). The impact of anonymity on perceptions of source credibility and influence in computer-mediated group communication. *Communication Research*, 34 (1), 100-125.
- Reunis, M. R. B., van Raaij, E. M. and Santema, S. C. (2005). Actor-to-actor dissemination of e-procurement adoption: an exploration of influencing factors. *Journal of Purchasing and Supply Management*, 10 (4-5), 201-210.
- Reunis, M., Santema, S. and Harink, J. (2006). Increasing e-ordering adoption: A case study. *Journal of Purchasing and Supply Management*, 12 (6), 322-331.
- Salisbury, W. D., Chin, W. W., Gopal, A. and Newsted, P. R. (2002). Research report: better theory through measurement – developing a scale to capture consensus on appropriation, *Information Systems Research*, 13(1), 91-103.
- Santema, S., Harink, J. and Reunis, M. (2006). Achieving E-Ordering Adoption with a Benefit Imbalance. *Proceedings of the 15th international IPSERA conference*, San Diego.

Schwarz, A. and Chin, W. (2007). Looking forward: Toward an understanding of the nature and definition of IT acceptance, *Journal of the Association for Information Systems*, 8 (4), pp. 230-243.

Schwieger, D., Melcher, A., Ranganathan, C. and Wen, H. J. (2004). Appropriating electronic billing systems: Adaptive structuration theory analysis, *Human Systems Management*, 23 (4), 235-243.

Tyre, M. J. and Orlikowski, W. (1994). Windows of opportunity: temporal patterns of technological adaptation in organizations. *Organization Science*, 5 (1), 98-118.

Vaidya, K., Sajeev, A. S. M. and Callender, G. (2006). Critical factors that influence e-procurement implementation success in the public sector. *Journal of Public Procurement*, 6 (1/2), 70-99.

Van Raaij, E. M., Brandon-Jones, A. and Reunis, M., (2007). The impact of e-procurement quality factors on user acceptance of e-procurement systems. In *IPSERA conference proceedings*, Bath, England.

Venkatesh, V. (2000). Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, 11 (4), 342-365.

Venkatesh, V. and Davis, F. D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, 46 (2), pp. 186-204.

Venkatesh, V., Davis, F. D. and Morris, M. G. (2007). Dead or alive? The development, trajectory and future of technology adoption research. *Journal of the Association for Information Systems*, 8 (4), 267-286.

Venkatesh, V., Morris, M. G., Davis, G. B. and Davis, F. D. (2003) User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27 (3), pp. 425-478.

Venkatesh, R. and Kohli, A. K. (1995). Influence strategies in buying centers. *Journal of Marketing*, 59 (4), 71-83.

Yin, R. K. (2003). *Case study research design and methods*. Sage Publications, Inc., USA.

Zuboff, S. (1985). Automate/Informate: The two faces of intelligent technology. *Organizational Dynamics*, 14 (2), 5-18.

Appendix

Appendix A: People interviewed in Article 1.

Appendix B: List of roles interviewed at the case organization and conducted observations.

Appendix A

People interviewed in Article 1.

Company Industry	Person interviewed	Number of employees
ABB	Nordic Purchasing Manager Engineering	157 000
	Project Manager Change Management e-procurement Industrial	
	Project Manager Technical e-procurement Automation	
Alfa Laval Engineering, packing	Vice President Operations Purchasing	9 600
AstraZeneca	Program Director Purchasing Pharmaceutical	54 000
Atlas Copco	Project Manager Logistics Engineering	26 000
	Purchasing & Logistics Manager	
Sandvik	Director Internet Business Development Steel	35 000
	Internet Business Development	
Scania	Global Purchasing Manager Automotive	26 900
Stora Enso	ePurchasing Manager Paper	43 000
Volvo	Snr Purchasing Manager Automotive	27 000
	Project Manager e-procurement	

Fig. 1. Persons interviewed in Article 1.

Appendix B

List of roles interviewed at the case organization and conducted observations.

Role/function	Interview date
Information director (member of the executive group)	7 th Oct 2004
Secretary to the information director/end-user	7 th Oct 2004
Swedish purchasing manager	3 rd April 2002 6 th Aug 2003 25 th Sept 2006
Central e-ordering project manager (2001-Dec 2002)	31 st Jan 2002 3 rd April 2002 16 th Dec 2003
Central e-ordering project manager (Dec 2002-Jan 2006)	1 st July 2003
Central e-ordering project manager (Jan 2006-)	25 th Sept 2006
Member of the central e-ordering project group responsible for system administration	29 th Aug 2003 22 nd Dec 2003
System support Consultant WM-data	5 th Nov 2002
System support Consultant WM-data	5 th Nov 2002
E-ordering business case fulfilment responsible for the measurement model	17 th Feb 2002
Purchaser AZ Tokyo	28 th Aug 2003
E&S	
Purchasing manager	30 th Sept 2002 16 th Dec 2002
Purchaser	22 nd Aug 2003
Purchasing administration person	18 th Aug 2003
Purchaser, responsible for system administration	30 th Sept 2002 22 nd Aug 2003
End-user (craftsman)	3 rd Dec 2002
End-user (craftsman)	3 rd Dec 2002
End-user (craftsman)	16 th Aug 2003

End-user (craftsman)	18 th June 2003
----------------------	----------------------------

R&D

Purchaser, responsible for the e-ordering system at the R&D division	14 th Jan 2004
--	---------------------------

End-user (researcher/manager)	3 rd Dec 2002 25 th Sept 2006
-------------------------------	--

End-user (porter)	25 th Sept 2006
End-user (researcher)	25 th Sept 2006
End-user (researcher/manager)	25 th Sept 2006

Meetings the researcher has participated in and observed

Meeting	Date
Training sessions at E&S	5 th Nov 2002 7 th Nov 2002 6 th May 2003 9 th May 2003 19 th May 2003 27 th May 2003 5 th Aug 2003 13 th Aug 2003
A training session for persons who had already participated in a training session, but who had not begun to use the system when ordering	7 th May 2003
One full information day with all persons involved in the e-ordering project from the entire Swedish organization	13 th June 2002
A meeting with people responsible for system administration from all divisions, discussing modifications in the system based on end-users' complaints	3 rd Oct 2002
Two full days of training in the system for people working with purchasing and finance, from different divisions.	25 th Nov 2002 26 th Nov 2002
A YPP (Young Purchasing Professional) meeting at the case organization, where the global purchasing manager presented purchasing within the organization and the e-ordering system initiative	17 th May 2004
Observations of daily work have been conducted on the following dates: 5 th Nov 2002, 11 th Nov 2002, 12 th Nov 2002, 18 th Nov 2002, 19 th Nov 2002, 3 rd Dec 2002,	

9th Dec 2002, 10th Feb 2003, 17th Feb 2003, 26th May 2003, 27th May 2003, 2nd June 2003, 16th June 2003, 17th June 2003, 19th June 2003, 4th Aug 2003, 5th Aug 2003, 6th Aug 2003, 7th Aug 2003, 11th Aug 2003, 13th Aug 2003, 15th Aug 2003, 18th Aug 2003, 19th Aug 2003, 20th Aug 2003, 21st Aug 2003, 22nd Aug 2003 and 25th Aug 2003.

Article 1

E-procurement maturity in industry

Katarina Arbin

Published 2003 in International Journal of Electronic Business, Vol. 1, No. 4,
pp. 396-407.

E-procurement maturity in industry

Katarina Arbin

Center for Information and Communication Research,
Stockholm School of Economics,
P.O. Box 6501, SE-113 83, Stockholm, Sweden
Fax: +46-8-33 43 22 E-mail: katarina.arbin@hhs.se

Abstract: This paper aims to examine the use and implementation of electronic procurement for indirect material in eight large global companies, and investigate what kinds of barriers exist towards electronic procurement. The empirical evidence comes from interviews with e-procurement experts and operatives in eight global firms. Results show that three out of eight companies are using e-procurement and four are planning to do so in the future. Barriers shown by the empirical material are lack of technological standard, different IT-maturity among suppliers, resistance among users to leaving old suppliers, lack of support from top management, differences in language, culture and legal systems. Other barriers found are getting suppliers to update and control the electronic product catalogues and to monitor them and getting the users in the organisation to use the system.

Keywords: e-procurement; e-business; value; barriers; indirect material.

Reference to this paper should be made as follows: Arbin K. (2003) 'E-procurement maturity in industry', *Int. J. Electronic Business*, Vol. 1, No. 4, pp.396–407.

Biographical notes: Katarina Arbin is a PhD Student at the Stockholm School of Economics at the Center for Information and Communication Research. She conducts research on electronic procurement and electronic marketplaces business-to-business. Her research focuses on implementation and use of e-procurement solutions in large companies. Arbin is also interested in wireless technology, procurement and logistics.

An earlier version of this paper was presented to the 11th Annual IPSERA Conference, the Netherlands, 25–27 March 2002.

1 Introduction

Electronic procurement is a relatively undeveloped research area; it is a new area both for academia and industry. Articles about e-procurement in the business press are often about success stories, but taking a closer look at e-procurement, what is actually happening in the industry and how well does e-procurement work? This paper will investigate the interest among large global firms, whether they are using e-procurement and how far they have developed. The paper will also investigate barriers to e-procurement.

The business press, consultants and researchers are all communicating that companies can reduce costs by using electronic procurement.

“Gartner Group says that a hypothetical \$9.6 billion company will pay back a \$7 million e-procurement technology investment in just over four years and will get \$6.2 million in savings in the fifth year.” [1]

“Telecommunications supplier Clear Communications (now TelstraClear) saved \$2.7 million in just one year after implementing an Oracle e-procurement system.” [2]

E-commerce innovations aim to reduce the cost of procurement before, during and after the transaction [3]. The potential cost savings in this area are substantial [3]. The areas of indirect procurement and operating resource management have been neglected in many companies. New technologies and marketplace models, together with the potential for very large cost savings in these purchasing areas, are increasingly affecting large and small companies [4]. E-procurement has brought a whole new perspective to traditional procurement practices. The popularity achieved by this solution stems from the fact that procurement function experiences similar problems regardless of industry [5]. The potential merit of various electronic procurement forms seems largely undisputed [6].

Research has been conducted on business-to-business electronic marketplaces and electronic procurement [4,7–13], but there is still a need for more empirical research in the area of electronic procurement. In this study, all of the companies interviewed said that they need more knowledge and insights about electronic procurement.

Procurement activities are often divided into direct, production-related procurement and indirect, non-production-related procurement [14]. Researchers conducting research on e-procurement also divide between direct and indirect procurement [4]. However, the empirical material in this study shows that companies have problems with seeing what is indirect material and what is direct. All companies in the survey had problems seeing which products are suitable for buying through an e-procurement system. The paper mainly investigates the use of e-procurement for indirect material. It is interesting to note that there was confusion regarding what is indirect material and what is not, and which products and services are suitable for e-procurement and which are not.

“E-procurement includes web technology-based purchasing solutions aimed at simplifying commercial transactions within and between organisations and information technology solutions for ordering, logistics and handling systems, as well as for payment systems.” [15]

In this paper, the e-procurement definition given above is used. The companies interviewed are all large companies with a main interest in information technology solutions. The companies that had already started were using an information technology solution that they had bought from Ariba and Oracle.

In spite of all the arguments and statements above, only three of the investigated companies have begun e-procurement. All of them are experiencing problems with their implementation. It is interesting, therefore, to investigate the status of e-procurement in large companies and the problems experienced by the personnel responsible for e-procurement.

The paper will begin with a presentation of the aim of the study and methodology used and continues with a description of the theoretical framework. There will be a discussion regarding how far the large global companies in the study have come in using e-procurement, whether they have reached a realised value and what they think is the potential value of the investment. The paper will then discuss problems that companies

experience when implementing an e-procurement solution. The paper will close with a summary of the results generated by the study.

2 Aim of the paper

The purpose of this paper is to investigate how far the studied companies have come in implementing an e-procurement solution for indirect material, and what kind of obstacles and problems they are experiencing, according to the people interviewed. This knowledge is interesting both for researchers and for industry. The business press often reports success stories in e-procurement but, frequently, the information given is an improved picture of reality. It is therefore interesting to take a closer look at the e-procurement projects that are actually running, in order to gain more knowledge about and better insights into electronic procurement. According to those interviewed, there is little knowledge about e-procurement today and they are learning from their own experience.

3 Methodology

In order to gain a deep understanding of e-procurement implementations in large companies, in-depth interviews with personnel involved in and responsible for eBusiness and purchasing have been conducted. The companies chosen for the study are all large industrial global companies who buy a relatively large quantity of indirect material and services. The companies were chosen with the intention that they could be potential case companies in a larger study, and they were also chosen because they have a reputation for being interested in e-procurement. People interviewed include purchasing managers, e-business managers and project managers in eight large companies (ABB, Alfa Laval, AstraZeneca, Atlas Copco, Sandvik, Scania, Stora Enso and Volvo Car Corporation).

Figure 1 Personnel interviewed

Company	Person interviewed	Number of employees	Industry
ABB	Nordic Purchasing Manager	157 000	Engineering
	Project Manager Change Management e-procurement		Industrial
	Project Manager Technical e-procurement		Automation
Alfa Laval	Vice President Operations Purchasing	9 600	Engineering Packing
AstraZeneca	Program Director Purchasing	54 000	Pharmaceutical
Atlas Copco	Project Manager Logistics	26 000	Engineering
	Purchasing & Logistics Manager		
Sandvik	Director Internet Business Development	35 000	Steel
	Internet Business Development		
Scania	Global Purchasing Manager	26 900	Automotive
Stora Enso	ePurchasing Manager	43 000	Paper
Volvo	Snr Purchasing Manager	27 000	Automotive
	Project Manager e-procurement		

4 Framework

In order to provide a framework and a roadmap to follow, the paper uses research about value and information technology investments, as this is the conventional way to look at e-procurement.

Chircu and Kauffman have made a summary of limits to value in electronic-related information technology investments, and present factors in their article that are limits to value [16]. They identify barriers specific to the valuation process (industry and organisational barriers), and to the conversion process (resource, knowledge and usage barriers) when making electronic commerce-related information technology investments. This is interesting to look at, because knowledge and awareness of potential problems and barriers can contribute to proactive actions in order to avoid and overcome problems and barriers when implementing an e-procurement solution.

Due to the lack of knowledge regarding the value of e-procurement (value given is mostly from the business press), it was interesting to ask what kind of value the companies expected the e-procurement project to generate. When asking the firms in this study, a distinction was made between two types of IT values: potential value, which represents the maximum value opportunity available to the company if the information technology is implemented successfully, and realised value, which is the measurable value that can be identified after the implementation ensues [17].

The paper uses the limits to value presented by Chircu and Kauffman [16] to provide a framework in order to be able to investigate what kind of barriers companies experience regarding information technologies investments, in this case investments in e-procurement.

4.1 The valuation process

There are two classes of limits to value for the IT valuation process: industry and organisational barriers.

Industry barriers can be scarcity, cost and other assets that are necessary to obtain the benefits of the technology. A large industry barrier can be lack of standardisation of technologies. Katz and Shapiro argue for the importance of a common technological standard. Adoption of new technology depends on the standardisation of technologies that are complementary to them [18]. The industry structure might also limit the potential value of the e-procurement solution.

Organisational characteristics, such as organisational routines, norms, market and product expertise, customer and supplier relationships, and human capital, can also limit the potential value of IT. Unfavourable pre-existing organisational conditions may render changes of large magnitude economically unfeasible [19]. Organisational payoff is maximised when several factors relating to IT, decision authority, business processes and incentives are changed in a co-ordinated manner [19].

4.2 The conversion process

Chircu and Kauffman identify three limits to value in the conversion process: resource, knowledge and usage barriers [16].

Success with IT implementation and realisation of value requires more than just managerial visions about how technology can be leveraged for strategic and operational

advantage. IT often requires additional investments in specialised resources, such as new organisational processes and human capital. Resources are needed to exploit any IT innovation [20].

Knowledge barriers affect the value of e-procurement investment. Firms delay in-house adoption of technology until they obtain sufficient technical know-how to implement and operate it successfully [21]. Redesign of work and processes also requires employees to learn new skills and the organisation to develop new routines, which can create knowledge barriers. Knowledge barriers also stem from a lack of absorptive capacity.

The success of the investment is highly dependent on how well its intended users adopt the IT. It is through consistently high levels of IT usage that potential value is realised. Many researchers believe that the effects of technologies are less a function of the technologies themselves than of how they are used [22]. In e-procurement this is of particular importance; if no one uses the e-procurement solution, or if they use it sporadically, it is worthless. Usage barriers are often related to user perceptions regarding the technology. Unfavourable perceptions will result in users not adopting the technology solution. Users can also have different levels of tolerance for innovation and organisational change; their personal characteristics may affect how well they will adopt the new way of working.

5 Discussion

5.1 *How far have they come?*

Three of the investigated companies had started an e-procurement project and four had plans about doing so in the near future. None of the firms had completed the implementation. The two companies that have passed the pilot stage, and are now in the process of rolling out the solution, face several challenges. One has rolled out the system to approximately 600 users and the other has rolled it out to 6,000–7,000 users. Another company is conducting a pilot project with approximately five users. Five of the eight companies have not yet started. For the companies that have started, the volume going through the systems is still relatively low.

In Figure 2, below, the different companies are placed according to how far they have proceeded in their e-procurement project. The preliminary stage involves collecting information, gaining knowledge and planning the project. The company in the pilot stage is conducting a pilot project with 5–15 users. In the operational stage, e-procurement is being used as a tool to procure products and services. No company has reached the mature stage or has yet undertaken a full rollout of the system.

Figure 2 Stage in e-procurement

Company	Preliminary	Pilot stage	Operational	Mature
1.	X			
2.	X			
3.	X			
4.	X			
5.	X			
6.		X		
7.			X	
8.			X	

5.2 Potential and realised value

There is discussion, especially in the business press, about what kind of value to gain from an e-procurement investment. The business press claim that, through using an e-procurement solution, firms can reduce the costs for procurement by up to 50–80%, and that reducing cost through a more effective procurement process is the main motivation for companies to initiate an e-procurement project. The empirical investigation, however, shows that this is not the case. The main reason for starting an e-procurement project, according to the interviewees, is to better navigate the purchasing in the organisation and to be able to negotiate better purchasing prices.

“We buy indirect material for \$900 million each year, and it is realistic to get approximately 75% of that volume through the system (\$650 million). This means that the suppliers can reduce their price by approximately 10%, which gives \$65 million back each year. This argument alone, gives enough motivation to start an e-procurement initiative.” *project manager, e-procurement*

Another reason mentioned by three of the companies, is that they want to get away from price discrimination by suppliers (suppliers charge a different price in different markets) and have one price in all countries, i.e., one global price. This is also a potential source for value.

However, all interviewees, with one exception, think that the procurement process will be more effective when the rollout has been completed, and that they will reduce cost through a more effective procurement process in the long run, but this is difficult to prove, and it will show in the future.

“The savings from a more effective process are still small, but in a few years time we will be able to see savings that come from reduced process costs.” *project manager, e-procurement*

“I have estimated potential reduced process costs, but it is difficult to argue; some people in the organisation are very critical and do not understand the discussion.” *e-purchasing manager*

When looking at potential and realised value [17], it is difficult to see a realised value, depending on whether any of the companies have completed the implementation. The interviewees believe that it will take approximately one or two more years before any of the studied companies will show a realised value. The closest they get to a realised

value is when looking at reduced prices from suppliers, which are generated by volume discounts. It is possible to compare a global price with the old; different prices in different markets. Two of the companies do say that they have quickly earned back the money spent on the e-procurement investment, merely by looking at purchasing prices.

When it comes to potential value, they all seem to have a similar, realistic picture. For most of them, potential value is the value gained by lower purchasing prices. They all (with one exception) mention reduced process costs, but most of them say that they do not count on the reduced process costs, mostly because process cost is too difficult to estimate.

“All calculations regarding reduced process costs, you have to be a bit sceptical about; it is possible to get almost any figure.” *global purchasing manager*

5.3 Limits to value

All of the companies in the study (except one that is not undertaking e-procurement according to van Weele’s definition) are in a very interesting phase in which they face new challenges. In many cases, according to the interviewees, there are no guidelines for action. They say that it is often common sense (in contrast to expert advice) that decides what to do and how to solve problems. Below, there is a discussion about limits to value and problems that the interviewees expect to face or are already facing when implementing an e-procurement solution.

5.3.1 Valuation barriers

The companies in the survey are experiencing problems that are linked to the industry, to the industry structure and to a lack of common technology standards. The empirical material also shows that there are problems with connecting supplier catalogues to the customer system.

“It is important to remember that this also means a change for the supplier. The suppliers also have to change their internal processes.” *Nordic purchasing manager*

“This is also a big change for the supplier; it would not be so bad if the suppliers gained more knowledge about technical integration.” *project manager e-procurement*

Problems connected to the different industries in which the companies are operating are the lack of common technological standards and the use of many small suppliers who have difficulties with communicating electronically. According to the interviewees, business units often use small local suppliers that do not have the resources necessary to create an electronic catalogue, receive orders in an electronic way and to update the catalogue with prices and new products. They will have large problems in communicating their offerings in an electronic way.

“Many suppliers have a positive attitude towards our e-procurement system; some small suppliers, though, have difficulties in creating an electronic catalogue and in communicating electronically.” *project manager e-procurement*

A problem from a supplier point of view is that suppliers often have several customers with different technological systems. This means that in order for the supplier to

communicate electronically with the customers, he has to be able to manage different kinds of electronic solutions.

“We need a standardisation, XML. There is no defined standard today. Everyone has their own wishes about how to send data, which means that the supplier has to create several unique catalogues, which cost a lot.” *person working with internet business development*

Another large obstacle to overcome, according to the interviewees, is the users' (users are the personnel within the organisation who use the e-procurement solution) resistance to leaving old suppliers and buying from new predetermined suppliers.

An organisational barrier that all persons interviewed (except one) mention as difficult to overcome is the breaking up of past supplier relationships. According to the interviewees, business units or subsidiaries often have their own relationships with local suppliers.

“We have had resistance because of the business unit's own relationships with their suppliers; often they have a long historical relationship to the supplier, who has been there for them. There are loyalty and feelings towards suppliers.” *project manager e-procurement*

According to the interviewees, local suppliers have often been very supportive and loyal towards the business unit. There can be personal connections between the employees at the business unit and the supplier, for example husband and wife, brother and sister, best friend, father in law, neighbour and so on. In a small society where the supplier has a few customers and the business unit is an important customer, there will be problems for the supplier if the business unit decides not to continue to buy from them. This is closely linked with usage barriers, and the user attitude towards the e-procurement system. This is a difficult barrier to overcome. It is difficult to give persons an overall perspective, to get them to understand that if they only buy from the predestined suppliers the company, as a whole, will reduce costs. According to the interviewees, some of the business units only see the damage they will do to the local supplier.

Ten of the persons interviewed brought up the importance of having support from top management, when implementing an e-procurement system. The empirical material shows that support from top management is crucial for successful implementation and usage. Two of the companies explicitly said that they saw the lack of support from top management as a large barrier for e-procurement in their organisation.

“You have to have a top-down approach, where top management communicate that this is an important initiative and that if all users use the system, it will result in large reduced costs for the company.” *e-purchasing manager*

It takes time and effort to educate thousands of users in a company; the firm has to consider different languages, different cultures and different legal systems, in the different countries in which it operates. The two companies using e-procurement today face difficulties in anticipating potential problems. When undertaking a global e-procurement rollout, it is, for example, important to remember and to consider that there are different cultures. It is also important to investigate the kind of legal rules that are applied in different countries. In some cases, there are different rules about how to handle, for instance, electronic invoices, and how to store the information that communicates electronically. In other countries, the employees are very poor at speaking English. English as a general language should not be taken for granted.

Purchasing managers say that using an e-procurement system will change the way of working for the purchasing department. According to the interviewees, the purchasing department will have more time to concentrate on sourcing instead of routine buying for the organisation. Processes and routines will change, both for the purchasing staff, and for the users. Before introducing the procurement system, the users often made a phone call to their supplier, or went down to the “shop on the corner”. With an e-procurement system, the users will make an order from predetermined suppliers within the system and the suppliers will deliver the product. The users will have to plan their purchase, and be aware that they will not get their products the same day.

5.3.2 Conversion barriers

Those companies in the study that are utilising e-procurement had, to some extent, consultants who helped them in the initial phase. They were mainly technical consultants who helped with the technical aspects of the system. But they were used also as teachers in order to learn about the system and to gain knowledge about how to integrate new suppliers, and how to manage the system. Six of the eight companies in the study have recruited personnel (internal and external) to provide more resources to work with the e-procurement project; there are different numbers of employees working with the project in different companies. In one of the firms, there are two people working part-time with the project and in another there are about 40 full-time workers involved with the e-procurement project.

All companies interviewed had a down-to-earth approach about the project, and realised that a successful e-procurement solution demands a lot of work. There were few fancy words and few unrealistic visions in the empirical material. Personnel involved in this kind of project seemed practical and realistic.

“The first vision was that all employees should put their orders through the system. We have, though, realised that this is a too hard demand to start with, and we do not interfere in how they organise it, who puts in the order, only that the volumes go through the system.” *Nordic purchasing manager*

There were no signs of only sophisticated managerial visions about how the technology can be leveraged for strategic and operational advantage. On the contrary, the people interviewed seemed to have a very practical and realistic picture about the e-procurement project.

One barrier, according to the interviewees, is the work involved in getting the suppliers to update and control the electronic product catalogues and to monitor them, so that they have the correct products and prices displayed. For e-procurement to work, it is important that the users are exposed to the right products at the right prices when buying through the system. Prices and products often change and it is important to constantly update product and price information. This can become a large problem if, for example, the customer has 20 suppliers in the system. The purchasing department must then monitor the catalogues in order to be sure that the correct products and prices are displayed in the catalogues.

Most employees in today’s organisations are used to computers in their daily work life. Potential e-procurement users in an organisation are used to working with a computer interface. The interviewees thought that, in many cases, the users were not used to ordering products and services electronically. The empirical material shows that it is important to teach the users how to use the e-procurement solution. The three companies

that are utilising e-procurement today have put a lot of effort into educating and spreading knowledge about how to use this solution, and why it should be used. Three companies explicitly said that they felt a pedagogic responsibility towards their users, and that they had to make everybody in the organisation understand why they use e-procurement. This helps to motivate employees to use the new system.

The investigated firms have dealt differently with the problem of spreading knowledge about how to use the system. One company has, for instance, chosen one user out of ten who is supposed to order through the system for all ten. Another firm has chosen to roll out the system to all employees and in that case has also educated all employees in how to order through the system.

According to e-procurement managers, the most important aspect and also the most difficult problem to overcome is to get the users use the system. The whole e-procurement project relies on the company's ability in spreading the knowledge and usage in the organisation. If the users do not use the system, the volumes will not go through it, and the supplier will not be prepared to lower the prices.

"One problem that we experience now is that we have to increase the volume that goes through the system; we have to get the users to use the system. There is, otherwise, a risk that the attitude of the supplier will change. The suppliers that are connected have started to wonder about the promised volumes that have not occurred." *Project manager e-procurement*

There were large differences regarding attitude towards how difficult it is to get the users to use the system. Three of the companies that were in the preliminary and pilot phase did not see the usage barrier as a difficult problem to overcome. Companies that had been working with the project for some time all felt that this is a very difficult and critical problem, which demands a lot of work and energy.

According to the interviewees, the companies that had been working with the project for some time have had to deal with some business units, subsidiaries and individuals who have a negative attitude towards the project, and who do not want to use the solution. Four of the interviewed companies mentioned that it takes time but, sooner or later, the individual will change their mind. In one case, the company felt that it had to use its power, and give the business unit, subsidiary or individual a definite order to use the system, by refusing to pay their invoices.

One of the companies in the operational stage thinks that physical nearness among users is very important, with a person who can explain to and show the users how to use the system, a person that they know and can ask 'stupid questions'. It is of particular importance to have experts on the e-procurement system from the mother firm, placed in offices in other countries that are involved and feel responsible for the project.

6 Conclusions

6.1 Summary of principal results

Five companies are in the preliminary and pilot stage when it comes to e-procurement and only two are beginning to see the end of the implementation phase in the first and second country. None of the companies in the survey are close to full implementation and usage of the system. The empirical material shows that companies are interested in e-procurement and are starting to use e-procurement solutions for indirect material. It is a

large and demanding project to undertake a global rollout of an IT-system, and there are obstacles to overcome. The main challenge, according to the personnel interviewed, seems to be the user barrier, which takes time and effort to overcome, and which should not be underestimated. Another obstacle is to get the suppliers integrated, and to solve the problem of who is to update and control the unique catalogues and how it is to be done. The breaking up of existing and historical supplier relationships was another problem that the interviewees mentioned. Other issues to consider are differences in culture, language and legal aspects.

Below, barriers for e-procurement found in the study are listed. Through being aware of potential barriers, firms can be proactive in order to overcome them.

- lack of technological standard
- different IT-maturity among suppliers
- getting suppliers to update and control the electronic product catalogues and to monitor the catalogues
- differences in language, culture and legal systems
- lack of support from top management
- resistance among users to leaving old suppliers
- getting the users in the organisation to use the system.

Firms can be proactive, identifying the valuation and conversion barriers and taking steps to overcome them. Such steps, for valuation barriers, might include sponsorship for new technology to help it become standard, and co-operation with other industry participants in order to leverage IT investment. Conversion barriers can be eliminated by investing in training and human capital, and through encouraging the use of the IT system through management support, information and promotions [16].

In the business press the impression is given that most large companies are buying through e-procurement systems or electronic marketplaces but, on taking a closer look at reality, it is apparent that e-procurement is not that widespread. It is still difficult to say what kind of value is to be gained from an e-procurement solution; none of the companies in this study had yet seen a realised value, or reached a mature stage.

Differences could be seen in the empirical material regarding the e-procurement project, between companies that were in an early stage and companies that had come further. Companies in an early stage think that they will be able to lower the process cost, and some had fantastic figures calculated, while the ones that had come further had realised the difficulties in trying to estimate potential savings through a more effective procurement process.

For the investigated organisations, the main reasons for starting an e-procurement project were to better navigate purchasing in the organisation and to negotiate better purchasing prices. Another reason mentioned by several companies was to gain better control over and knowledge about purchasing behaviour in the organisation.

References

- 1 *BusinessWeek* (2001) 27 August.
- 2 *NZBusiness* (2002) February.

- 3 Lucking-Reiley, D. and Spulber, D. (2001) 'Business-to-business electronic commerce', *Journal of Economic Perspectives*, Vol. 15, No. 1, pp.55–68.
- 4 Segev, A., Gebauer, J. and Färber, F. (2000) 'The market for internet-based procurement systems', *CITM Research Report, WP1040, Part 1, Fisher Center for Information Technology and Marketplace Transformation*, Haas School of Business, University of California, Berkeley.
- 5 Venuprasad, R. (2001) 'Leveraging the supply chain: exploiting the potential of electronic procurement as strategic operating resource', *The 10th International Annual IPSERA Conference*, Jönköping, Sweden.
- 6 Boer, Harink and Heijboer (2002) 'A conceptual model for assessing the impact of electronic procurement', *European Journal of Purchasing & Supply Management*, Vol. 8, No. 1, pp.25–33.
- 7 Bailey, J. and Bakos, Y. (1997) 'An exploratory study of the emerging role of electronic intermediaries', *International Journal of Electronic Commerce*, Vol. 1, No. 3, pp.7–20.
- 8 Bakos, Y. (1991) 'A strategic analysis of electronic marketplaces', *MIS Quarterly*, Vol. 15, No. 3, pp.295–310.
- 9 Bakos, Y. (1991) 'Information links and electronic marketplaces: the role of interorganisational information systems in vertical markets', *Journal of Management Information Systems*, Vol. 8, No. 2.
- 10 Essig, M. and Arnold, U. (2001) 'Electronic procurement in supply chain management: an information economics-based analysis of electronic markets', *The Journal of Supply Chain Management: A Global Review of Purchasing and Supply Management*, Autumn, pp.43–49.
- 11 Kaplan, S. and Sawhney, M. (2000) 'E-hubs: the new B2B marketplaces', *Harvard Business Review*, Vol. 78, No. 3, pp.97–104.
- 12 Malone, T.W. and Yates, J. (1989) 'The logic of electronic markets', *Harvard Business Review*, May-June, pp.166–170.
- 13 Segev, A., Gebauer, J. and Färber, F. (1999) 'Internet-based electronic markets', *Electronic Markets*, Vol. 9, No. 3, pp.138–146.
- 14 Zenz, G.J. (1996) *Purchasing and the Management of Materials*, John Wiley & Sons Inc., New York.
- 15 Van Weele, A.J. (2002) *Purchasing and Supply Chain Management*, Thomson Learning, London.
- 16 Chircu, A.M. and Kauffman, R.J. (2000) 'Limits to value in electronic commerce-related information technology investments', *Journal of Management Information Systems*, Vol. 17, No. 2, pp.59–81.
- 17 Davern, M.J. and Kauffman, R.J. (2000) 'The value of decision technologies: discovering potential and realising payoff', *Journal of Management Information Systems*, Vol. 16, No. 4, pp.121–144.
- 18 Katz, M.L. and Shapiro, C. (1986) 'Technology adoption in the presence of network externalities', *Journal of Political Economy*, Vol. 94, No. 4, pp.822–841.
- 19 Barua, A., Lee, S.C.H. and Whinston, A.B. (1996) 'The calculus of reengineering', *Information Systems Research*, Vol. 7, No. 4, pp.409–428.
- 20 Clemons, E.K. and Row, M.C. (1991) 'Sustaining IT advantage: the role of structural differences', *MIS Quarterly*, Vol. 15, No. 3, pp.275–293.
- 21 Attewell, P. (1992) 'Technology diffusion and organisational learning: the case of computing', *Organisation Science*, Vol. 3, No. 1.
- 22 DeSanctis, G. and Poole, M.S. (1994) 'Capturing the complexity in advanced technology use: adaptive structuration theory', *Organisation Science*, Vol. 5, No. 2, pp.121–147.

Article 2

The road towards successful e-ordering implementation:

Success factors and barriers

Katarina Arbin

Published 2008 in International Journal of Procurement Management, Vol. 1,
No. 4, pp. 415-429.

The road towards successful e-ordering implementation: success factors and barriers

Katarina Arbin

Center for Information and Communication Research
Stockholm School of Economics
P.O. Box 6501, Hölländargatan 32
SE-113 83 Stockholm, Sweden
Fax: +46 (0)8 33 43 22
E-mail: katarina.arbin@hhs.se

Abstract: Implementing an e-ordering system in a successful way, *i.e.*, managing the implementation process, overcoming the barriers that occur and achieving a satisfactory compliance rate, is not as easy as some consultants and software companies claim. Understanding how a given organisation has managed the implementation process (resulting in a satisfactory compliance rate) may help other organisations achieve the successful implementation of e-ordering systems. The present paper describes the implementation of an e-ordering system in a large pharmaceutical organisation, discussing the problems it faced and how those were overcome. An analysis of the success factors found in previous research is presented, revealing one area that influences implementation success to a larger extent: the end user uptake. A four-year longitudinal case study is presented, which is based on interviews, observations made in daily work, at meetings and training sessions, and other documentation.

Keywords: e-procurement; e-ordering; implementation; longitudinal; case study; success factors; barriers.

Reference to this paper should be made as follows: Arbin, K. (2008) 'The road towards successful e-ordering implementation: success factors and barriers', *Int. J. Procurement Management*, Vol. 1, No. 4, pp.415–429.

Biographical notes: Katarina Arbin is a PhD Candidate at the Center for Information and Communication Research, at the Stockholm School of Economics. Her research focuses on purchasing, electronic ordering systems and Information Systems (IS) adoption and use. She holds an MSc in Marketing from the Stockholm School of Economics and, prior to starting her PhD project, she worked for an e-ordering system software supplier. Her academic work has appeared in the *International Journal of Electronic Business* and the *International Journal of Automotive Technology and Management*.

1 Introduction

Historically, the area of Maintenance, Repair and Operating (MRO) expenditures has been neglected in many organisations and undertaken in a decentralised and uncoordinated fashion. This has resulted in MRO often being a poorly managed and nonvalued activity, which suffers from a lack of internal support, maverick purchasing and the fragmentation of spending within the organisation (Croom, 2000; Cox *et al.*, 2005). This picture, however, is changing and MRO purchasing is receiving increased attention (Nissen and Sengupta, 2006; Al-kaabi *et al.*, 2007; MacDonnell and Clegg, 2007; Sarkar and Mohapatra, 2008). MRO purchasing is currently recognised as a major area for potential improvement, amounting to up to 20% of all purchases (by value) and 70%–90% (by number) of purchase orders, shipment expenses and invoices (Barry and Cavinato, 1999; van Weele, 2005).

MRO is receiving increased attention for several reasons. First, it is becoming more difficult to squeeze additional savings from raw materials and managers are turning to other potential areas in which the costs can be reduced. Second, too little time is spent on strategic MRO issues, because too much time is spent on processing routine paperwork and attending to day-to-day tactical decisions. Third, managers and executives are pressured to trim the costs wherever possible due to the increasing cost pressure and global competition (Bechtel and Patterson, 1997).

Monczka *et al.* (2005) defined MRO as all the items used to support production and operations. These items are not physically part of a finished product, but are critical to the continuous operation of the plant, equipment and offices (Monczka *et al.*, 2005). What constitutes MRO purchasing often depends on the company and the industry it competes in. It is therefore difficult to say in general what items are included in the MRO concept (Bechtel and Patterson, 1997). Here, MRO (equivalent to the indirect material in purchasing research) is defined as all the materials (both products and services) that do not go directly into production. Examples of MRO items are office desks and chairs, personal computers and software, equipment maintenance and repair (Nissen and Sengupta, 2006).

MRO is often a highly complicated area to manage due to sporadic buying patterns and a number of barriers that are difficult to overcome, such as the lack of meaningful data, fragmented supply chains and embedded local personal relationships (Cox *et al.*, 2005). MRO further includes an extensive article assortment; an assortment containing 10 000–15 000 articles is common (van Weele, 2005; Nissen and Sengupta, 2006). The articles often have a low and irregular consumption rate (low inventory turnover rate) and the user has a substantial influence over the choice of the product. Barry and Cavinato (1996) claimed that MRO purchasing is often one of the least systematic and the most problematic areas of purchasing. What strategies then are recommended for managing MRO purchasing?

A centralisation trend can be identified for MRO procurement (Dubois and Gadde, 2002; Axelsson *et al.*, 2005). For example, Puschmann and Alt (2005) found that many of the organisations in their study had implemented a central coordination office to gain better control over the products and services to be purchased on a company-wide basis. Using a category management strategy – sourcing products and services per category centrally, in combination with an e-ordering system that functions as a tool to guide the

purchasing in the organisation towards the chosen suppliers and their products and services – is recommended for managing the area of MRO procurement (van Weele, 2005). Using an e-ordering system for managing MRO procurement is further supported by Croom (2000) and Puschmann and Alt (2005).

The term e-ordering refers to the web-based tools that automate the ordering process. E-ordering is equivalent to e-MRO, defined by De Boer *et al.* (2002) as a supporting software system (an ordering catalogue system) that is used by all the employees of an organisation in the process of creating and approving purchasing requisitions, placing purchase orders and receiving goods and services. E-ordering is one of the newer facets of electronic procurement (Schoenherr and Tummala, 2007).

A compliance rate as low as 25%–50% for MRO procurement is not uncommon in large organisations, where people largely buy from their own choice of suppliers. One of the main motives for implementing an e-ordering system is the wish to reduce the maverick or off-process purchases in the organisation and to increase the compliance with the centrally chosen suppliers (Croom and Johnston, 2003). Through a reduction in maverick buying and an increased compliance rate resulting in fewer suppliers, the direct purchasing costs in the form of lower prices can be achieved (people tend to buy products at a higher price when deciding on the supplier themselves, compared to centrally negotiated agreements). The decreased costs may also be realised through the increased purchasing volumes from fewer suppliers, leading to increased volume discounts. Croom and Brandon-Jones (2007) found evidence of a greater leverage in negotiation. They also found that the cost of processing the purchase requisitions was reduced through improvements to the procurement system, but also in the reduction of maverick purchasing (Croom and Brandon-Jones, 2007). E-ordering systems are also aimed at realising faster and more efficient operational procurement processes by bypassing the purchasing department and enabling those people to concentrate on more strategic tasks (Puschmann and Alt, 2005).

The benefits of e-ordering have been widely acknowledged, but achieving these benefits still remains a challenge (Reunis *et al.*, 2004; Talluri *et al.*, 2006). According to Subramaniam and Shaw (2002), organisations are still unsure as to whether a web-based system can deliver the promised benefits. The market observations further indicate that the adoption and integration of e-ordering systems into the business mainstream are occurring at a much slower pace than expected and the studies on how companies use these e-procurement solutions and what factors are critical to their implementation are only emerging (Subramaniam and Shaw, 2002; Arbin, 2003; Davila *et al.*, 2003; Puschmann and Alt, 2005). Puschmann and Alt (2005) presented a first step towards an analysis of the factors that may guide companies in the implementation of e-ordering systems. The important success factors found are the preparation of catalogues, the embracement of suppliers at an early stage, the automation of the authorisation workflow, the creation of a central coordination office for supplier management, a strategy for the physical hosting of the catalogues, the integration of the e-procurement system with other relevant systems and the redesign of the procurement process to improve efficiency.

The aim of the present paper is to discuss the e-ordering success factors found in the previous literature and to analyse these factors using the data from an e-ordering implementation case study, thereby contributing additional knowledge about the

e-ordering success factors. The paper will further describe one company's e-ordering journey, from deciding on the system to achieving the planned compliance rate for system use, discussing the problems faced and how the organisation overcame them. A longitudinal case study has been conducted by following the implementation of an e-ordering system at a large pharmaceutical organisation over a four-year period. Following the e-ordering implementation for such a long period of time enables the longitudinal knowledge of e-ordering implementation and of the barriers and success factors involved.

The present paper adds knowledge about e-ordering implementation by:

- providing a comprehensive description of e-ordering implementation in a large organisation, from deciding on an e-ordering system to finally achieving the planned compliance rate for the system, presenting the barriers faced and how the organisation overcame them
- expanding (adding to) our knowledge of the success factors for e-ordering implementation.

The paper is structured as follows, first, previous research on e-ordering implementation success factors is presented, followed by a section on the methodology and a description of the case. Thereafter, the analysis is presented, followed by a concluding section. Finally, the paper provides managerial and research implications.

2 Literature on e-ordering success factors

There has been previous research on success factors for e-ordering (Puschmann and Alt, 2005; Vaidya *et al.*, 2006; Angeles and Nath, 2007). Based on their analysis of five companies, Puschmann and Alt (2005) identified important factors for the successful use of e-ordering systems in these organisations. In order to find these factors, empirical data were collected through site visits, at which the companies presented their solutions. Owing to the limited information presented by Puschmann and Alt (2005) regarding who, or rather, which role provided the information on the companies and because they did not use triangulation or a similar method to assess the e-ordering implementation success, it is difficult to interpret their findings. The factors identified by Puschmann and Alt (2005), however, are: the preparation of catalogues, the embracement of suppliers at an early stage, the automation of the authorisation workflow, the creation of a central coordination office for supplier management, a strategy for the physical hosting of the catalogues, the integration of the e-ordering system with other relevant systems and the redesign of the procurement process to improve efficiency. Based on a literature review, Vaidya *et al.* (2006) identified eleven factors likely to affect the success of the e-ordering initiatives in the public sector. These are the end user uptake and training, supplier adoption, compliance with the best practices for business cases/project management, systems integration, security and authentication, reengineering the process, top management support, performance measurement, change management, the e-ordering implementation strategy and the technological standards. Through their questionnaire study that resulted in 185 completed questionnaires and a factor analysis of the responses, Angeles and Nath (2007) found three success factors and three challenges to e-ordering

implementation. The success factors found were supplier and contract management, the end user behaviour and the e-ordering business processes and the information and e-ordering infrastructure. The challenges to e-ordering implementation that were found are the lack of system integration and standardisation issues, the immaturity of e-ordering-based market services and end user resistance and maverick buying and the difficulty in integrating e-ordering with other systems. When aggregating the information on success factors found in Puschmann and Alt (2005), Vaidya *et al.* (2006) and Angeles and Nath (2007), five factor areas crystallised. Here, the first factor area is called end user uptake and change management; it includes the end user uptake and training, end user behaviour, compliance with the best practices for business cases/project management, top management support, performance measurement, change management and e-ordering implementation strategy. The importance of the end user uptake and change management factor areas is further supported by Reunis *et al.* (2006), who claimed that the benefits of e-ordering can only be achieved if and when end users adopt the tool and apply it successfully in their everyday work. Croom and Brandon-Jones (2007) also supported the importance of end user uptake and change management. They claimed that e-procurement implementation creates the potential to improve compliance, however, it is clear that compliance is far from 'given' and that the extent to which the internal users are provided with the support to use e-procurement appears to have a significant effect on maverick spending (Croom and Brandon-Jones, 2007). The second factor area is called the redesign of the procurement process and includes the automation of the authorisation workflow, the redesign of the procurement process to improve efficiency, reengineering the process and the e-ordering business processes. The third factor area is called managing suppliers and includes the embracement of suppliers at an early stage, supplier adoption, supplier and contract management and the creation of a central coordination office for supplier management. The fourth factor area is called technological issues and includes the integration of the procurement system with other relevant systems, system integration, technological standards, information and the e-ordering infrastructure. The fifth and last factor area can be viewed as lying in between the third and fourth, and is called managing catalogues. It includes the preparation of catalogues and a strategy for the physical hosting of catalogues. Talluri *et al.* (2006) further supported the importance of managing suppliers for succeeding with the e-ordering implementation. According to Talluri *et al.* (2006), many companies are currently facing the issue of supplier integration in an e-ordering environment and how to optimally chose and integrate the suppliers is a difficult question. The five areas are summarised in Figure 1.

After describing the methodology and presenting the e-ordering implementation case study below, an analysis will be made of whether these factor areas were present in the pharmaceutical case study and, if so, what role they played. The subsequent discussion will address which factors were most important in implementing the e-ordering system in the studied organisation and which factors played a smaller role, or no role at all.

Figure 1 The five factor areas found in the literature on successful e-ordering implementation

<i>End user uptake and change management</i>	<i>Redesign of the procurement process</i>	<i>Managing suppliers</i>	<i>Technological issues</i>	<i>Managing catalogues</i>
End user uptake and training (Vaidya <i>et al.</i> , 2006)	Automation of authorisation workflow (Puschmann and Alt, 2005)	Embracement of the suppliers at an early stage (Puschmann and Alt, 2005)	Integration of the procurement system with other relevant systems (Puschmann and Alt, 2005)	Preparation of catalogues (Puschmann and Alt, 2005)
End user behaviour (Angeles and Nath (2007)	Redesign of the procurement process to improve efficiency (Puschmann and Alt, 2005)	Supplier adoption (Vaidya <i>et al.</i> , 2006)	System integration, security and authentication (Vaidya <i>et al.</i> , 2006)	Strategy for the physical hosting of the catalogues (Puschmann and Alt, 2005)
Compliance with the best practices for business cases/project management (Vaidya <i>et al.</i> , 2006)	Reengineering the process (Vaidya <i>et al.</i> , 2006)	Supplier and contract management (Angeles and Nath, 2007)	Technological standards (Vaidya <i>et al.</i> , 2006)	
Top management support (Vaidya <i>et al.</i> , 2006)	E-ordering business processes (Angeles and Nath, 2007)	Creation of a central coordination office for supplier management (Puschmann and Alt, 2005)	Information and e-ordering infrastructure (Angeles and Nath, 2007)	
Performance measurement (Vaidya <i>et al.</i> , 2006)				
Change management (Vaidya <i>et al.</i> , 2006)				
E-ordering implementation strategy (Vaidya <i>et al.</i> , 2006)				

3 Methodology

A longitudinal case study has been conducted that follows the implementation of an e-ordering system at a large pharmaceutical organisation over a four-year period. Following the implementation of an e-ordering system in an organisation for such a long time has facilitated knowledge about how to manage and achieve the success factor areas described above, leading to an understanding of which success factors are more or less difficult to manage and which are the most important to manage and achieve. This knowledge is based on interviews, observations and documentations from a period stretching from January 2002 to September 2006.

A total of 33 interviews have been conducted. The first semistructured interview was conducted in January 2002 with the then-project manager for the e-ordering project and the last interview was conducted in September 2006 with the Swedish purchasing manager and the current project manager for the e-ordering project. The roles covered in the interviews were: the Swedish purchasing manager, the project manager for the e-ordering project, the division purchasing manager, the Swedish information manager, the system administrator, the system support persons, the person responsible for the measurement model for e-ordering, the consultants involved in the e-ordering project, the purchasers (working with sourcing), the purchasing administration staff, the system administrator at the division level, the potential users of the e-ordering system, the actual users of the e-ordering system, the caretaker and the authorisers. The interviews lasted between 1 h and 2 h and were performed at the company. The handwritten notes were transcribed into a Word document the same day. At most interviews, a tape recorder was used, which later functioned as support when transcribing the interview protocols. Through interviewing the people with different roles at different levels within the organisation, knowledge about the e-ordering project and implementation emerged, including knowledge about how the organisation managed the factors described above and which factors were the most difficult to manage and the most important in order to succeed with the e-ordering implementation.

Observations constituted another good source of information. The observations were made in the context of daily work, at training sessions and at meetings, mainly during the period of June 2002–August 2003. All together, the observations were conducted for 28 full days in the context of daily work. The observations were made at nine training sessions, each lasting for approximately 3 h. Further observations were made at meetings with the people involved in the e-ordering project. The observations contributed to rich knowledge about the end users' attitudes, adoption and usage of the e-ordering system from an end user perspective.

A third source of information was the documentation about the e-ordering project. There was an extensive amount of documentation regarding the e-ordering project, largely due to the many people involved (the people from different divisions and sites) in different groups (steering groups for the managers, groups for the system administrators and so on), resulting in several protocols from the meetings and instructions from the central project group, contributing to a good overview of the e-ordering project, its size, time plan and status.

4 The case study

4.1 Introduction

In January 2006, the large pharmaceutical organisation studied here, consisting of approximately 54 000 coworkers worldwide, finally reached the compliance rate goal of 80% (of which 70% was through the e-ordering system) in their Swedish organisation (consisting of approximately 12 000 coworkers). The four years of work with introducing and implementing an e-ordering system had finally paid off and now, the people in the organisation were ordering indirect products and services (in this paper, equivalent to MRO) through the e-ordering system on seven out of ten ordering occasions. The Swedish organisation had finally succeeded in getting the people in the organisation to order from the suppliers with agreements, thus achieving a compliance rate of 80%. This could be compared to the situation before introducing the e-ordering system, when most purchases were made from suppliers without agreements.

4.2 Investigating the possibilities of e-ordering

It was during the autumn of 2001 that the organisation began investigating the possibilities of implementing centralised sourcing combined with an e-ordering system. The increased demand from the shareholders that the organisation reduce its costs and make a higher profit – in combination with a pharmaceutical market that was not growing as rapidly as it had, leading to higher costs for new products – put more pressure on the organisation to manage the other processes in the organisation in a more cost-efficient and effective manner.

A business case study was conducted, in which yearly savings on the order of \$200–\$250 million USD were estimated. The Swedish organisation purchased products and services each year for approximately \$2,150 million USD, half of which constituted the purchasing of indirect products and services. At the time, the purchasing organisation was decentralised and there was no cooperation between the different divisions within the organisation, resulting in the divisions having different agreements (*i.e.*, different prices, delivery terms, *etc.*) with the same supplier. A large proportion of indirect or MRO purchases were made from the suppliers without agreements. For the most part, people were calling their preferred suppliers and ordering by telephone. The estimated savings of centralised sourcing combined with an e-ordering system would derive from the reduced purchasing prices (fewer suppliers, larger volume discounts and thus, lower prices) and a more efficient purchasing process.

4.3 The decision taken to implement an e-ordering system

In November 2001, the decision was taken to implement a standardised e-ordering system from Oracle. The technological solution included interfaces with the related purchasing and finance systems as well as selected complementary solutions (*e.g.*, punch-out solutions for electronic communication with suppliers, solutions for electronic invoices from suppliers, *etc.*).

The Oracle system contains functions for ordering, authorisation, goods reception and payment. The purchasing orders are made directly through the system, either from a supplier catalogue or through a descriptive free text order. The user registers the price

and account number in the system when making a purchase order. Authorisation is conducted in the system before the order goes to the supplier. When the authoriser is absent, the right to attest the order is delegated to another person. The agreements and suppliers are given in the system and the people working with purchasing are responsible for updating this information. Goods reception is carried out in the system when the product or service has arrived. The invoices are matched by an accounts payable ledger and are not physically sent to the persons involved. The authoriser receives an e-mail before the order goes to the supplier, asking him or her to authorise the order. Thus, authorisation is made in advance.

4.4 The purchasing process prior to the e-ordering system

Prior to the e-ordering system, the divisions and departments had their own purchase-to-pay processes, which were different across the divisions. At one department, for example, the research and development division, a caretaker ordered for the entire department. The people working at the department wrote him a note or e-mail giving instructions about what to purchase and he then carried out their instructions. At the engineering and support division, however, the people ordered by themselves (often without authorisation in advance) by either calling the supplier or visiting the supplier store. One aim of the e-ordering system was to achieve the harmonisation of the purchase-to-pay processes within the organisation, resulting in one purchase-to-pay process used by all persons at all departments and divisions.

4.5 Top management support

The initiative to centralise and implement an e-ordering system came from the top management within the organisation, who had supported the project from the beginning. They allocated resources and showed support for the project by appearing in an information movie, in which the then-CEO proclaims that, from now on, they will use the e-ordering system when ordering indirect products and services (MRO items).

4.6 Rolling out the e-ordering system

The e-ordering project was divided into different phases, starting with the first release of the system in August 2002. In this release, the system was rolled out to 320 persons (including the requestors (users) and authorisers) at three divisions. The goal, which was accomplished, was to have seven catalogue suppliers entered into the system at the first release. The users and authorisers were introduced to the system in a 3 h classroom training session.

The second release was presented in February 2003. The standardised system was then somewhat modified and some of the system's childhood diseases had been taken care of. The objective of the second release was to roll out the system to all the divisions and at the end of March 2003, to have 2000 users and 20–25 supplier catalogues in the system. The cooperation with the suppliers worked well and 25 supplier catalogues were available in the system during this time. Already in January 2002, the e-ordering project group had a meeting with 80 suppliers, at which they discussed electronic catalogues. The organisation has experienced no resistance from the suppliers, many suppliers were interested in becoming catalogue suppliers to the organisation and those

who were asked accepted. The organisation initially had help from an independent e-marketplace, which assisted the suppliers in creating electronic catalogues and supported the internal content group in the pharmaceutical organisation. The suppliers are, furthermore, responsible for updating their catalogues and sampling tests were conducted by the purchasers within the pharmaceutical organisation.

At the end of March 2003, 2000 potential users had received training. There was a problem, however. The potential users who had received training did not continue using the system to order products and services when they returned to their own departments. Few catalogue and free text orders had been placed in the system and instead, the people tended to continue making purchases as they had done before, buying from the suppliers they preferred.

4.7 The problems with the end user uptake

The resistance to using the system for ordering was noticed at all divisions. At one of the divisions, some potential users even resisted testing the e-ordering system, in large part because they could not see how they could perform their working tasks if they were forced to order via the e-ordering system. They felt that e-ordering was time consuming and not the best way of acquiring the needed products and services. Initially, the system was also met with resistance in another division, largely because of the directives stating that all people should place their own orders in the system, thus, they should not ask an assistant, secretary or caretaker for help. After experiencing initial problems, efforts were made to visit people at their own workstations, help them place orders and be more flexible with regard to who was allowed to place an order, which resulted in the increased usage of the system at that division.

From April 2003 onwards, the emphasis was put on change management to ensure changes in the purchasing behaviour (*i.e.*, using the system instead of visiting or phoning the supplier), an increased cooperation between the divisions regarding the supplier agreements (*i.e.*, to be achieved through the centralised sourcing organisation) and increasing the compliance with the centrally chosen suppliers. The technology was in place and working well, the suppliers were on board and there were no problems regarding managing the catalogues in the system. The main challenge was then to get the potential users who had received training to use the e-ordering system.

By December 2003, 4000 potential users had been trained to use the e-ordering system. The use of the system was still relatively low, however, compared to the purchases made outside the system.

4.8 The performance measurement

From the beginning of the project, the importance of using statistics and measuring the progress in figures was understood. It was important to be able to show how the project was progressing and to see the financial effects associated with the purchasing change. The process of the project and the financial effects were measured in two parts: the process and savings. The process was measured as the percentage of people who had been trained and of the people who were active users (an active user is a user who has used the system once) and in terms of the compliance rate (to what extent is the organisation (and the different divisions) buying from the suppliers with agreements). The savings were measured in money (\$) and constituted by the difference in the price

when negotiating new supplier agreements (improved supplier agreements resulting in lower negotiated prices due to the assurance of an increase purchasing volume from that supplier) and by the compliance with these new agreements, which made it possible to compare the actual prior purchasing costs from a supplier with the purchasing costs after the new, more advantageous agreement was in place.

4.9 Working towards achieving end user uptake

The figures also showed which divisions had extremely poor usage figures, allowing the communication of general dissatisfaction to the managers at these divisions. The general dissatisfaction communicated to the management of one of the divisions actually led to an extra investment in that division in order to support the use of the e-ordering system there. During 2005, the division made great efforts to increase the use of the system. During a six-month period, extra resources in the form of three additional persons were allocated to the division. They provided training in small groups and assistance at the moment of ordering, which resulted in the increased use of the system.

4.10 Achieving the planned compliance rate

Since January 2006, the use of the system has remained at a stable level. By December 2006, compliance with the supplier agreements was approximately 80% for indirect (MRO) purchasing, where 70% of all orders went through the e-ordering system and 10%, to the suppliers with agreements, but not through the system. Also by December 2006, the number of users who had ordered through the system more than five times was over 3000. Four thousand people had received training, but many of them were not ordering themselves. Rather, they asked an assistant, secretary, caretaker or coworker to order for them.

When the Swedish purchasing manager and the project manager of the e-ordering project were asked what they saw as the important factors leading up to the successful implementation, they first emphasised the importance of being persistent, because it takes time to achieve the use of the system and thus, compliance with the agreements. The second important factor had been the attitude and ambition that all indirect products and services shall be available for ordering through the e-ordering system. Third, the project had received support from the highest management throughout the project (from 2001 onwards). Fourth, an external driving force was the requirement to follow the Sarbanes-Oxley (SOX) Act. This law implies the increased demands for insight into and the transparency of the companies listed on the US Stock Exchange. For the organisation, this had meant demands for transparency also within purchasing and transparency regarding the information on whom the organisation is buying from and on the cost of purchases.

Finally, we can say that the organisation began its e-ordering journey in spring 2002 and that by December 2006, it had achieved its planned compliance goal of 80% supplier agreements, of which 70% go through the e-ordering system.

The analysis is presented below. The five areas that have been found to influence the success of the e-ordering implementation in previous research and that will be analysed below are managing catalogues, technological issues, managing suppliers, the redesign of the procurement process and the end user uptake and change management.

5 Analysis

5.1 *Managing catalogues*

In the pharmaceutical case studied here, catalogue handling was never an issue. The suppliers had been invited to information and discussion sessions early on in the project and the chosen suppliers were happy to accept the offer to become catalogue suppliers. Initially, the organisation received help from a third-party content supplier (an independent electronic marketplace), which assisted their chosen suppliers in creating electronic catalogues. Internally, there has also been and still is a group working with the content. The organisation viewed the presence of electronic supplier catalogues in the e-ordering system as an important factor. Initially, however, these catalogues were not used to the planned extent, as those users who employed the system chose to place orders in free text.

5.2 *Technological issues*

Technological issues, such as the integration of the procurement system with other relevant systems, were considered before deciding on an e-ordering solution. The standardised system from Oracle was chosen largely because it included interfaces with the related purchasing and finance systems. Several of the information systems in use in the organisation were Oracle systems and it seemed to be a good idea to choose an Oracle system for e-ordering as well. The technological issues that arose, such as the demands for technological changes within the system, were gradually taken care of during the first years through the modification of the system (to the extent possible for a standardised system) and were not viewed as barriers or as success factors.

5.3 *Managing suppliers*

The area of managing suppliers has already been brought up in connection with managing catalogues, as the two are closely connected. For the pharmaceutical organisation, getting catalogue suppliers was never a problem. Most of their suppliers were interested in becoming catalogue suppliers and those who were asked accepted the offer. The pharmaceutical organisation has also helped the chosen suppliers (those who needed help) create and connect catalogues and has taken a large part of the additional costs for creating an electronic catalogue. Early on in the project, the buying organisation further informed the potential catalogue suppliers about their e-ordering plans, thus, involving the suppliers at an early stage.

5.4 *The redesign of the procurement process, the end user uptake and change management*

The two areas remaining – the redesign of the procurement process and the end user uptake and change management – are also connected. In this case, a demanded change in the purchasing process has influenced the end user usage of the system, leading to less initial use than expected and thus, influencing adoption behaviour negatively. Getting the potential users who have received training to order through the system has been the most difficult barrier to overcome. This is viewed as the most important factor for succeeding with the implementation, because if the people in the organisation continue to

order from their old supplier contacts by telephone or by visiting the supplier instead of using the e-ordering system, the investments in a centralised MRO purchasing function, combined with the investments in an e-ordering system, will be wasted. The pharmaceutical organisation achieved the planned levels of usage of the system after four to five years, patiently working to encourage the users to employ the system. According to the managers in the pharmaceutical case, there are four reasons why they were finally able to get the end users to change their purchasing behaviour and to start (and continue) ordering through the system:

- 1 they were persistent
- 2 they had the attitude and ambition that all MRO items should be available for ordering through the e-ordering system
- 3 the project had support from the highest levels of management throughout the project (from 2001 onwards)
- 4 the external driving force, in the form of the SOX Act, also required an increased transparency in purchasing, which put pressure on the managers at all levels to work towards this increased transparency, *i.e.*, to work towards the increased use of the e-ordering system.

6 Discussions and conclusions

If we look at the five areas identified in the previous literature as influencing the success of the e-ordering implementation, two of them have been of main importance in the pharmaceutical case: the end user uptake and change management and the redesign of the procurement process. These areas have been the most difficult to succeed in and the most critical to the e-ordering implementation success. The potential users resisted using the system (and the new harmonised purchasing process) for quite a long time, thus delaying the success of implementation. After persistent work with supporting potential users, the case organisation finally achieved the planned levels of use of the system. The other three areas – managing catalogues, technological issues and managing suppliers – were taken care of and in place early on in the project and ran smoothly. In areas about which the organisation initially had limited knowledge (*e.g.*, catalogue management), it used consultants with prior experience in similar projects who contributed their know-how and transferred it to the pharmaceutical organisation.

It is interesting to note that although all the success factors related to the end user uptake and the redesign of the procurement process found in the previous literature were in place, the organisation still had problems with the end user uptake. The end users had received training (some even twice), the organisation had used the best practices for project management, there was top management support throughout the project, performance measurement and change management were used and they had an e-ordering implementation strategy. Furthermore, they had automated the authorisation process and redesigned the procurement process (*i.e.*, gone from several different processes to one standardised process in the e-ordering system). The only factor not addressed was the end user uptake/end user behaviour, which shows the importance of this specific success factor and that it is the most important and the most difficult to achieve.

Having knowledge about which success factors are easier or more difficult to achieve helps the organisation managers focus on the right factors and put the most energy where it is needed. Regarding the factors related to technology issues and managing catalogues, knowledge and help can be sought from the experts who have previous experience. Achieving the success factors related to the suppliers was never an issue at the present case organisation. This is probably due to the size of the organisation (*i.e.*, its buying power). Most suppliers viewed becoming a catalogue supplier to this large organisation as an opportunity and as a possibility to become a preferred supplier, selling more products and services to the pharmaceutical organisation. The most difficult success factor to achieve in the case organisation was the end user uptake factor, which demanded resources and energy spread over a longer period of time than was first anticipated. The end user uptake factor is something the organisation must manage by itself and the importance of this success factor should not be underestimated. Organisations beginning the process of implementing an e-ordering system should not forget the importance of getting the end users to use the e-ordering system and they should ensure that sufficient resources and time are allocated to addressing this factor.

Given the importance of the end user uptake factor, more information is needed about what influences the end user uptake and the nature of that influence. Further research should investigate in more detail what factors and structures influence the adoption and use of an e-ordering system and endeavour to understand the nature of their influence, thus improving our knowledge of end user adoption and the use of e-ordering systems.

Acknowledgements

The author appreciates the feedback of an anonymous reviewer, whose suggestions have improved an earlier version of this paper.

References

- Al-kaabi, H., Potter, A. and Naim, M. (2007) 'An outsourcing decision model for airlines' MRO activities', *Journal of Quality in Maintenance Engineering*, Vol. 13, No. 3, pp.217–227.
- Angeles, R. and Nath, R. (2007) 'Business-to-business e-procurement: success factors and challenges to implementation', *Supply Chain Management: An International Journal*, Vol. 12, No. 2, pp.104–115.
- Arbin, K. (2003) 'E-procurement maturity in industry', *Int. J. Electronic Business*, Vol. 1, No. 4, pp.396–407.
- Axelsson, B., Rozemeijer, F. and Wynstra, F. (2005) 'The case for change', in B. Axelsson, F. Rozemeijer and F. Wynstra (Eds.) *Developing Sourcing Capabilities. Creating Strategic Change in Purchasing and Supply Management*, Chichester, England: John Wiley & Sons Ltd.
- Barry, J. and Cavinato, J.L. (1996) 'A development model for effective MRO procurement', *International Journal of Purchasing and Materials Management*, Vol. 32, No. 3, pp.35–44.
- Bechtel, C. and Patterson, J.L. (1997) 'MRO partnerships: a case study', *International Journal of Purchasing and Materials Management*, Vol. 33, No. 3, pp.18–23.

- Cox, A., Chicksand, D., Ireland, P. and Davies, T. (2005) 'Sourcing indirect spend: a survey of current internal and external strategies for non-revenue-generating goods and services', *Journal of Supply Chain Management*, Vol. 41, No. 2, pp.39–51.
- Croom, S.R. (2000) 'The impact of Web-based procurement on the management of operating resources supply', *Journal of Supply Chain Management*, Vol. 36, No. 1, pp.4–13.
- Croom, S.R. and Brandon-Jones, A. (2007) 'Impact of e-procurement: experiences from implementation in the UK public sector', *Journal of Purchasing & Supply Management*, Vol. 13, No. 4, pp.294–303.
- Croom, S.R. and Johnston, R. (2003) 'E-service: enhancing internal customer service through e-procurement', *International Journal of Service Industry Management*, Vol. 14, No. 5, pp.539–555.
- Davila, A., Gupta, M. and Palmer, R. (2003) 'Moving procurement systems to the internet: the adoption and use of e-procurement technology models', *European Management Journal*, Vol. 21, No. 1, pp.11–23.
- De Boer, L., Harink, J. and Heijboer, G. (2002) 'A conceptual model for assessing the impact of electronic procurement', *European Journal of Purchasing and Supply Management*, Vol. 8, No. 1, pp.25–33.
- Dubois, A. and Gadde, L.E. (2002) 'Cost management across firm boundaries – a case study of MRO-procurement', *Proceedings from the IMP Conference 2002*, Perth, Australia.
- MacDonnell, M. and Clegg, B. (2007) 'Designing a support system for aerospace maintenance supply chains', *Journal of Manufacturing Technology Management*, Vol. 18, No. 2, pp.139–152.
- Monczka, R.M., Trent, R.J. and Handfield, R.B. (2005) *Purchasing and Supply Chain Management*, US: Southwestern, part of the Thomson Corporation.
- Nissen, M.E. and Sengupta, K. (2006) 'Incorporating software agents into supply chains: experimental investigation with a procurement task', *MIS Quarterly*, Vol. 30, No. 1, pp.145–166.
- Puschmann, T. and Alt, R. (2005) 'Successful use of e-procurement in supply chains', *Supply Chain Management*, Vol. 10, No. 2, pp.122–133.
- Reunis, M.R.B., Santema, S.C. and Harink, J. (2006) 'Increasing e-ordering adoption: a case study', *Journal of Purchasing and Supply Management*, Vol. 12, No. 6, pp.332–331.
- Reunis, M.R.B., van Raaij, E.M. and Santema, S.C. (2004) 'Actor-to-actor dissemination of e-procurement adoption: an exploration of influencing factors', *Journal of Purchasing and Supply Management*, Vol. 10, Nos. 4–5, pp.201–210.
- Sarkar, A. and Mohapatra, P. (2008) 'Maximum utilization of vehicle capacity: a case of MRO items', *Computers & Industrial Engineering*, Vol. 54, No. 2, pp.185–201.
- Schoenherr, T. and Tummla, V.M.R. (2007) 'Electronic procurement: a structured literature review and directions for future research', *Int. J. Procurement Management*, Vol. 1, No. 1, pp.8–37.
- Subramaniam, C. and Shaw, M. (2002) 'A study of the value and impact of B2B E-commerce: the case of web-based procurement', *International Journal of Electronic Commerce*, Vol. 6, No. 4, pp.19–43.
- Talluri, S., Chung, W. and Narasimhan, R. (2006) 'An optimization model for phased supplier integration into e-procurement systems', *IIE Transactions*, Vol. 38, pp.389–399.
- Vaidya, K., Sajeew, A.S.M. and Callender, G. (2006) 'Critical factors that influence e-procurement implementation success in the public sector', *Journal of Public Procurement*, Vol. 6, Nos. 1–2, pp.70–99.
- Van Weele, A. (2005) *Purchasing and Supply Chain Management*, London: Thomson Learning.

Article 3

The structure of determinants of individual adoption and use of e-ordering systems

Katarina Arbin

Published 2008 in Human Systems Management, 27, pp. 143-159.

The structure of determinants of individual adoption and use of e-ordering systems

Katarina Arbin *

Center for Information and Communication Research, Stockholm School of Economics, Stockholm, Sweden

Abstract. Electronic ordering (e-ordering) systems are currently being implemented in both private and public organizations. The advantages of these systems are widely acknowledged: increased compliance with use of fewer suppliers and improved efficiency. However, realizing these benefits is difficult due to end-user resistance to adopting and using such systems. The present paper proposes a framework inspired by adaptive structuration theory (AST) that functions as an analytical framework that helps to understand what structures and factors influence adoption and use of an e-ordering system. To the adapted AST framework is added factors of influence found in previous purchasing research, resulting in a framework that helps to understand adoption and use of an e-ordering system over time. The framework is tested using empirical data from a 4-year longitudinal case study. The paper embeds purchasing theory within the structuration framework of AST.

Keywords: Adaptive structuration theory, IS adoption and use, e-ordering systems, e-procurement, framework



Katarina Arbin is a PhD Candidate at the Center for Information and Communication Research, Stockholm School of Economics. Her research focuses on purchasing, electronic ordering systems and IS adoption and use. Ms Arbin holds an MSc in Marketing from the Stockholm School of Economics and, prior to starting her PhD project, she worked for an e-ordering system software supplier. Her academic work has appeared in the *International Journal of Electronic Business* and the *International Journal of Automotive Technology and Management*.

1. Introduction

Organizations spend millions of dollars on new information technology systems in the hope that these systems will allow them to successfully compete in the marketplace, help managers make better decisions, and improve efficiency and productivity [26]. Such advantages can only be realized, however, if the systems are actually adopted and used [26]. The process of information technology adoption and use is critical to deriving the benefits of information technology

[27]. There has been a move towards packaged solutions and enterprise-wide implementations, e.g., ERP, SCM, and CRM systems, which has brought about increased costs and broader impacts along with tendencies to limit (unit or individual) customization [29]. Looking at administrative information systems (i.e., e-ordering systems and e-billing systems) to be implemented and used in organizations, they are largely standardized, designed by large software companies (i.e., Oracle, SAP, etc.), thus leaving little room for technological changes based on users' wishes or usage and, thereby, reducing end-user influence.

One standardized administrative information system for purchasing currently being implemented in organizations is an electronic ordering system (e-ordering system). The potential benefits of such a system, such as a more efficient purchasing process and a reduction in maverick purchasing leading to cost savings, are known [16,17,42]. These benefits, however, can only be realized if the system is adopted and used by end-users in the organization. Studies have shown that achieving end-user adoption and use of e-ordering systems is more difficult than many organizations first anticipate and that getting end-users to adopt and continue to use the system seems to be the greatest challenge to achieving the promised benefits [2,17,45, 47].

* Address for correspondence: K. Arbin, Center for Information and Communication Research, Stockholm School of Economics, P.O. Box 6501, SE 113 83, Stockholm, Sweden. Tel.: +46 (8) 736 95 56; Fax: +46 (0) 8 33 43 22; E-mail: katarina.arbin@hhs.se.

1.1. Two streams of research

There are different streams of research dealing with IS adoption and use. The two that have received great attention in the literature are the Technology Acceptance Model (TAM) and its related models, and IS research focusing on structuration and technology.

The TAM stream of research focuses on cognitive mechanisms that lead to individual adoption decisions and originates from the Theory of Reasoned Action (TRA), developed by Fishbein and Ajzen [23]. TRA claims that individual behaviour is a function of the intention to perform a specific behaviour, and that the intention, in turn, is determined by a person's attitude and the normative pressure perceived by that person. The TAM model further proposes that an individual's behavioural intention to use a system is determined by two beliefs: perceived usefulness, defined as the extent to which a person believes that using the system will enhance his or her job performance, and perceived ease of use, defined as the extent to which a person believes that using the system will be free of effort [18]. The Unified Theory of Technology Acceptance and Usage (UTAUT), developed by Venkatesh et al. [51], further posits three direct determinants of intention to use (performance expectancy, effort expectancy and social influence) and two direct determinants of usage behaviour (intention and facilitating conditions) [51].

This stream of research, however, provides relatively few practical implications for management for implementing new technology and lacks the insights that can be obtained from process studies owing to its focus on giving snapshots of adaptation through survey methods. This can be compared to the rich and complete stories of innovation with information technology that can be gained through in-depth longitudinal case studies [29]. Benbasat and Barki [9] supported this criticism, claiming that the former stream of research is unable to provide actionable advice to practitioners, and that because most TAM studies focus on static models, they do not capture or describe the dynamic interplay that usually occurs between various user behaviours. These behaviours include system use from go-live to the relatively stable and steady states of implementation, and thus what is called for are longitudinal studies that view and assess system use over time. Schwarz and Chin [48] further encouraged researchers to expand their view of IT acceptance. According to them, acceptance is not only something that occurs during the initial adoption stage; researchers should also consider that alternative notions of usage, such as routinization

or infusion, may have a stronger connection to performance outcome (end-user uptake and use) than do the traditional TAM antecedents.

One stream of research that meets these demands is IS research focusing on structuration and technology [20,30,36,37,40,41]. The value of structuration theory is that it gives information technology researchers a theoretical approach to understanding how users' interactions with IT evolve and what the implications of these interactions are [41]. Structuration theory, which is associated with Giddens' [25] institutional theory of social evolution, suggests that implementation and use of a new technology are not deterministic; technologies are instead structured by users in their context of use [20,30,36,37]. According to this stream of research, the technology adaptation process is understood to evolve over time, sometimes gradually, sometimes discontinuously, and is constrained by the organization's pre-existing structures and its associated tasks and technology [20,30].

One theory belonging to the structuration stream of research that has received great attention and that can help us understand what influences adoption and use of an e-ordering information system is the adaptive structuration theory (AST) by DeSanctis and Poole [20]. This theory accounts for the structural potential of technology while maintaining focus on the use of technology as a primary determinant of technology impacts [49]. It provides a framework that takes into account technology constraints and possibilities, management's role in implementation and other sources of structure in order to find explanatory factors for users' 'appropriation' (here 'adoption and use') of an advanced information technology system.

The AST framework, however, has not been used to investigate adoption and use of a standardized information technology system within purchasing, and needs to be adapted to a purchasing context, and complemented with factors previously found to influence e-ordering adoption.

1.2. Purpose

The present paper aims at developing a framework that helps to understand what factors influence adoption and use of a standardized electronic ordering (e-ordering) system over time. Through having a framework that shows the structures and factors of importance to adoption and use allows management to act proactively and manage the introduction and implementation process in the best possible manner.

This is done by combining research based on the structuration process, developed by Giddens [24,25], i.e. adaptive structuration theory [20], and purchasing research. The framework is tested using empirical data from a 4-year longitudinal case study conducted at a large pharmaceutical organization, focusing on end-users who had been instructed to use the system (an e-ordering Oracle system). We have chosen not to describe the case in a comprehensive way, as the focus of the present paper is on developing a theoretical framework that explains what influences adoption and use of a standardized e-ordering system over time. Here, the empirical data are merely used to test the framework.

The present paper provides an example of an alternative use of adaptive structuration theory, both regarding the system studied (a standardized system) and the administrative area to which the system under investigation belongs (the purchasing area).

To our knowledge, no previous studies have used structuration frameworks to investigate what structures and factors influence adoption and use over time of 'new' standardized information systems, which have a "fixed" structural set of technology (e.g., e-ordering or e-billing systems).

1.3. Paper structure

The paper is structured as follows. First purchasing, MRO and e-ordering are introduced and their importance to organizations discussed. This is followed by a section presenting previous research using AST as an analysis tool and how AST has been used in the present research. The research methods are then presented, followed by a brief case description. The framework is then tested, and case findings are presented following the framework structures and factors. This is followed by a summary section. The paper ends with a section on theoretical and practical implications.

2. Purchasing, MRO and e-ordering

2.1. Purchasing

Recently, more and more companies have realized that procurement plays an important role in the overall business economy [5,42]. During the first years of this century, top management began to recognize purchasing as a key contributor to corporate strategy. This is evidenced by an upgrading of purchasing in the corporate hierarchy. Especially in large firms,

we now frequently find titles such as purchasing director, vice-president of purchasing or chief purchasing/procurement officer [5].

Purchasing-to-sales ratios are generally in the range of 30–60% for service organizations, 50–70% for manufacturing industries and 80–95% for retailing firms, and many firms are seeing a further rise in this percentage [5]. A dollar saved in purchasing is a dollar added to the bottom line and the opposite, which implies that purchasing has a great influence over business success [50].

Purchasing can be divided into direct and indirect purchasing. Direct purchasing concerns buying of items that go directly into production. Indirect purchasing is defined as non-production buying and concerns all items and services that do not go into production. Examples are travel expenses, computers, office supplies, consultants and cleaning equipment. Indirect material may also be referred to as maintenance, repair and operating supplies (MRO supplies). Monczka [34] defined MRO as all items used to support production and operations. These items are not physically part of a finished product, but are critical to the continuous operation of the plant, equipment and offices [34]. What constitutes MRO purchasing often depends on the company and the industry in which it competes, and it is therefore difficult to say exactly what is included in the MRO concept [8]. Both direct and indirect (MRO) buying are important activity domains within purchasing, though up until recently, buying of production items has received most attention both in practice and in the research.

Direct material or production-oriented material has been receiving management attention for many decades, and information systems for managing direct buying, in the shape of electronic data interchange (EDI) systems, have been in place for over two decades, and consequently been comprehensively researched [6,10,22,33,35].

2.2. MRO

Indirect material (or MRO resources), however, is one area that has long been undertaken in a decentralized and uncoordinated fashion in many organizations, and it has seldom been discussed in the literature [14]. MRO is currently receiving increased attention in many organizations, including IBM, Delta Airlines and Rolls-Royce [5,13]. There are several reasons for this. First, it is becoming more difficult to squeeze additional savings from raw materials, and managers

are turning to other potential areas in which costs can be reduced. Second, too little time is being spent on strategic MRO issues, because too much time is being spent on processing routine paperwork and attending to day-to-day tactical decisions. And third, managers and executives are being pressured to trim costs wherever possible, due to increasing cost pressure and global competition [8].

Indirect spending (or MRO purchasing) constitutes a relatively large share of an organization's external spending, amounting to up to 20% of all purchases (by value) and 70–90% (by numbers) of purchase orders, shipment expenses, and invoices processed [13]. In many organizations, MRO purchasing still suffers from lack of internal support, maverick purchasing and fragmentation of spending within the organization, and a compliance rate as low as 25–50% for MRO purchasing is not uncommon, as people largely buy from their own choice of supplier [13]. It is also often the case that different divisions in a large organization have different agreements (i.e., different prices, delivery terms, etc.) with the same supplier, and that people in a decentralized purchasing organization rarely have time to communicate and work together with purchasers at other divisions when conducting sourcing, resulting in fragmented spending.

Management of indirect spending is an important consideration for organizations, and failure to adopt effective strategies in this area will have a detrimental impact on overall corporate bottom-line performance [13].

A centralization trend in MRO purchasing has been identified [5,21,42]. Through a centrally coordinated purchasing function for MRO, the organization can have better control over the products and services to be purchased on a company-wide basis. However, even when central agreements are in place, the organization still has to succeed in getting employees to buy from the chosen suppliers in order to reduce costs. One strategy that is recommended for MRO purchasing is to have a centralized purchasing function using a category management strategy, sourcing products and services per category, in combination with an e-ordering system that functions as a navigating tool, steering purchasing orders towards centrally chosen suppliers [14, 42,50].

2.3. *E-ordering*

The main reason to implement an e-ordering system is the desire to reduce maverick purchases in the

organization and to increase compliance with choosing suppliers who have agreements in place with the organization [17]. Through a reduction in maverick buying and an increase in compliance (towards fewer suppliers, i.e., those with agreements), direct purchasing costs in the form of lower prices can be achieved. Buying more from fewer suppliers (compared to the fragmented spending of the past) enables volume discounts, resulting in lower prices compared to the previous situation. E-ordering systems are also intended to promote faster and more efficient operational procurement processes, bypassing the purchasing department and enabling those people to concentrate on more strategic tasks [42].

E-ordering systems are equivalent to e-MRO, defined by De Boer et al. [19] as a supporting software system (an ordering catalogue system) that is used by all employees in an organization in the process of creating and authorizing purchasing requisitions, placing purchase orders and receiving goods and services.

The benefits of e-ordering have been widely acknowledged, but achieving these benefits remains a challenge, as companies are experiencing difficulties with adoption during implementation [17,44,45,47]. People are in many cases reluctant to change and are not keen on changing their current purchasing habits, i.e. transitioning from ordering products and services from their own choice of supplier via phone, e-mail or by visiting the store, to ordering from centrally chosen suppliers through an e-ordering system. The benefits presented above (reduced maverick purchasing and more efficient operational processes), however, can only be obtained if end-users adopt the e-ordering tool and continue to use it when ordering.

Previous research has investigated the organizational aspects of e-ordering [15,17,43,45,47]. This research has stressed the importance of getting users to adopt and use the system in order to gain on the investment; it has also begun to investigate what factors influence end-user adoption of an e-ordering system.

In previous research on e-ordering adoption and on changes to improve and upgrade the strategic sourcing function, some factors that affect adoption of such a system have emerged. First, there is the breaking up of old business relationships, mentioned by Axelsson [4] and Arbin [2], which affects adoption behaviour, as does the existence or lack of management support. Having support at the highest level of management, however, does not imply support at all managerial levels. Without support from the highest levels, however, it is difficult to change purchasing behav-

our, as described by Arbin [2]. Another factor brought up by Axelsson et al. [5] is resources, which can influence changes in purchasing behaviour (i.e., lack of resources can negatively influence adoption of an e-ordering system, leading to lack of compliance with selection of centrally chosen suppliers and, on the contrary, having enough resources can positively influence adoption of an e-ordering system, leading to compliance). Employment of mandating systems or enforcement has been shown to influence adoption behaviour [43,47]. Communication is another issue that affects adoption behaviour, and communicating in order to clarify the change process and what is about to come influences adoption of the e-ordering system [45]. Incorporating representatives from different departments into the implementation project team, so as to involve all stakeholders in the project, is another factor found to influence adoption behaviour [5,16].

Looking at the findings (factors) presented above, we see that none of them are related to the technology of the e-ordering system, i.e. the technological structures of the e-ordering system (i.e., how to order, how to authorize orders and how to receive goods in the system), or to how well the technological structures have been matched to ordinary working life at the organization and whether this match affects adoption and use.

In order to investigate the influence of such a structure on adoption and use, a theoretical roadmap is needed that considers the individual who is to adopt and continue to use the system, the technology, as well as more organizational aspects such as previous ordering routines and working routines, etc. The theoretical roadmap should help capture longitudinal change, i.e. changes in adoption and use behaviour, as well as changes in technical, task and organizational structures occurring over time.

3. Use of AST

3.1. AST

Adaptive structuration theory (AST), presented by DeSanctis and Poole [20], is an approach to studying the role of advanced information technologies in organizational change and examines the process of change from two vantage points: (1) the types of structures that are provided by advanced technologies and (2) the structures that actually emerge in human action as people interact with these technologies.

AST maintains that users of a system play a large role in contributing to adoption and use, a view that is shared here. Without adoption and use of the e-ordering system by users, compliance rates will remain on a similar level as before, implying wasted centralization and sourcing efforts. AST further takes into account that structures, both technological and other more organizational structures, can influence adoption and use. However, previous research using AST has not considered the question of whether the constraints and possibilities of technology structures and other structures within the organization affect adoption and use of an e-ordering system. AST is widely accepted and has the potential to be a suitable theoretical roadmap in navigating our search in this area, owing to its focus on structures and appropriation and its longitudinal thinking, which is a prerequisite for studying the influence of structures on adoption and use, and a possible change in structures due to use of the e-ordering system. In the present research, the term 'appropriation' is interpreted as 'adoption and use', 'adoption' meaning using the system for the first time, and 'use', using it the second time and more.

Previous research using AST has mainly focused on group decision support (GDS) systems and how to develop scales to measure appropriation when using GDS systems [1,12,20,46]. Maznevski and Chudoba [31] studied virtual teams in organizations, investigating dynamics and effectiveness using a template based on AST to guide their research. AST has also been used to investigate advanced information technology systems other than GDS systems and virtual organizations. Schwieger et al. [49] proposed a modified AST model, which provides a theoretical framework explaining the appropriation process of medical electronic billing systems, identifying appropriation issues when planning and evaluating use of medical electronic billing systems in medical centres. Other systems under investigation have been implementation of a data warehouse, studied by Chenoweth et al. [11], and computer-mediated communication (CMC) media, studied by Peters [39]. Peters [39] employed an AST approach to develop a conceptualization of CMC technologies and their use in organizations. Chenoweth et al. [11] analysed differences found in appropriation success in different units within a company using the AST theoretical framework. However, AST has not been used to investigate adoption and use of a standardized information technology system within purchasing. In the present case, when developing a framework that shows what structures and factors influence adoption

and use of a standardized e-ordering system, AST is a useful theoretical tool, in that it provides explanatory structures and factors not previously discussed in the research on e-ordering adoption.

3.2. Adapting AST to purchasing

In the present paper, AST is used to help us understand the factors that affect adoption and use of a standardized e-ordering system. The AST framework has been modified to better target the subject (a standardized e-ordering system) and the administrative area under investigation (purchasing). The adapted model used here focuses on the structures of the technology, other sources of structure and the groups' internal system and their influence on adoption and use, and does not extend to decision processes or outcomes. Here, the internal system is interpreted as a group of colleagues who have been instructed to adopt and use the system, instead of a group that uses the system simultaneously (because the system under investigation is used individually and is not a 'group' system, GDS system or similar). Added to the adapted model are several factors of influence found in previous purchasing research. Figure 1 shows the constructs in the adapted AST model, and the factors found in previous research on e-ordering.¹

The main structural features of an e-ordering system are the structures for how to create, follow up, and authorize an order, and how to receive goods and services in the system. These structures are intended to facilitate the ordering, authorization and reception of the products and services that are needed. According to DeSanctis and Poole [20], the more restrictive the technology, the more limited is the set of possible actions the user can take; the less restrictive the technology, the more open is the set of possible actions for applying the structural features. Advanced information technologies can also be described in terms of their level of sophistication. For a GDS system, for example, three general levels can be identified: level 1 systems provide communication support; level 2 systems provide decision modelling; and level 3 systems provide rule-writing capability so that groups can develop and apply highly specific procedures for interaction [20]. The more comprehensive the system, the greater the number and variety of features offered to users [20], thus degree of comprehensiveness can be interpreted as the richness of the system's structural feature set.

When describing a standardized e-ordering system, it is viewed as a relatively restrictive system because it is standardized (users have to follow strict instructions on how to fill in information, otherwise the order will not go through). The e-ordering system offers a great number of features to users, and users must fill in a considerable amount of information if the order is to go through (such as price information, article number, authorizer, delivery date, delivery address and account number). Thus, the system in focus here can also be viewed as a comprehensive system, offering a great number of features.

The social structures of an advanced information technology can also be described in terms of their spirit [20,40]. According to DeSanctis and Poole [20], spirit is the general intent with regard to the values and goals underlying a given set of structural features. The spirit is the "official line" that the technology presents to people regarding how to act when using the system, how to interpret its features, and how to fill in gaps in procedures that are not explicitly specified [20]. It can also function as a means of signification, because it helps users understand and interpret the meaning of the technology [20].

Spirit is a property of the technology as it is presented to users. It is not the designers' intentions, these are reflected in the spirit, but it is impossible to fully realize their intents. Nor is the spirit of the technology the users' perceptions or interpretations of it, which give us indications of the spirit, but are likely to capture only limited aspects [20]. How managers introduce the system may be viewed as an important part of the spirit. Both a coherent and an incoherent spirit may be communicated. A coherent spirit would be expected to channel technology use in definite directions. An incoherent spirit would be expected to exert a weaker influence on user behaviour. An incoherent spirit might also send contradictory signals, making use of the system more difficult. The spirit of an e-ordering system can be viewed as increased effectiveness and efficiency, as such an improvement is often claimed when promoting e-ordering systems [13,17,42].

There are other sources of structure that affect appropriation (adoption and use) of the system. The content and constraints of a given work task, for example, are another major source of structure. Also, the organizational environment provides structures. Corporate information, histories of task accomplishment, cultural beliefs and so on also provide structures to invoke, in addition to the advanced information technology [20].

Factors that, according to DeSanctis and Poole [20], might influence how a group (remember this refers

¹ Appendix shows the original AST framework.

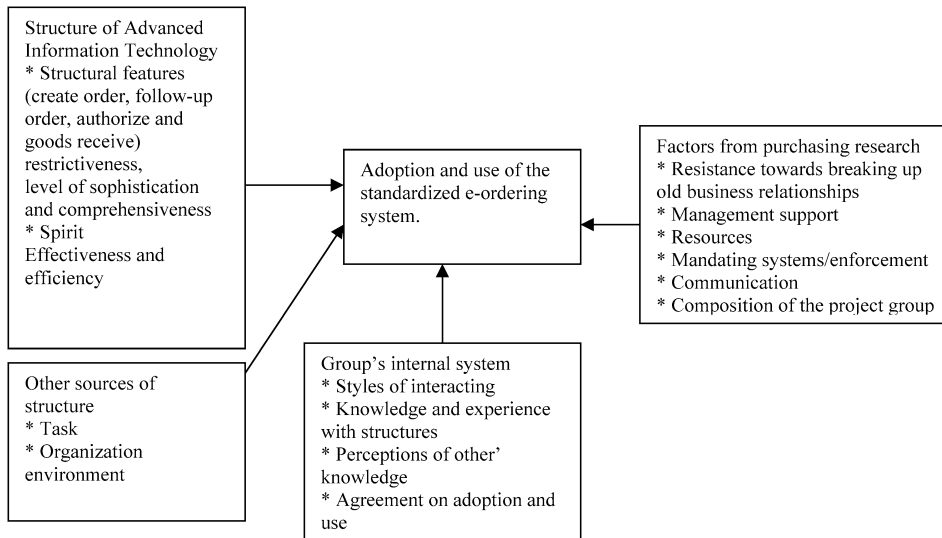


Fig. 1. Adapted AST constructs for an e-ordering system context, with the addition of factors of influence found in previous purchasing research.

to GDS systems) appropriates available structures include:

- Members' style of interacting. For example, an autocratic leader may introduce and use technology structures very differently than a democratic leader. Other stylistic differences, such as differences in group conflict management styles, may also influence appropriation processes.
- Members' degree of knowledge and experience of the structures embedded in the technology. For example, understanding of possible pitfalls and pratfalls in the structures may contribute to more skilful use by certain members.
- The degree to which members believe that other members know and accept use of the structures. The better known the structure is, the fewer members may deviate from the typical form of use. This is consistent with the notion of "critical mass", whereby the perceived value of a technology shifts as it spreads rapidly through a community; later adopters are influenced by the values and behaviours of earlier adopters and vice versa.
- The degree to which members agree on which structures should be appropriated. There may be uncertainty about which structures are most appropriate for the given situation or power struggles over which structural features should be

used. Greater agreement on appropriation of structures should lead to more consistency in the group's usage patterns.

When discussing adoption and use of an e-ordering system, it is the structural features of the technology, along with the task, the organizational environment, and the group's (group of colleagues instructed by management to adopt and use the system) internal system that act as the opportunities and constraints in which adoption and use occur.

The framework in Fig. 1 will be tested below, showing its suitability for investigating what structures and factors influence adoption and use of an e-ordering system. Before testing the model, the research methods will be discussed, including a description of how the empirical data used for testing the model were collected and of the case under study.

4. Research method

A case study including extensive observations has been conducted by following the implementation of an e-ordering system in a large international pharmaceutical organization from January 2002, when decisions were made for an e-ordering system, throughout the implementation, until September 2006, when the organization had reached the compliance goal of 70% through the e-ordering system.

4.1. Research site

The research site, hereafter referred to as “the organization”, was chosen because the organization was about to roll out an e-ordering system (enabling real time observations, observing potential users adopting and using the e-ordering system) and was willing to grant access to the organization over a longer period of time.

The empirical data were collected at the Swedish organization outside Stockholm, the capital of Sweden. Two divisions within the organization were studied: the engineering and support division (E&S) and the research and development division (R&D).

4.2. Data collection

Interviews, observations and documentation studies have been conducted over a 4-year period.

Thirty-three interviews have been conducted. The roles covered in the interviews were: Swedish purchasing manager, project manager for the e-ordering project, division purchasing manager, Swedish information manager, person responsible for system administration, system support persons, person responsible for measurement model for e-ordering, external consultants involved in the e-ordering project, purchasers (working with sourcing), purchasing administration staff, system administrator at the division level, potential users of the e-ordering system, actual users of the e-ordering system, caretaker, and authorizers.

Observations were conducted in the context of daily work for 28 full days, at nine training sessions and at meetings.

Another main source of information was documentation about the e-ordering project, and information about the project (including project organization, training session schedule, notes on meetings, training material and so on) presented on the project’s own webpage on the Intranet. As regards the e-ordering system, a good source of information for understanding the technology structure, as presented by DeSanctis and Poole [20], was the educational material file, which consisted of pictures of the different ‘pages’ in the e-ordering system, showing the structures, functions, and information needed to order, authorize and receive goods using the system.

4.3. Testing of the model

The aim of the testing was to see whether there were any connections, positive or negative, between adop-

tion/use and structures/factors in the framework in this specific case. Thus, the aim was to confirm whether or not the structures and factors in the framework were valid here.

5. Case description

It was during the autumn of 2001 that the pharmaceutical organization began investigating the possibilities of implementing centralized sourcing combined with an e-ordering system. Shareholders’ increasing insistence that the organization reduce its costs and make a higher profit, in combination with a pharmaceutical market that was not growing as rapidly as it had, leading to higher costs for new products, put more pressure on the organization to manage other processes in a more cost efficient and effective manner.

In November 2001, the decision was taken to implement a standardized e-ordering system from Oracle. The technological solution included interfaces with related purchasing and finance systems as well as selected complementary solutions (e.g., punch-out solutions for electronic communication with suppliers, solutions for electronic invoices from suppliers, etc.).

The Oracle system contains functions for ordering, authorization, goods reception and payment. Purchasing orders are made directly through the system, either from a supplier catalogue or through a descriptive free-text order. The user registers price and account number in the system when making a purchase order. Authorization is conducted in the system before the order goes to the supplier. Agreements with suppliers are given in the system, and people working with purchasing are responsible for updating this information. Goods reception is carried out in the system when the product or service has arrived. Invoices are matched by accounts payable ledger and are not physically sent to the persons involved. The authorizer receives an e-mail before the order goes to the supplier, asking him or her to authorize the order. Thus, authorization is made in advance.

Prior the e-ordering system, divisions and departments had their own purchase-to-pay processes, which were different across departments and divisions. At one department, for example at the R&D division, a caretaker ordered for the entire department. People working at the department wrote him a note giving instructions about what to purchase and then he carried out their instructions. At the E&S division, however, people ordered themselves (often without autho-

rization in advance), by either calling the supplier or visiting the supplier store. One aim of the e-ordering system was to achieve harmonization of the purchase-to-pay process, so that one process would be used by all persons, at all departments and divisions.

The e-ordering project was divided into different phases, starting with a first release of the system in August 2002, in which the system was rolled out to 320 persons. The second release was presented in February 2003, and during this phase the system was to be rolled out to all divisions. At the end of March 2003, 2000 potential users had received training, but there was a problem: Potential users who had received training did not continue using the system when ordering products and services. People instead continued making purchases as they had done before, buying from the suppliers they preferred.

From April 2003 onwards, the emphasis was put on change management to ensure changes in purchasing behaviour (i.e., using the system instead of visiting or phoning the supplier), increased cooperation between divisions regarding supplier agreements (i.e., to be achieved through the centralized sourcing organization), and increasing compliance with selection of centrally chosen suppliers.

In December 2003, 4000 potential users had been trained to use the e-ordering system. Use of the system was still relatively low, however, compared to purchases made outside the system.

During 2005, the E&S division (whose usage figures were poor) made great efforts to increase use of the system. During a 6-month period, extra resources, in the form of three persons, were allocated to the division. They provided training in small groups and assistance at the moment of ordering, which resulted in increased use of the system.

Usage of the system has increased gradually since the introduction, though not as fast as planned. Since January 2006, use of the system has remained at a stable level. Compliance with supplier agreements was approximately 80% for indirect (MRO) purchasing, where 70% of all orders went through the e-ordering system and 10% to suppliers with agreements, but not through the system. In December 2006, the number of users who had ordered through the system more than five times was over 3000. Four thousand people had received training, but many of them were not ordering themselves, rather asking an assistant, secretary, caretaker or co-worker to order for them.

6. Testing the model/case findings

6.1. Structure of technology

6.1.1. Structural features: Restrictiveness and comprehensiveness

Starting with the structural features (create order, follow-up order, authorize and goods receive) of the e-ordering information technology system, and their restrictiveness, level of sophistication and comprehensiveness, empirical data from the case study show that the restrictiveness and comprehensiveness of the 'create order' structural feature affect adoption and use of the system.

People at both studied divisions (E&S and R&D) found it difficult to adopt and continue to use the system due to the high degree of restrictiveness and comprehensiveness of the structural feature 'create order'. The high degree of restrictiveness was constituted by the requirement to fill in all fields and to fill in them correctly for the order to go to the purchasing department for final execution, or directly to a supplier. For example, if a field was not filled in, or if a comma was used instead of a full-stop, the order did not go through. This resulted in end-users spending more time than they had before trying to order products and services, but these attempts were not always successful. Many gave up trying after a while, and instead returned to their old routines of phoning their own choice of supplier or asking the caretaker, assistant or secretary to order for them.

Regarding comprehensiveness of the system, a person using the system for the first time on his or her own has to have information about price, account number, authorizer, delivery address and delivery date to complete an order. If the person lacks information on price or account number, some search work has to be done, which takes time from the individual and was experienced as a barrier to ordering through the system, as compared to ordering procedures prior to the system, when people largely made a phone call to their choice of supplier, neglecting or unaware of current supplier agreements, or asked a caretaker, assistant or secretary to order for them, not having to worry about information on price, account number and authorizer.

Regarding sophistication, it was difficult to translate the notion, as defined by DeSanctis and Poole [20], into an e-ordering context. No empirical data were found, however, supporting some kind of degree of sophistication of the system structure and its influence on adoption and use.

6.1.2. Spirit

The spirit communicated by the highest levels of management and management for the e-ordering project was that by using the e-ordering system, large savings would be achieved. When looking at empirical data from the case study, there is no clear support for the influence of the spirit or incoherent spirit communicated on adoption and use behaviour. At the E&S division, however, one person giving information about the system at training sessions communicated an incoherent spirit saying, *"I am not sure this will save money, and off the record the e-ordering system is not really suitable for our division"*, and thus creating confusion among end-users at that training session. E&S was the division experiencing the greatest difficulties in getting end-users to adopt and use the system. Communicating an incoherent spirit has certainly not positively affected adoption and use, instead it has probably led to fewer people adopting the system.

Another kind of incoherent spirit was found: different persons at different divisions, levels and functions had different knowledge about why the e-ordering system should be used, thus they had different insights into why it is important to achieve savings within purchasing, leading to different incentives for using the system. The craftsmen at E&S who were told to use the system had no understanding of why the organization needed to save money, due to the good financial situation at the time and the fact that the current culture was one of not worrying about the price of products and services. When asked why the organization was changing the purchasing function (towards more strategic sourcing conducted centrally) and introducing an e-ordering system, the Swedish purchasing manager and the e-ordering manager gave a much larger picture as an explanation, referring to potential financial difficulties in the future and the importance of saving on costs instead of dismissing people. The different understandings of why this purchasing initiative had been made can also be viewed as a kind of incoherent spirit. It is difficult to say, however, if and how this incoherent spirit has influenced adoption and use. The users who did not have the larger picture and who did not understand that their jobs could be at stake were, though working in the E&S division, precisely those potential users in the organization who were most reluctant to use the system.

6.2. Other sources of structure

In the empirical data, different sources of structure were found to influence adoption and use of the sys-

tem. These were structures prior to the e-ordering system for (1) how to order, (2) how to perform ordinary working tasks, and (3) how to authorize orders, and how well these structures corresponded to the new e-ordering system structures. Another structure found to affect adoption and use behaviour in the pharmaceutical case is the decentralized culture within the organization, which in this case delayed adoption and use of the e-ordering system.

6.2.1. Order structure

Starting with the ordering structure prior to the system, it was quite different at the two studied divisions. At the E&S division, end-users largely phoned or visited their own choice of supplier, whereas at the R&D division, end-users wrote what they needed on a pink piece of paper and gave the instruction to the caretaker, who saw to it that the product was bought and received. Upon introduction to the e-ordering system, people were instructed to place their own orders in the system, and they were instructed not to phone or visit the supplier, and not to ask a secretary, assistant or caretaker for help. The idea was that everyone should place their own orders using the computer interface. This required a change in behaviour for end-users at both divisions, and such a change was not positively received. This is illustrated by two statements, one made by a Craftsman in May 2003, and one made by a researcher in June 2003.

Today it takes me 2 seconds, I just phone the supplier and tell him what I want and then he knows exactly what I need. I call the supplier and he fixes it, and the products arrive. Using the system seems to be much more complicated and time demanding.

I'm here to conduct research, not to put my time and energy into purchasing.

There was some resistance to using the system at both divisions, which was largely related to the required change in order structure. After some time resisting using the system, however, end-users at R&D went back to the old ordering structure, writing notes to the caretaker with purchase instructions. The caretaker then ordered the product or service needed in the e-ordering system instead of phoning, visiting or e-mailing the supplier, as he had done before. End-users at E&S received training after training, adopted the system (i.e., used it once), but resisted continued use of the system.

6.2.2. Working routine structure

At the E&S division, end-users felt it was difficult to combine performing their work and ordering products and services through the system, instead of directly phoning the supplier. Difficulties for them to plan their work in advance.

When we are working, we often have to go by car up to the supplier to buy products, it may be urgent and important for the internal customer, that the repair is made as fast as possible. Sometimes it can be urgent and then you don't have time to use the e-ordering system, you don't have time to wait for the products to arrive (Craftsman, November 2002).

The fact that the working structure in place prior to the system did not correspond well to ordering through the system negatively influenced both adoption and use of the system. The main effects were on use, however, as end-users had tried out the system in different training sessions and when receiving help at the moment of ordering.

The working structure of end-users at R&D corresponded better to ordering products and services using the e-ordering system, because it is easier for them to plan ahead what materials they will need. In the R&D case, the working structure had no negative influence on adoption and use behaviour.

6.2.3. Authorization structure

The authorization structure at the E&S division prior to the e-ordering system was unclear. Most end-users were used to buying what they needed and to not asking a manager for approval. Some end-users did not know who was supposed to authorize their purchases.

Who is going to be the authorizer? Who has the knowledge to judge the investment in, for example, a new chimney? Making the right decision requires knowledge and competence regarding material quality (End-user at E&S at a training session, August 2003).

When ordering through the e-ordering system, a limit on how much the end-user could order without seeking approval from a superior had to be set. This was not easy, however, owing to unclear (or rather lack of) authorization rules. When ordering through the system, the end-user had to fill in the authorizer, which was not as easy as one might think, because there were no clear rules. The unclear (or lack of) authorization structure prior to the system negatively influenced adoption and use, making it difficult for end-users to use the system.

At the R&D division, clear authorization rules had long been in force, and these rules were similar to the authorization structure in the system (amount limit and known approver). Thus, authorization was never an issue.

6.2.4. Organizational culture

A decentralized culture was observed at the case organization. Persons in the organization were used to taking their own initiatives and following them through, often without asking a superior. This behaviour was also observed in purchasing; people in the organization largely made their own choices regarding suppliers and products, not taking current supplier agreements into account.

The decentralized culture made it difficult to get end-users to adopt and continue to use the new system. It was difficult to tell employees how to carry out their purchases when they were used to deciding for themselves.

It's difficult to oversee action locally. Directives are coming centrally, from above, and have to be pressed down into a decentralized organization (Consultant working with change management issues, June 2003).

The present organizational culture can be viewed as a structure that influenced adoption and use behaviour by delaying such behaviour. It took approximately four years to achieve the planned compliance rate as regards using the e-ordering system.

6.3. Group's internal system

Among the factors given by DeSanctis and Poole [20], empirical data from the present pharmaceutical case only support the influence of one factor: knowledge and experience of structures, i.e. knowledge and experience of similar advanced information technology systems and computer literacy.

At R&D, end-users had previous knowledge and experience of using other advanced information technology systems, and were used to working with computers on a daily basis. In contrast, at E&S, previous knowledge and experience of other information technology systems were limited, at some places non-existent, and computer literacy was generally low. End-users at R&D adopted and started using the e-ordering system to a greater extent and faster than did end-users at the E&S division. One explanation is probably the greater previous experience of a similar system and higher computer literacy at R&D compared to E&S.

It's been easier for us than for E&S. Our users used the old system for purchasing before; they're already used to making their orders in an information technology system (Purchaser R&D, January 2004).

Your IT maturity influences your adoption of the e-ordering system a lot. Our largest problem in this division is the varying degree of computer maturity among our people; many of the craftsmen working there are not used to working with computers (Purchasing manager E&S, December 2002).

Interestingly, there was no empirical support for the "critical mass" notion (the degree to which members believe that other members know and accept use of the structures), thus that end-users were induced to adopt and use the system because many people in the organization were using it. This may be due to the decentralized culture and the fact that end-users were used to deciding for themselves and to not worrying about what others might think. Two of the four factors were difficult to translate into a purchasing context: 'members' style of interacting' (because there is no interaction between users when ordering through the system, one individual end-user uses the system at a time) and 'degree to which members agree on which structures should be adopted and used' (management had already decided that the structures in the e-ordering system were to be adopted and used, it was nothing to be discussed among end-users).

6.4. Factors from purchasing research

6.4.1. Resistance to breaking up old business relationships

Starting with the influence of old business relationships on adoption and use of the e-ordering system, empirical data from the case study show that this factor does affect adoption and use behaviour. Initially, especially at the E&S division, end-users did not want to stop buying from their old suppliers and instead order from centrally chosen suppliers, and thus they resisted using the e-ordering system.

They have to put in the suppliers we buy most of our products from, otherwise why should we use it (Craftsman at a training session, November 2002).

There was, however, a possibility to order from current suppliers (provided that agreements existed) through free-text orders in the system. This was explained to end-users, making them somewhat less re-

luctant to use the system, as it did not mean breaking up old business relationships. The central purchasing function also made an effort to investigate important suppliers at each division, resulting in catalogues covering the main suppliers at each division. This reduced resistance to using the system because it furthered current business relationships.

6.4.2. Management support and resources

Regarding management support, the project had support from the highest levels of management throughout the implementation process. Support among division and middle managers was somewhat different, however. At both R&D and E&S, division managers and middle managers had their hands full with other more business-related issues, and failed to put enough focus on purchasing and managing adoption and use of the e-ordering system. Use of the system increased faster at R&D than at E&S owing to structures and factors tested above. In 2005, however, managers at E&S decided to allot extra resources, in the shape of three persons, to supporting end-users for six months in order to achieve use of the system. The reason for this was mainly the reminders from higher level management about the poor usage figures at the division, which put pressure on managers to act. Training was given again (for the second or third time) in small groups and help was given at the moment of ordering. During this six-month period, use of the new system increased at E&S. After these three persons had left, usage dropped somewhat, but remained at a higher level than before. The empirical data from the case study show that management support – at all levels, not only top management – has an impact on end-user adoption and use. The investment in extra resources at E&S increased adoption and use of the system at that division. Sufficient resources have been in place for the e-ordering project organization, from the beginning (in 2002) onwards, and this has helped the organization achieve its compliance goal of 70% ordering through the system in January 2006. Empirical data from the case study thus support the influence of the resource factor, i.e. having sufficient resources, on adoption and use of the system.

6.4.3. Mandating systems/enforcement

Interestingly, end-users made no mention of mandating systems or enforcement as reasons for adoption and continued use of the e-ordering system. However, managers did bring up different kinds of mandating systems/enforcement as factors that influenced adoption and use behaviour. End-users themselves, how-

ever, did not adopt and use the system due to pressure from above. One reason for this may be the decentralized culture within the organization: End-users worked in an organization that had a long history of a decentralized culture, which gave great freedom to researchers, for example. However, enforcement in the shape of dissatisfaction communicated by top management to division managers if usage figures were poor did affect investment in extra resources, which in turn influenced end-user adoption and use behaviour. In the present case, however, we found no empirical support for the notion that mandating systems/enforcement influenced end-user adoption and use directly.

6.4.4. Communication

No empirical data from the pharmaceutical case indicate that communication influences end-users' adoption and use behaviour. There were no signs of lack of communication as a reason for end-user resistance, nor were there signs of "brilliant" communication contributing to adoption and use of the system. The project group responsible for managing implementation put considerable effort into communicating about the implementation process, highlighting successful results (giving attention to the person conducting most orders through the system each month), and providing information about the people in the project group, for example. This information was given on a web-page on the intranet and in a regular newsletter from the central purchasing department. One reason why communication was not mentioned or observed as a factor of influence in the present case may be that the project group managed to successfully communicate to end-users about the implementation process and the change in the system.

6.4.5. Composition of the project group

Initially (spring 2002), the e-ordering project group consisted mainly of external consultants with a project manager from the organization. This changed gradually, however, as consultants were replaced with new recruits. From the outset, a steering group was in place above the project group; it represented different stakeholders, such as purchasing, finance and information technology. No empirical data support the notion that this factor may have affected adoption and use of the e-ordering system. The reason for this is probably that the project group and the steering group together managed to represent all the different stakeholders involved from different functions and divisions, not only people from information technology.

7. Summary of results

7.1. Discussion

Does the framework work? After testing the framework using empirical data from the longitudinal case study, we must say that the framework and the data correspond relatively well. The empirical data in this case are from an e-ordering implementation case study at a large pharmaceutical organization. The framework has contributed new knowledge by shedding light on structures and factors not previously discussed in e-ordering research. The fact that a high degree of *restrictiveness and comprehensiveness of the system's structural features* affects adoption and use has not been previously discussed in the literature. Requiring that end-users learn the structure of the system (i.e., how to fill in empty fields and change fields containing incorrect information) and have information previously not needed (such as information about price, account number, authorizer, etc.) functioned as a barrier both to using the system for the first time (the adoption moment) and to using it the second time and more. It was difficult to translate the sophistication of a GDS system into the sophistication of an e-ordering system. This is probably because standardized e-ordering systems from different suppliers (i.e., Oracle, SAP, etc.) and e-ordering systems offered by application software providers (ASP) (i.e., the buying organization rents access to the system, which is managed by the ASP) all are relatively similar, offering similar functions in the systems (create order, follow-up order, authorize order and receive product or service). Thus, no different general levels of sophistication can be identified, which according to DeSanctis and Poole [20] was the case with GDS systems.

Regarding the *system spirit*, there was no direct evidence that adoption and use were affected by a communicated coherent or incoherent spirit. The project management and the highest levels of management communicated that the system would save money. However, the data do not show that any end-user adopted and used the system because that would save the organization money. The incoherent spirit that was found in connection with adoption and use behaviour showed that an incoherent spirit was communicated to end-users at the division that had the lowest adoption and usage figures. Thus, the incoherent spirit communicated certainly did not positively influence adoption and use, but may have had a negative effect. In the present case, there was no clear relationship be-

tween system spirit and adoption and use behaviour. If the framework were to be tested using empirical data from another case, a closer connection could possibly be revealed. The case organization had a decentralized culture combined with a successful financial history, which may explain why end-users did not adopt and continue to use the system because of the system spirit of saving money for the company.

Other sources of structure such as the different task structures found (how to order and authorize prior to the system and working routine structures) showed great influence on adoption and use in the pharmaceutical case, thus confirming that other sources of structure affected adoption and use of the e-ordering system. Organizational culture may also be viewed as a structure of influence, in the present pharmaceutical case (which has a decentralized culture) by delaying adoption and use.

Regarding factors given by DeSanctis and Poole [20], representing the influence of the group's internal system, the empirical data only confirmed one of the four factors: knowledge and experience of structures, i.e. knowledge and experience of similar advanced information systems and computer literacy. No Empirical data were found, however, that could support the other three factors mentioned by DeSanctis and Poole [20]. Two of the factors – 'members' style of interacting' and 'degree to which members agree on which structures should be adopted and used' – were difficult to translate into an e-ordering context. This is because there is no interaction between users when ordering through the system, and because the e-ordering system was standardized, with pre-set structures designed by the software people at Oracle. No empirical support was found for the influence of the factor 'degree to which members believe that other members know and accept the use of the structures'. The reason for this is probably the decentralized culture in the case organization, where end-users were used to deciding for themselves, and not to worrying about what others might think.

Factors found in previous purchasing research that were also shown to affect adoption and use in the present case study data were: 'resistance to breaking up old business relationships' and 'management support and resources'. For the other three factors – 'mandating systems/enforcement', 'communication' and 'composition of the project group', the empirical data did not support their influence on end-user adoption and use in this case. These factors, however, have been confirmed in previous research on e-ordering [15,43,45,

47]. The reason they did not affect adoption and use in this case may be that both communication and composition of the project group were appropriately managed, communicating about the change process rather than about the information system as such, and having a steering and project group that represented all stakeholders. In the present case, the factor 'mandating systems/enforcement' was found to influence end-user adoption and use indirectly, though not directly.

Finally, we conclude that the framework presented here can shed light on both structures and factors that affect end-user adoption and use of standardized electronic ordering information systems implemented in large organizations.

7.2. Limitations

The framework has been tested using empirical data from one specific case study, a large pharmaceutical organization implementing a standardized Oracle system for ordering indirect products and services. Through the case methodology, rich insights were gained into what influenced adoption and use in this specific case [32]. The intent was to understand the deeper structure of the phenomenon, which, according to Orlikowski and Baroudi [38], in turn can be used to inform other settings. Generalization from this specific setting to a population was not part of the present aim. As Lee and Baskerville [28] claimed, interpretive research places no particular emphasis on generalizability. The framework has only been tested once and then, as described above, using empirical data from a longitudinal case study. The framework should also be tested using empirical data from other organizations of different sizes and from different industries. The framework presented here, however, can be used to inform other settings, as this is not the same as claiming generalizability.

7.3. Theoretical implications

The present research illustrates an alternative way of using AST as a framework. Here, AST is adapted to the administrative area of purchasing and is able to reveal structures and factors that affect adoption and use of a standardized system, an e-ordering system. By using the adapted AST framework, we could present findings on what factors/structures influence adoption and use of the system over time as well, not only at one moment of time. AST served as a guide for investigating certain structures, how they change and their in-

fluence on adoption and use behaviour. The structures further largely explain both end-user adoption and use of the system, thus contributing new knowledge about e-ordering adoption. The present research aggregates previous knowledge on e-ordering adoption, which together with the adapted AST framework gives us a more in-depth understanding of the factors and structures that influence adoption and use behaviour over time as regards standardized e-ordering systems.

7.4. Practical implications

Achieving end-user adoption and use of IS is crucial if gains are to be made on the investment. In the purchasing case, if end-user use of the e-ordering system fails, the investment in a centralized MRO sourcing function and the investment in the e-ordering system are wasted. If people in the organization do not buy from the centrally chosen suppliers (i.e., through the system), decreased purchasing costs based on increased volume discounts will not be realized.

Having a framework that shows the structures and factors of importance to adoption and use allows management to act proactively and manage the introduction and implementation process in the best possible manner. For example, knowing about the influence of the order structure prior to the e-ordering system and about how well it corresponds with the new system structures given management the greatest possible opportunity to adapt the order structure to the system. In the present case, usage at the R&D division, for example, would have increased faster if they had been allowed to retain their order structure (i.e. writing notes to the caretaker who then ordered for them), and instructed the caretaker to order through the system.

Acknowledgements

The author wish to thank Professor Per Andersson, Professor Björn Axelsson and Professor Mats Edenius for their helpful comments in the first drafts of this article.

Appendix: Original constructs of adaptive structuration theory

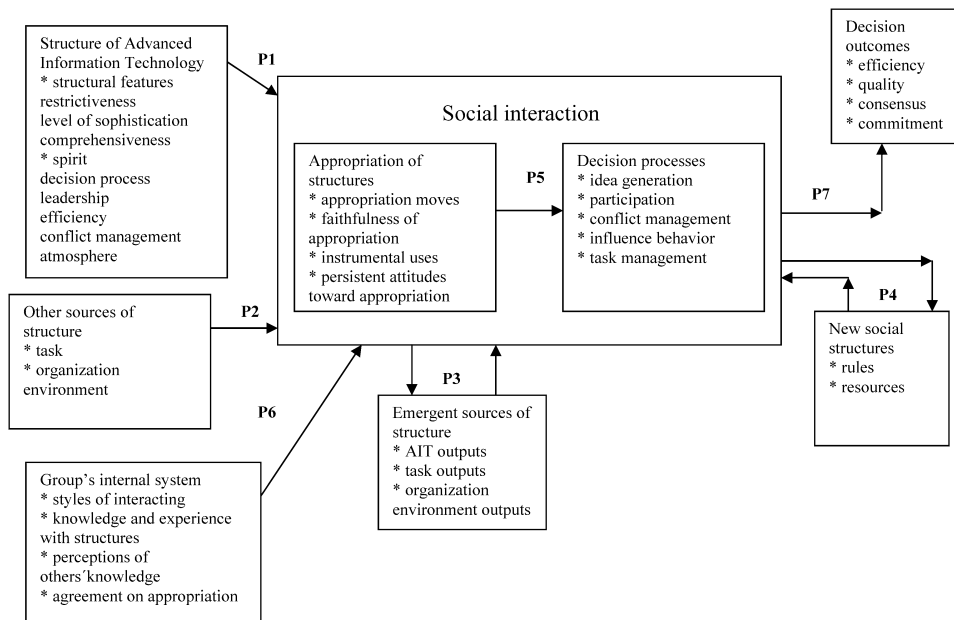


Fig. 2. Summary of the major constructs and propositions of AST (DeSanctis and Poole [20]).

References

- [1] C.D. Allport and W.A. Kerler, A research note regarding the development of the consensus on appropriation scale, *Information Systems Research*, **14**(4) (2003), 356–359.
- [2] K. Arbin, E-procurement maturity in industry, *International Journal of Electronic Business* **1**(4) (2003), 396–407.
- [3] K. Arbin, The road towards successful e-ordering implementation: Success factors and barriers, *International Journal of Procurement Management* **1**(4) (2008), 415–429.
- [4] B. Axelsson, From buying to supply management at Nordic Construction Company (NCC), in: *Developing Sourcing Capabilities, Creating Strategic Change in Purchasing and Supply Management*, B. Axelsson, F. Rozemeijer and F. Wynstra, eds, John Wiley & Sons Ltd., Chichester, England, 2005, pp. 257–291.
- [5] B. Axelsson, F. Rozemeijer and F. Wynstra, The case for change, in: *Developing Sourcing Capabilities, Creating strategic change in purchasing and supply management*, B. Axelsson, F. Rozemeijer and F. Wynstra, eds, John Wiley & Sons Ltd., Chichester, England, 2005, pp. 3–13.
- [6] S. Banerjee and V. Sriram, The impact of electronic data interchange on purchasing: an empirical investigation, *International Journal of Operations and Production Management* **15**(3) (1995), 29–38.
- [7] S. Barley, Technology as an occasion for structuring: evidence from observations of CT scanners and the social order of radiology departments, *Administrative Science Quarterly* **31**(1) (1986), 78–109.
- [8] C. Bechtel and J.L. Patterson, MRO partnerships: a case study, *International Journal of Purchasing and Materials Management* **33**(3) (1997), 18–23.
- [9] I. Benbasat and H. Barki, Quo vadis, TAM?, *Journal of the Association for Information Systems* **8**(4) (2007), 211–218.
- [10] J.R. Carter and L.D. Fredendall, The dollars and sense of electronic data interchange, *Production and Inventory Management Journal* **31**(2) (1990), 22–26.
- [11] T. Chenoweth, K. Corral and H. Demirkan, Seven key interventions for data warehouse success, *Communications of the ACM* **49**(1) (2006), 115–119.
- [12] W.W. Chin, A. Gopal and W.D. Salisbury, Advancing the theory of adaptive structuration: the development of a scale to measure faithfulness of appropriation, *Information Systems Research* **8**(4) (1997), 342–367.
- [13] A. Cox, D. Chicksand, P. Ireland and T. Davies, Sourcing indirect spend: a survey of current internal and external strategies for non-revenue-generating goods and services, *Journal of Supply Chain Management* **41**(2) (2005), 39–51.
- [14] S.R. Croom, The impact of Web-based procurement on the management of operating resources supply, *Journal of Supply Chain Management* **36**(1) (2000), 4–13.
- [15] S.R. Croom and A. Brandon-Jones, Key issues in e-procurement: procurement implementation and operation in the public sector, *Journal of Public Procurement* **5**(3) (2005), 367–387.
- [16] S.R. Croom and A. Brandon-Jones, Impact of e-procurement: Experiences from implementation in the UK public sector, *Journal of Purchasing & Supply Management* **13**(4) (2007), 294–303.
- [17] S.R. Croom and R. Johnston, E-service: enhancing internal customer service through e-procurement, *International Journal of Service Industry Management* **14**(5) (2003), 539–555.
- [18] F.D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly* **13**(3) (1989), 319–340.
- [19] L. De Boer, J. Harink and G. Heijboer, A conceptual model for assessing the impact of electronic procurement, *European Journal of Purchasing and Supply Management* **8**(1) (2002), 25–33.
- [20] G. DeSanctis and M. Poole, Capturing the complexity in advanced technology use: adaptive structuration theory, *Organization Science* **5**(2) (1994), 121–147.
- [21] A. Dubois and L.E. Gadde, Cost management across firm boundaries – a case study of MRO-procurement, in: *Proceedings from the IMP conference 2002*, Perth, Australia, 2002.
- [22] D.M. Ferguson, N.C. Hill and J.V. Hansen, Electronic data interchange: Foundations and survey evidence on current Use, *Journal of Information Systems* **4**(2) (1990), 81–91.
- [23] M. Fishbein and I. Ajzen, *Attitude, Intention and Behaviour: An Introduction to Theory and Research*, Addison-Wesley, Reading, MA, 1975.
- [24] A. Giddens, *Central problems in social theory: Action, structure and contradiction in social analysis*, California Press, Berkeley, 1979.
- [25] A. Giddens, *The Constitution of Society: Outline of the Theory of Structuration*, California Press, Berkeley, 1984.
- [26] R. Hirschheim, Introduction to the special issue on “Quo vadis TAM – issues and reflections on technology acceptance research”, *Journal of the Association for Information Systems* **8**(4) (2007), 203–206.
- [27] E. Karahanna, D.W. Straub and L.C. Norman, Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs, *MIS Quarterly* **23**(2) (1999), 183–213.
- [28] A.S. Lee and R.L. Baskerville, Generalizing generalizability in information systems research, *Information Systems Research*, **14**(3) (2003), 221–243.
- [29] H.C. Lucas, E.B. Swanson and R.W. Zmud, Implementation, innovation, and related themes over the years in information systems research, *Journal of the Association for Information Systems* **8**(4) (2007), 205–211.
- [30] A. Majchrzak, R.E. Rice, A. Malhotra and N. King, Technology adaptation: the case of a computer-supported inter-organizational virtual team, *MIS Quarterly* **24**(4) (2000), 569–600.
- [31] M.L. Maznevski and K.M. Chudoba, Bridging space over time: global virtual team dynamics and effectiveness, *Organization Science* **11**(5) (2000), 476–493.
- [32] S.B. Merriam, *Case Study Research in Education*, Studentlitteratur, Lund, Sweden, 1994.
- [33] R.M. Monczka and J.R. Carter, Implementing electronic data interchange, *Journal of Purchasing and Materials Management* **25**(1) (1989), 26–33.
- [34] R. Monczka, R. Trent and R. Handfield, *Purchasing and supply Chain Management*, International Thomson Publishing, Cincinnati, Ohio, US, 1998.

- [35] T. Mukhopadhyay, K. Sunder and K. Suresh, Business value of information technology: A study of electronic data interchange, *MIS Quarterly* **19**(2) (1995), 137–157.
- [36] W. Orlikowski, The duality of technology: Rethinking the concept of technology in organizations, *Organization Science* **3**(3) (1992), 398–427.
- [37] W. Orlikowski, Using technology and constituting structures: a practice lens for studying technology in organizations, *Organization Science* **11**(4) (2000), 404–428.
- [38] W. Orlikowski and J. Baroudi, Studying information technology in organizations: research approaches and assumptions, *Information Systems Research* **2**(1) (1991), 1–28.
- [39] L.D. Peters, Conceptualising computer-mediated communication technology and its use in organisations, *International Journal of Information Management* **26** (2006), 142–152.
- [40] M.S. Poole and G. DeSanctis, Structuration theory in information systems research: methods and controversies, in: *The Handbook of Information Systems Research*, M.D. Whitman and A.B. Wozczynski, eds, Idea Group Publishing, Hershey, US, 2004, pp. 206–249.
- [41] M. Pozzebon and A. Pinsonneault, Challenges in conducting empirical work using structuration theory: learning from IT research, *Organization Studies* **26**(9) (2005), 1353–1376.
- [42] T. Puschmann and R. Alt, Successful use of e-procurement in supply chains, *Supply Chain Management* **10**(2) (2005), 122–133.
- [43] M. Reunis, S. Santema and J. Harink, Increasing e-ordering adoption: A case study, *Journal of Purchasing and Supply Management* **12**(6) (2006), 322–331.
- [44] M. Reunis and E. Van Raaij, Scale development for E-Procurement (EP) adoption influence tactics, in: *Proceedings of the 15th International IPSERA Conference*, San Diego, 2006.
- [45] M.R.B. Reunis, E.M. van Raaij and S.C. Santema, Actor-to-actor dissemination of e-procurement adoption: an exploration of influencing factors, *Journal of Purchasing and Supply Management* **10**(4/5) (2005), 201–210.
- [46] W.D. Salisbury, W.W. Chin, A. Gopal and P.R. Newsted, Research report: better theory through measurement – developing a scale to capture consensus on appropriation, *Information Systems Research* **13**(1) (2002), 91–103.
- [47] S. Santema, J. Harink and M. Reunis, Achieving E-Ordering adoption with a benefit imbalance, in: *Proceedings of the 15th International IPSERA Conference*, San Diego, 2006.
- [48] A. Schwarz and W. Chin, Looking forward: Toward an understanding of the nature and definition of IT acceptance, *Journal of the Association for Information Systems* **8**(4) (2007), 230–243.
- [49] D. Schwieger, A. Melcher, C. Ranganathan and H.J. Wen, Appropriating electronic billing systems: Adaptive structuration theory analysis, *Human Systems Management* **23**(4) (2004), 235–243.
- [50] A. Van Weele, *Purchasing and Supply Chain Management*, Thomson Learning, London, 2005.
- [51] V. Venkatesh, M.G. Morris, G.B. Davis and F.D. Davis, User acceptance of information technology: Toward a unified view, *MIS Quarterly* **27**(3) (2003), 425–478.

Article 4

Structures influencing individual acceptance of e-ordering systems: Findings from a longitudinal case study

Katarina Arbin

Conditionally accepted for publication in Journal of Purchasing and Supply Management.

Structures influencing individual acceptance of e-ordering systems:

Findings from a longitudinal case study

Abstract

Using structures from adaptive structuration theory as an analytic tool and analysing data from a four-year longitudinal case study, the present paper focuses on structures that inhibit and enable end-user adoption and use of an e-ordering system. The structures presented, including routines, culture and how to order and authorize in the e-ordering system, have not previously been discussed in e-ordering research. Structures found to influence end-users' adoption and use of the e-ordering system are: the restrictiveness and comprehensiveness of the technical system's structural features, the order, working and authorization routine in place prior to the e-ordering system, and how well these routines correspond with how to order and authorize in the system. Organizational culture was also found to affect end-users' acceptance of the e-ordering system.

Keywords: E-ordering, end-user, adoption, use, acceptance, structures, routines, adaptive structuration theory, longitudinal, case study

Introduction

Organizations worldwide are implementing e-ordering systems in order to reduce indirect spending. Organizations have identified savings associated with using an e-ordering system, such as greater leverage in negotiation and reduced cost of processing the purchase requisitions (Croom and Brandon-Jones, 2007). Reduced costs are gained through reduced maverick purchasing, increased compliance with centrally chosen suppliers and an improved purchasing process (Croom and Johnston, 2003; Croom and Brandon-Jones, 2007).

If organizations are to succeed with system implementation and to achieve these savings, the system has to be accepted (i.e., adopted and used) by individual end-users (requestors) in the organization. Empirical data show, however, that this is not easy in all organizations (Arbin, 2008; Reunis et al., 2005). Getting end-users to adopt and use the e-ordering system is regarded as a most challenging task and is more difficult than many organizations first anticipate (Arbin, 2008; Reunis et al., 2006; Santema et al., 2006; Croom and Brandon-Jones, 2005; Reunis et al., 2005).

Research on individual e-ordering acceptance has primarily been investigated from two perspectives; a managerial and an individual end-user perspective.

A managerial perspective has revealed influencing factors such as management support, historical relationships with suppliers, having sufficient resources and involving all stakeholders in the project (Dooley and Purchase, 2006; Kulp et al., 2006; Croom and Brandon-Jones, 2005; Arbin, 2003). Research investigating the subject from an individual end-user perspective has thus far merely focused on what affects end-users' intention to adopt and use the system and on what influences their intention, building on research by Davis (1989) (The Technology Acceptance Model) and Venkatesh et al. (2003) (Unified Theory of Acceptance and Usage of Technology) (Van Raaij et al., 2007; Santema et al., 2006; Reunis et al., 2006), by doing this they have disregarded the individual acceptance of e-ordering systems. With regard to research on individual information system (IS) acceptance in general, there are further issues not yet discussed in the literature on e-ordering acceptance that influence individual acceptance, such as different structures (i.e., habits and routines) (Limayem et al., 2001; Limayem et al., 2007; Schwarz and Chin, 2007). Barley (1986) defined structure as "patterned action, interaction, behaviours and cognition" that become taken-for-granted aspects of social life, and the present author agrees with this definition. The technology (the IS) and structures within the IS itself, such as restrictiveness, comprehensiveness and sophistication of the system features, are also argued to influence individual acceptance (Orlikowski, 2000; Orlikowski, 1992; DeSanctis and Poole, 1994). Structures such as those presented above differ from factors already investigated in e-ordering research. Structures (e.g., how different routines are performed) are formed by both individual end-users (including tasks to be performed) and the IS in question. These structures can further only be identified by investigating actual behaviour in contrast to investigating the intent to accept an IS. Structures may further change or be modified over time, and this modification or change is shaped both by the individual end-user and the IS. The present paper argues that structures play a central role in enabling or inhibiting individual acceptance of an e-ordering system, and that it is time to begin investigating their role also in e-ordering system adoption and use.

The aim of the paper is to investigate "Which structures inhibit and enable individual acceptance of an e-ordering system and how do they inhibit and enable?" Focus is on structures as routines, habits and structures offered by the e-ordering system and their influence on individual e-ordering system acceptance.

The paper is organized as follows. First a literature review is presented covering e-ordering adoption and acceptance, followed by a section on IS literature on structuration and structures. The theoretical framework guiding the search for structures influencing individual e-ordering adoption is thereafter presented, followed by a description of the research method. The case is then presented and described, followed by an analysis section. Conclusions are thereafter presented, followed by theoretical implications.

Practical implications and limitations follow. The paper ends with a section on suggestions for future research.

Literature review

Previous research on individual e-ordering adoption was identified by studying academic journals and conference proceedings, and by searching keywords such as e-ordering, individual, end-user, adoption, e-procurement, etc., in different combinations, in different databases. The journals and databases that were searched can be found in the appendix.

Research from a managerial perspective (based on interviews with managers) presents factors such as management support, having sufficient resources, the involvement of all stakeholders, composition of the implementation project team, and old relationships with suppliers (Dooley and Purchase, 2006; Kulp et al., 2006; Croom and Brandon-Jones, 2005; Arbin, 2003).

Santema et al. (2006) and Reunis et al. (2006) have focused more explicitly on end-users and what influences their intention to adopt and use the system, building on research by Venkatesh and Kohli (1995) (influence strategies) and Venkatesh et al. (2003) (Unified Theory of Acceptance and Usage of Technology). They (Santema et al., 2006; Reunis et al., 2006) found that introducing a mandate, telling end-users to use the system, improved system compliance. Peer influence, too, was very strong, according to Reunis et al. (2006). Peers had substantial influence on each other, both in a negative and a positive way. Work by Brandon-Jones and Van Raaij (2006) and Reunis and Van Raaij (2006) has also aimed at increasing our knowledge about individual e-ordering adoption, the focus here being on developing scales to measure influence tactics and e-procurement quality. Van Raaij et al. (2007) further investigated what influences end-users' intent to adopt from an end-user perspective. They confirmed that user-perceived usefulness and ease of use of the system (influencing factors identified by Davis, 1989) are key determinants of the e-ordering user's attitude towards the system and his/her intention to use it.

Research related to e-ordering adoption within organizations is summarized in Table 1, which shows factors found to influence adoption of e-ordering systems.

Insert Table 1 here.

Previous research on individual adoption and use of e-ordering systems from an end-user perspective is, however, still limited. The few studies that do focus on individual adoption have merely investigated what influences the

intent to adopt and use, thus neglecting what affects actual behaviour, such as different structures and their influence. In order to discover which structures influence adoption and use behaviour and how, further theoretical guidance is needed.

Structuration theory, structures and information systems

Previous research has identified structuration theory as one of the most influential social theories in the information system field (Jones and Karsten, 2008; Poole and DeSanctis, 2004). Originating from sociologist Anthony Giddens's work (1979; 1984), it is a general theory of social organization rather than a theory specific to IS (Jones and Karsten, 2008). The central concern of structuration theory is the relationship between individuals and society (Jones and Karsten, 2008). Structure and agency mutually constitute a duality. Thus social phenomena are not the product of either structure or agency, but of both (Jones and Karsten, 2008). In this way, structuration theory avoids the historical division between determinist and voluntarist views (Pozzebon and Pinsonneault, 2005). Human agents draw on social structures in their actions, and at the same time, these actions serve to produce and reproduce social structure.

We can identify two important variants of Giddens's work that have employed structuration ideas in the IS field: The duality of technology by Orlikowski (1992) and the adaptive structuration theory (AST) by DeSanctis and Poole (1994), and further work based on these theories.

Orlikowski (1992) proposed a reconceptualization of technology that takes both the deterministic and the voluntaristic perspective into account and presents the structuration model of technology. In this view, the technology is not an objective, external force that has deterministic impacts on organizational structures, nor is it the outcome of strategic choice and social action. Technology is viewed as flexible, and it is claimed that technology is created and changed by human action as well as used by humans to accomplish some action. In later work, Orlikowski (2000) extended the structuration perspective on technology by proposing a practice-oriented understanding of the interaction between people, technologies and social action, in order to better explain emergence and change in both technologies and their use. Orlikowski (2000) focused on how people's interaction with technologies enacts structures of technology use. Orlikowski's work (2000) shows that there is a duality between people's usage and the technology, and that they both shape each other over time. The technology is further viewed as flexible, i.e. as tailor-made IS, which can be modified and changed in accordance with users' usage and requests. The subject of study in the present paper, however, is not individual acceptance of a tailor-made system, i.e. a system that can be changed in accordance with user usage and wishes, the subject is instead individual acceptance of a standardized IS created by a

large international software organization and then sold to several organizations, thus an IS that only allows limited changes and modifications.

The other variant of Giddens's work applied to IS research – the adaptive structuration theory (AST) by DeSanctis and Poole (1994) and Poole and DeSanctis (1990) – views the IS as only one source of structure and argues that also other sources of structure, such as tasks and the organizational environment, need to be considered. AST provides a model that describes the interplay between advanced information technologies, social structures and human interaction. There are structures in technology, on the one hand, and structures in action, on the other. The two are argued to be continually intertwined; there is a recursive relationship between technology and action, each iteratively shaping the other. AST divides structures that influence appropriation of an IS into the structure of advanced information technology and other sources of structure, such as how tasks are performed and the organizational environment (e.g., cultural beliefs). The present paper has been inspired by AST and has used the classification of structures in AST as a general roadmap to guide the search for structures that inhibit and/or enable individual acceptance of an e-ordering system. The full AST model can be found in the appendix.

Structures proposed in adaptive structuration theory (AST) – a starting point

In AST, structures are divided into the structure of advanced information technology and other sources of structure.

The structures of an advanced information technology consist of the structural features of the given technology and the spirit of this feature set. Structural features are the specific types of rules and resources, or capabilities, offered by the system. A given advanced information technology can be described and studied in terms of the specific structural features that its design offers. The structures of an advanced information technology can also be described in terms of their spirit. According to DeSanctis and Poole (1994), spirit is the general intent with regard to the values and goals underlying a given set of structural features. The spirit is the “official line” that the technology presents to people regarding how to act when using the system, how to interpret its features, and how to fill in gaps in procedures that are not explicitly specified. It can also function as a means of signification, because it helps users understand and interpret the meaning of the technology. DeSanctis and Poole (1994) argued that the restrictiveness, comprehensiveness and level of sophistication of the structural features affect individual IS appropriation, as does the system spirit.

Other sources that are argued to affect appropriation of the IS are the content and constraints of tasks to be performed and structures within the

organizational environment, for example, current pressure to reduce spending, circumstances that favour certain projects over others and cultural beliefs. According to DeSanctis and Poole (1994), these structures, in addition to the advanced information technology, affect appropriation of the IS.

If we relate the structures proposed in AST to an e-ordering system context, the structural features are structures for how to order, authorize and receive goods in the system. Different task structures in an e-ordering system context can be the content and constraints of tasks, such as how to perform ordinary working tasks, and how to order and authorize prior system implementation.

Research method

How to investigate the research question?

A case study including extensive observations of end-users' adoption and use behaviour has been conducted by following the implementation of an e-ordering system in a large pharmaceutical organization from January 2002, when decisions were made for an e-ordering system, throughout the implementation, until September 2006, when the organization had reached the compliance goal of 80%.

Research site

Due to requirements that data should not be collected retrospectively and that this kind of study should be conducted over time, an organization was chosen that was about to roll-out an e-ordering system (facilitating real-time observations, observing end-users using, trying to use or resisting use of the e-ordering system), and that was willing to allow access to the organization over a longer period of time.

The organization in focus here is one of the world's leading pharmaceutical companies, with 65,000 employees worldwide, 58% in Europe, 28% in the U.S. and 14% in the rest of the world. Sales in 2007 totalled \$29.6 billion, with an operating profit of \$8.1 billion. The corporate headquarters are situated in London, UK, and the research and development headquarters are situated in Sweden, close to Stockholm, the capital. The Swedish organization consists of approximately 12,000 persons working mainly within research, production and marketing/sales.

Two divisions within the Swedish organization were chosen as research sites: a research and development division (R&D) and an engineering and support division (E&S), consisting of approximately 1,500 and 400 persons, respectively, at the time of the case study. In order to get close to end-users, the researcher functioned as a kind of mobile helpdesk (a mobile helpdesk in

the sense that people were able to call me for help when using the e-ordering system). The researcher was also able to follow the person responsible for training and helping end-users at the E&S division. By functioning as a helpdesk person and by following the person responsible for training, the researcher made contact with persons using the system for the first couple of times, with regular users and with persons not using the system, thus facilitating observations of the problems they experienced and providing insights into why they were experiencing these problems.

Data sources

Observations, interviews and documentation have been used as sources of data. Observations were mainly conducted from June 2002 to December 2003. Thirty-two interviews have been conducted, the first in January 2002 and the last in September 2006.

Observations

Observations have been conducted in the daily work (including at coffee breaks and lunches) on 28 full days, spanning from the 5th of November 2002 to the 25th of August 2003. The researcher was physically placed with people working with purchasing administration at E&S. Spending time at the division helped the researcher understand how the e-ordering system was perceived and accepted by end-users. By following the system administrator in his daily work, observations were made of end-users' actual use of the system and their experienced problems at that moment.

Observations were also conducted at nine training sessions, where potential users and authorizers were introduced to the system for the first time. These sessions lasted approximately three hours and consisted of a maximum of 9 participants. At these training sessions, users' first-time use of the system and their reactions and actions could be observed, leading to insights into why, for example, some thought it was difficult and others thought it would work to order and authorize through the system.

Observations were also conducted at a two-day training session for expert users and purchasing and finance people, on one afternoon at the central helpdesk, at one daily meeting for the entire project organization, and at a meeting for system administrators from all divisions.

During the training sessions, and during observations at the helpdesk and meetings, notes were made about what was said and what occurred (including quotations). These notes were then transcribed the same day. Directly after the session or meeting, the researcher went to her computer to transcribe the handwritten notes.

When the researcher alone or together with the system administrator visited potential users, trying to help them use the e-ordering system, notes were taken in parallel with helping them or just after helping them. These notes were also transcribed on the same day.

Interviews

Thirty-three interviews have been conducted. The first semi-structured interview was conducted with the project manager for the e-ordering project on the 31st of January 2002, and the last interview was conducted with the Swedish purchasing manager and project manager for the e-ordering project on the 25th of September 2006. Roles interviewed are: Swedish purchasing manager, project manager for the e-ordering project, division purchasing manager, Swedish information manager, person responsible for system administration, system support persons, person responsible for measurement model e-ordering, external consultants involved in the e-ordering project, purchasers (working with sourcing), purchasing administration staff, system administrator at the division level, potential users of the e-ordering system, actual users of the e-ordering system, porter, and authorizers. Some of the persons were interviewed several times at different time intervals and some persons only once. The staff turnover during the time of the study was low, and end-users interviewed at one occasion were observed by the researcher at several other occasions. These persons and the researcher also had several informal talks (in connection to training sessions or when visiting their place of work, etc.).

The semi-structured interviews were held on the organization premises and lasted approximately one to two hours. Notes were taken on paper during the interview and at most interviews a tape recorder was used (to facilitate later transcription into a Word file). Some interview protocols were sent back to the interviewee for comments, in order to ensure that the transcripts were adequate. The interview questions were not guided by the framework of DeSanctis and Poole (1994). Interview questions were somewhat different depending on the role of the person interviewed. Examples of questions asked when interviewing people in the central project group were: "How do you work with getting end-users to use the system? What do the end-users think of using the e-ordering system? How many are using the e-ordering system today? How do you view the different divisions and their use of the e-ordering system, are there any differences? Examples of questions asked when interviewing persons responsible for the implementation at different divisions were: The end-users attitude and usage of the system? Which end-users have had problems with using the e-ordering system and why? Have you faced any problems and if so, which? Why does it take so long to get end-users to use the system? Compared to other divisions, has it been easier or more difficult for your division to implement the system? Examples of questions asked when interviewing end-users were: What role do you have,

what working tasks do you perform? How did you make purchases before the e-ordering system? Have you used the e-ordering system? How did it go? What are the biggest advantages of the e-ordering system? What are the biggest disadvantages of the e-ordering system? Why did you start using the system, and why are you using it now? Have there been any changes and/or modifications that have caused you to increase your use of the system?

Documentation

Another main source of information was documentation about the e-ordering project and information about the project presented on the project's own webpage on the Intranet. A good source of information for understanding the technology structure, as defined by DeSanctis and Poole (1994), for the e-ordering system was the education material file, which consisted of pictures of the different 'pages' in the e-ordering system, showing the structures, functions, and information needed to order, authorize and receive goods in the system.

Analysis procedure

The analysis proceeded from DeSanctis and Poole's (1994) structures influencing appropriation of an advanced information system and from the structure "old relationships to suppliers", which in previous literature on e-ordering adoption was found to influence adoption and use.

I began by printing out observation notes, interview protocols and documentation text, collecting them in files, sorted by date when the observation or interview was conducted. The researcher then went through the text, categorizing it in accordance with AST structures. For example, text describing the order routine at different occasions (over time) was marked and categorized as order routine within the category other sources of structure/task. The researcher then went through the text category by category, investigating influences on end-user continued use of the e-ordering system. If structures (e.g., order and authorization routine at some point of time) within the category other sources of structure/task influenced end-user use positively or negatively, this text was marked as influencing end-user use. The main source of data for identifying influencing structures was notes from observations of daily work (meeting with potential users when using or trying to use the e-ordering system and listening to conversations between users and the purchasing administration staff), and from interviews with end-users talking about, for example, their everyday situation, how they used to order indirect products and services, and how they perform ordinary working tasks.

Finally, the present author compared the two studied divisions regarding their starting point, adoption and use of the system and what had influenced adoption and use.

Case description

The case description is structured as follows; first the two studied divisions are presented, followed by a presentation of the starting point. Thereafter the e-ordering implementation and use process is described with a focus on inhibiting and enabling structures.

The two divisions

Research and development

Persons working at the R&D division mainly consisted of highly educated researchers. All persons working at the division had their own computers situated at their own workstation. Their work was performed either in the laboratory or in front of the computer. They were using information systems also for other purposes than purchasing, such as a laboratory information management system (LIMS) (an information system in which all incoming samples are registered and all results are recorded and distributed to their assigner).

Prior to the e-ordering system, the order routine for indirect products and services functioned as follows: If a researcher needed an indirect product or service, he or she wrote information on a pink piece of paper and gave it to the caretaker, who ordered the product via phone, e-mail or by visiting the supplier store. When the product arrived, the caretaker received it and delivered it to the right person. The invoice was sent directly to the person needing the product, i.e. the researcher and not the caretaker, who gave it to the manager for formal authorization.

Authorization rules were in force at the R&D division, which meant that purchases needed approval before invoices were sent to the financial department for payment, and that there was an amount limit up to which purchases could be made without authorization. The purchase, however, was formally authorized only after it had been made, when the manager was signing the invoice.

Engineering and support

The E&S division, which supplies other divisions with project and maintenance services in the areas of construction work, engineering plant, electricity and automation, also sees to it that the divisions' infrastructure, such as electricity, steam, water, coldness, heating, etc., is in working order.

The E&S division consisted mainly of craftsmen and engineers, and administrative staff (such as human resources, finance, information technology, purchasing, etc.).

The craftsmen working at the E&S division had largely mobile jobs, meaning that they did not conduct their work by sitting at a desk. They instead repaired and maintained construction work, etc., on the organization premises, performing various tasks when needed.

Prior to the e-ordering system, purchases of indirect material were decentralized; people largely ordered from their own choice of supplier, often by phone, fax or by visiting the supplier store.

There were no common authorization rules at the E&S division. At one department, for example, end-users received an order number that was equivalent to a project number, which was tied to all products and services bought during that project/assignment. They were further allowed to buy products and services up to a relatively high amount, i.e. they did not have to ask for managers' approval for purchases up to this amount. At other departments, end-users were used to buying what was needed up to different amounts; then the manager would authorize the purchase when the invoice arrived. Thus, managers had a great deal of confidence in their colleagues.

Starting point

Purchasing had been decentralized for many years, and the different divisions had managed both direct and indirect purchases by themselves with no interaction with other divisions. Further, purchasing processes and policies, authorization rules and accounting procedures varied between divisions.

Looking at what was going on in the organization, it was found that the organization bought indirect products and services from many similar suppliers. At the time, the organization had approximately 15,000 suppliers, from which indirect products and services were bought. This situation had contributed to high prices (compared to negotiated prices) and guarantees that were not optimal, such as terms of delivery, service, etc. Having many and similar suppliers also had led to high costs for administrating them. Moreover, orders at the time often lacked information, which demanded a great deal of time from the purchasing administration and purchasers, who needed to find out who had ordered, what had been ordered, from which supplier and at what price. The limited cooperation between purchasing departments at different divisions further led to more suppliers and non-optimal negotiated volumes. Some divisions bought from the same supplier without knowledge about this, i.e., they negotiated with the supplier independently, not aggregating the volume bought by the entire organization. This resulted in a higher price than would have been negotiated with higher

purchasing volumes. There were further unclear routines regarding authorization rules at some divisions, i.e. lack of authorization in the current process. There was also low usage of the purchasing departments; a great deal of purchasing professionals' time was spent on purchasing out in the organization, instead of achieving coordination advantages, for example.

An e-ordering system was thought to facilitate web (electronic) catalogues from which end-users should order. Through these catalogues, it should be easy to follow agreements, because only suppliers with a centrally negotiated agreement were accepted as catalogue suppliers. Further, purchasing did not have to be involved, because the order was to go directly to the supplier. This would give purchasing more time for analysis and strategic supplier agreement work and for promoting cooperation between sites. By end-users following the instructions in the e-ordering system, the right information about the purchase would be obtained, authorization secured and there would be the possibility of automatically matching invoices. Buying from fewer suppliers would further increase discounts, reduce prices and improve terms connected to the purchase. Fewer suppliers would also lead to lower administration costs.

At the end of 2001, the decision was taken by the executive managerial group to implement an e-ordering system, and a standardized e-ordering system from Oracle was bought.

Implementation, individual adoption and acceptance

The e-ordering implementation was divided into two phases: Release 1A and Release 1B. The plan was to start on a small scale with Release 1A, rolling out to a limited number of users, and the objective of Release 1B was to roll-out the e-ordering system to all organizational units within the organization.

In Release 1A, which started August 2002, the e-ordering system was rolled out to 320 users including requestors, authorizers, purchasers and goods receivers (who in many cases were the same person as the requestor).

At the E&S division, there were no problems in getting end-users to show up and participate in classroom training sessions. The problem was that when end-users who had received training were supposed to continue ordering by themselves, this did not happen. They instead continued to order from their choice of supplier and to use their old way of ordering (via the phone, e-mail or by visiting the supplier store).

The objective of Release 1B, which started February 2003, was to roll-out the e-ordering system to all organizational units.

At the end of March, all divisions within the organization had access to the system. End-users at E&S still preferred to buy items needed without using the e-ordering system, thus phoning or visiting the suppliers they were used to buying from. At R&D, end-users had begun to order their items through the system, thus increasing use of the system.

In December 2003, 4,000 end-users had been trained in how to use the e-ordering system, and usage of the system was gradually increasing, but there were still end-users who resisted using the system and they needed to be persuaded. Use of the system at the E&S division was still low or almost non-existent.

A problem at E&S was still that people who already had received information and attended training sessions did not continue to use the system when ordering. Persons who had attended two training sessions still felt it was difficult to use the e-ordering system.

Throughout 2004, the work with getting end-users to continue to use the system continued, resulting in increased use of the system when ordering indirect products and services at most divisions, also at the two studied divisions E&S and R&D. Use of the system at E&S was still low, however.

During 2005, use of the system increased. During this year, the E&S division made an extra investment that was initiated by the highest management at E&S. During a six-month period, extra resources supported potential users out in the division when ordering through the system. Two to three persons were involved from the central purchasing function and one consultant who only focused on supporting end-users. Training was given again in small groups, and help at the moment of ordering was offered.

By September 2006, compliance with supplier agreements was approximately 80% for indirect material (including products and services), 70% of all orders of indirect material went through the e-ordering system and 10% were estimated to go to suppliers with agreements, but not through the e-ordering system.

Structure of technology

At the E&S division, computer literacy was relatively low (compared to the R&D division), and for end-users who were not used to using the computer, the transition from ordering by phone and visiting the supplier store to ordering through the computer interface was difficult.

One further problem was that if they tried to order through the system, there were problems when filling in fields. A statement made by one of the

purchasing administration staff describes the “delivery day” problem, which illustrates the problems and consequences of failing to fill in all the fields.

“One problem that has received many complaints is that the delivery time in the system was set to 10 days automatically, and if end-users did not change to less time then they had to wait 10 days for the product to arrive, even though the supplier had the products in stock, because they thought that the customer wanted the product in 10 days not less. Many end-users forgot to change the number of days, and then had to wait 10 days for the product to arrive, which at the E&S division was too long, resulting in end-users having to visit the supplier store and there buying what had already been ordered in the system.”

(Purchasing administration person, August 2003)

Filling in fields with the right information and in the right manner was a problem for individuals at the division when trying to use the e-ordering system by themselves the first couple of times. Individuals learned from their mistakes through a process of trial and error. This process took some time, however, and demanded extra support. Filling in information in the system was time consuming for individuals who were not used to working with computers and who had not used similar information systems before. This was not the only problem, however. Other issues made it difficult for craftsmen at the division to use the system.

Other sources of structure

When the craftsmen at the division E&S finally understood what information to fill in and how, they realized that they could not wait for the products to arrive as was planned with the system. From the beginning, both at Release 1A and 1B, craftsmen who had received training had difficulties seeing how they could perform their work in a satisfying way when ordering through the system. Their tasks were sometimes urgent, and therefore difficult to plan ahead. These individuals were mobile in their work, making repairs throughout the organization premises. Repairs often had to be made in a hurry, and material was needed as fast as possible. Thus, some craftsmen were ordering up to 50 items a day, which took too long time to do in the system. Another issue was that there was some resistance to leaving their old suppliers and to ordering from new centrally chosen suppliers. How authorization would take place was also unclear, and there were worries that there would be a bottleneck, leading to a long waiting time before the products arrived.

An effort was made to increase use of the e-ordering system among craftsmen at E&S. It was decided by the central project group and representatives from the E&S division that E&S should be allowed to have a special solution, owing to the difficulty of combining working tasks with ordering through the system. Instead of saying, as before, that there is only one ordering process for the organization (and for the division), an effort was

made to facilitate use of the system also for craftsmen working at this division. They were allowed, for example, to order up to an amount of \$3,250 by phoning the supplier, if they needed the material immediately. The order, however, was to be registered afterwards in the e-ordering system and the purchase should still be made from suppliers with a central agreement.

Another special solution for the division was that authorization of orders up to a value of \$16,240 could be made by the purchasing administration staff at the division, considering the importance of getting the product right away. (The purchasing administration was always present and could authorize immediately when an order arrived in the system, compared to the managers who themselves were often out working in the field.) This was an adjustment to the working conditions at E&S. The normal procedure in other divisions was that it was always the manager who authorized the request (order) in the system.

If a person at the division had to order a product or service to a value exceeding \$16,240, he or she had to discuss the purchase with a professional buyer (purchasing professional) and get help with performing demand specification and an offer inquiry.

The more pragmatic view on how to order within the division was presented during training sessions that followed during autumn 2003. These sessions showed that it was also possible for end-users at the E&S division to use the system. Individuals still did not use the system for ordering, however. By this time, the craftsmen who had received training in 2002 and 2003, and then had tried to use the system by themselves, had forgot how to use it, i.e., to fill in information and how, and during 2005, extra resources were allocated to offering further training sessions and help at the moment of ordering. This kind of support in combination with more pragmatic use of the process resulted in an increase in orders through the system. During this period, users at E&S mainly learned how to use the free-text order to a greater extent, resulting in considerable increased use of the system.

Looking at the R&D division, it was initially communicated by the central e-ordering project group that all people should order indirect products and services by themselves, using the e-ordering system. This confused some of the researchers at the analytical function who, prior to the new system, had ordered by writing what they needed on a post-it note and giving it to the caretaker. Statements such as “I am a researcher, here to conduct research and not to spend time ordering products and services” were overheard when researchers were discussing the e-ordering system/project over lunch. Compared to the E&S division, however, end-users at R&D were used to working with computers and had experience of using other similar information systems, thus their computer literacy was relatively high. Persons working at this department further had the possibility to plan their work in

advance, i.e. they were not worried about having to wait a longer time for products ordered through the system than for products ordered by phone, fax or e-mail, nor were they worried that ordering through a computer interface would delay or affect their work.

After some time, researchers who had had a routine in which the caretaker ordered for the entire department, and who initially resisted using the system, decided to – instead of ordering themselves, i.e., doing what management had told them to do – ask the caretaker to order for them, which resulted in orders going through the system. The only difference compared to how they ordered before the system was that the caretaker now ordered from the suppliers through the e-ordering system instead of ordering by phone or e-mail.

Analysis

The analysis proceeds from DeSanctis and Poole's (1994) structures, i.e. structure of technology and other sources of structure.

Structure of technology

The restrictiveness and comprehensiveness of features, and their influence on adoption and use

In the e-ordering case, the system features are how to create an order, follow up an order, authorize an order and how to receive goods. They were identified by viewing teaching material describing the system features and by studying the actual e-ordering system.

The standardized e-ordering system implemented in the organization is viewed as a relatively restrictive system, because it is standardized. The users have to follow strict instructions on how to fill in information, otherwise the order will not go through, or will not be processed properly. The e-ordering system offers a great number of features to users, such as price information, article number, authorizer, delivery date, delivery address and account number. Thus, the system in focus here is also viewed as a comprehensive system, offering a great number of features that have to be filled in.

The high degree of restrictiveness and comprehensiveness of the order structure has affected use of the e-ordering system, making it difficult for the user. For most end-users, this has been an initial problem when ordering by themselves the first couple of times. After making mistakes, they learned and remembered what to fill in and how. This was mainly a problem at the E&S division; end-users at the R&D division did not specifically mention the restrictiveness and comprehensiveness of the systems structural features as something that had influenced their adoption and use.

Other sources of structures

Other structures influencing acceptance of the system are the content and constraints of a given task and structures within the organizational environment, such as corporate culture. Structures concerning the task and the organizational environment are analysed in this section, starting with the task structure.

Task

Identified from the case were three different task structures that enabled and/or inhibited acceptance of the system. They were structures regarding: 1) how to order, i.e. order routine, 2) how to perform ordinary working tasks, i.e. working routine, and 3) how to authorize orders, i.e. authorization routine.

1) How to order.

Looking at the case, end-users both at E&S and R&D felt it was more time consuming to use the purchase order (PO) structure within the e-ordering system than to use their previous order routine. Initial resistance to using the system was largely related to the required change in order routine. The discrepancy between pre-existing order routine and order routine with the e-ordering system thus inhibited initial use at both divisions.

Initially, the demand for changed order routine behaviour created some resistance among researchers within the R&D division. After this initial resistance, however, people began asking the caretaker for help with ordering instead of doing it themselves, thus resuming their old order routine. After returning to the old ordering routine, this was no longer an issue, and thus it did not inhibit acceptance of the system.

At the E&S division, the demanded change in order routine, i.e. to order through the system instead of phoning or visiting the supplier store, took more time to achieve and more resources were required to get users to accept the system, as compared to R&D.

It was difficult for individuals to change their order routine, and the discrepancy between the order routine prior to the system and within the new system thus influenced end-user acceptance of the e-ordering system for a couple of years. The order routine was also closely connected with how ordinary working tasks were performed and what needs had to be met in order for individuals to conduct their work properly.

2) How to perform ordinary working tasks

A further structure that influenced end-users' acceptance of the system was how ordinary working tasks were performed, and how well working routines corresponded with ordering through the e-ordering system. This structure inhibited use of the system at the E&S division for a couple of years; end-users had problems performing their ordinary work when having to order through the system.

This was not an issue for end-users at R&D. Their working routine, i.e. sitting in front of the computer, or being near a computer throughout the working day, and being able to plan their purchases in advance, corresponded well with ordering in the system, and thus enabled acceptance of the system.

The special solution, which was presented at the E&S division during 2003, made it possible to get orders into the system at the same time as craftsmen could conduct their work in a satisfactory way. Modifying the order structure when using the system, in order to better match working routines, facilitated use of the system also for end-users who made emergency repairs.

Even though this special solution was present already in 2003, it was not until 2005 that use of the system at E&S started to take off. The special solution allowed orders to be placed in the system, thus it enabled end-user acceptance of the e-ordering system. One reason why usage did not take off after the special solutions were decided on was that end-users had forgotten how to fill in information in the system. Further training sessions and help at the moment of ordering were needed to again teach end-users what to enter into the system and how.

3) How to authorize orders

For both E&S and R&D end-users, there was a difference between the authorization structure prior to the system and in the system, though this was mainly the case for end-users at E&S. The difference between the old authorization routine and that in the system caused some initial confusion for persons working in E&S. The authorization structure in the system inhibited acceptance of the system at the E&S division.

During 2003, a special solution for authorization at the division E&S was presented, solving the problem of manager authorization functioning as a bottleneck. By offering a modified (special) version of the authorization structure/routine when ordering in the system, end-user acceptance of the system was enabled.

At the R&D division, the authorization structure was never an issue, and the authorization structure prior to the system instead enabled use of the system.

This was because the previous authorization routine was similar to the authorization structure in the system.

Organizational culture

The organizational environment also provides structures that affect appropriation. A decentralized culture was observed at the case organization in the sense that persons working within the organization were used to taking their own initiatives and following them through, often without asking a superior. This behaviour was also observed in purchasing; people in the organization largely made their own choices regarding suppliers and products, not taking current supplier agreements into account. This decentralized culture made it difficult to get people to adopt and continue to use the system; it was difficult to tell employees how to make their purchases when they were used to deciding for themselves. The decentralized culture has affected use of the system throughout the implementation, by delaying acceptance of the system compared to planned use.

Conclusions

Structures that have affected (enabled or inhibited) acceptance of the e-ordering system in this case are the restrictiveness and comprehensiveness of the e-ordering system's structural features, how to order, work and authorize prior to the system and how well these structures correspond with ordering in the e-ordering system. Moreover, the culture within the organization, i.e., the fact that employees were used to having great freedom in deciding how to conduct their work and how to purchase the products and services needed, affected acceptance of the e-ordering system.

The high degree of restrictiveness and comprehensiveness of the e-ordering system's features (order and authorizing structure in the system) mainly influenced acceptance of the system initially, when the individual was going to use it for the first couple of times, by inhibiting acceptance. The process of individual learning of what to fill in and how can be compared to a trial and error process, in which individuals come to understand how to use the system by learning from their mistakes. When the individual learned what to fill in and how, however, the structural features of the e-ordering system no longer inhibited acceptance. But the case also showed that individuals forget what to fill in and how when they do not use the system regularly for some time, thus requiring further training sessions and help at the moment of ordering.

The order, working and authorizing structures affected acceptance of the system in different ways at the two studied divisions. The order structure initially inhibited acceptance of the system at both divisions. With time, however, the order structure at both divisions was modified somewhat to enable use of the system. The working and authorizing structures inhibited

acceptance of the system at the E&S division and enabled acceptance at the R&D division. After being changed somewhat at the E&S division, the working and authorizing structures also enabled acceptance of the system. Until the order structure and the authorization structure with the e-ordering system were modified (so that individuals could conduct their work as before), these structures inhibited acceptance of the system. Thus, prior to modification, it was not possible for craftsmen at the division to use the new system when ordering.

The organizational culture, which gave employees great freedom to decide how to conduct their work and how to purchase products and services, primarily affected acceptance of the system during the first couple of years. The reason was the difference between previously having the freedom to decide for oneself and being told to use a standardized tool by management. After a couple of years, however, people had got used to the instructions from above on how they were to purchase products and services.

Considering the importance of different structures over time, it can be argued that the restrictiveness and comprehensiveness of the e-ordering system features affected use during the first couple of years, when individuals had just begun to try out the system by themselves. This structure can be viewed as a first barrier to individual e-ordering acceptance. When managing what to fill in and how in the system, structures such as how to order, work and authorize can be experienced as either enabling use of the system or inhibiting use. If one of the structures inhibits use, it makes it difficult for the individual to use the e-ordering system. In order to facilitate individual use, all structures must enable or facilitate use of the system. To make it possible for individuals to use the system, inhibiting structures have to be modified so that they can enable use, as was illustrated in the E&S case. The structure described as a culture within the organization, where individuals had great freedom in conducting their work and in purchasing products and services, influenced acceptance of the system during the first couple of years, when individuals resisted accepting it.

Even if all structures enable individual use of the system, further resources and support may still be needed to get individuals to accept the system and increase their use of it. As is illustrated by the E&S case, at the end of 2003, the structures enabled use of the system at the E&S division, but it was not until 2005 that system use actually increased. What happened in 2005 was that the division invested extra resources (in the shape of three persons helping individuals at the moment of ordering), which together with the enabling structures affected system use. If the structures had not enabled use, the extra resources invested would have been wasted and use would have remained at the same level. The structures can thus be viewed as a hygienic factor that has to enable use for acceptance to occur. But it may very well be the case that having only enabling structures is not enough to increase use of

the system, other influencing forces such as extra resources, enforcement, etc., may have to be added for usage to increase.

Theoretical implications

The present research adds to our knowledge about individual e-ordering acceptance by presenting structures that enable and inhibit individual end-user adoption and use of an e-ordering system, and by presenting how these structures enable and inhibit use. This knowledge adds to the previous research on individual adoption and acceptance of these systems, research that to date has merely focused on the intent to use and what influences that intent (Van Raaij et al., 2007; Santema et al., 2006; Reunis et al., 2006). By adding knowledge about structures that inhibit and enable individual e-ordering acceptance, a greater understanding of the structures that influence individuals' actual use behaviour in relation to such systems is achieved. This new knowledge, together with previous research on intent to use and what influences that intent, provides a broader picture of what affects use or non-use of an e-ordering system.

Taking a closer look at how the present findings support and extend earlier work, we can begin with the work of van Raaij et al. (2007). Structures found to influence individual behaviour in the present paper can be connected to the two most important factors found to influence perceived usefulness and perceived ease of use (which in turn are argued to be the key determinants of the user's attitude towards the system and intention to use it) in earlier work by van Raaij et al. (2007): perceived order processing performance of the system and system usability. Processing includes order processing speed, order lead-time, on-time delivery, and order accuracy. Usability covers system availability, ease of navigation and screen loading. The present findings show that the factors processing and usability, presented by van Raaij et al. (2007), are more complex than described by van Raaij et al. (2007), and that the individual end-user, the e-ordering system and the interplay between the two need to be considered if we are to understand these factors in more depth. The routines of how to order, authorize and work all influence how the individual experiences processing with the system. These routines are thus also argued to influence how the individual perceives processing with the system. The routines presented and their influence on system acceptance thus contribute to a greater understanding of processing. The restrictiveness and comprehensiveness of the e-ordering system's structural features can also be added when describing the content of usability. Thus, the restrictiveness and comprehensiveness of the e-ordering system also influence acceptance. The present findings show that usability, too, is more complex than previously described.

The present results also suggest that only using enforcement methods or investing large amounts of resources, etc., does not necessarily lead to

increased system use. If structures (routines, etc.) do not enable acceptance of the system, individuals will not be able to use it, regardless of the resources invested and the methods of enforcement used. It is first when structures enable individual use that enforcement and resources can influence acceptance of the system.

The present findings, showing that structures such as routines affect individual acceptance of the e-ordering system, further support research by Jaspersen et al. (2005) and Limayem et al. (2001: 2007), who have claimed that habits (i.e., routines) have a direct effect on individual IS behaviour. Both Jaspersen et al. (2005) and Limayem et al. (2007) have argued that past behaviour or habits (i.e., routines) have a direct effect on behaviour over and above the effect of intention. Limayem et al. (2007) went one step further and argued that circumstances may exist under which the intention effect is partly or even entirely suppressed, and that in such cases intention can no longer be regarded as a reliable predictor of behaviour. The present paper argues that routines must enable (facilitate) acceptance of the system for usage to occur. If routines inhibit use, it does not matter how strong the individual's intention to use the e-ordering system is. If, for example, the individual cannot combine ordering in the system with working routines, then he/she cannot use the system, and any prior intentions to use it are irrelevant. This supports the argument made by Limayem et al. (2007), that there are circumstances under which the intention effect is entirely suppressed, and that in those cases intention cannot be regarded as a reliable predictor of behaviour.

Practical implications

The present paper argues that structures (i.e., different routines, etc.) affect individual e-ordering acceptance behaviour, either by inhibiting or enabling system use. The importance of having structures that enable use of the system is stressed, because this is vital to achieving usage and gaining on the IS investment. Structures of importance for individual use of e-ordering systems are routines for how to order, authorize and work. If these routines do not correspond well with ordering through an e-ordering system, the organization will have problems achieving system use. For an organization implementing an e-ordering system, one suggestion is to investigate prior to roll-out how routines for ordering, authorizing and working function at different divisions and departments, and how well these routines can be combined with ordering through the system. By having knowledge about which divisions and departments have routines that are possible to combine with (enable) system use, a roll-out plan can be created in which the system is first rolled-out to divisions and departments with routines that enable system use. This knowledge also helps in planning special solutions for departments whose routines inhibit system use early on in the project.

One way to identify structures, i.e. routines, is to talk to people who work at the different divisions and departments (i.e., not with purchasing professionals, but with persons working within operations that are supposed to adopt and then continue to use the system), and to spend a day or two observing how items are bought, authorizations carried out and work performed.

How one should adapt inhibiting routines to enable acceptance of the system depends on the inhibiting routines in question and how modifiable they are. The present paper presents an example of how one organization modified both ordering and authorization routines so that work could be done in a satisfactory way and so that orders could be placed in the system. Adapting inhibiting structures takes time and should be based on individuals' experiences of trying to use an e-ordering system and failing to do so, because, for example, using the system is not compatible with working tasks. This is a process of trying to conduct working tasks and trying out new ordering and authorization routines (with the system). If problems occur, thoughts and ideas about how to solve these problems and how to modify these routines have to be discussed and tested.

Limitations

The present paper has focused on structures that inhibit and enable acceptance, and used empirical data from a large pharmaceutical organization, which has been obtained through one case study. The present findings, thus, are not generalizable, but can inform other research settings. Because the focus was on structures and their influence, the present paper does not claim to give a comprehensive picture of what influences individual acceptance. Other issues not discussed in the present paper may also influence individual adoption and use. Issues brought up here, though not explicitly, are previous experience and knowledge of similar information systems, computer literacy, existing supplier relationships and resources allocated to help individuals at the moment of ordering.

Looking back, the suitability of using AST as an inspiration and starting point for investigating a standardized e-ordering system can be questioned. If we take a closer look at AST, it was developed as a means of understanding technologies specifically designed to facilitate social interaction, such as group decision support systems, and the e-ordering system has more of a task orientation than a social interaction orientation. There is no doubt, however, that the inspiration provided by AST has led to conclusions that increase our understanding of the structures that enable and inhibit individual end-user acceptance of e-ordering systems. Through the inspiration provided by AST, findings such as the influence of the technical structural features restrictiveness and comprehensiveness and the influence of routines – such as

ordering, authorizing and working routines – on acceptance behaviour have been brought to light.

Future research

The present paper has focused on structures and actual behaviour, and thus contributed to new knowledge on what influences individual acceptance of e-ordering systems. The findings have further supported earlier work on individual IS use by Limayem et al. (2007) and Jasperson et al. (2005), in that routines (i.e., habits) affect individual IS actual behaviour. A suggestion for future research is to further investigate the interplay between structures and intentions. Structures can both stand between intention and action and impact an individual's intention. One suggestion for future research is to try to increase our understanding of the relationship between intention and structures, and its influence on individual IS use.

References

- Arbin, K. (2003). E-procurement Maturity in Industry. *International Journal of Electronic Business*, 1 (4), 396-407.
- Arbin, K. (2008). The road towards successful e-ordering implementation: Success factors and barriers. *International Journal of Procurement Management*, 1 (4), 415-429.
- Barley, S. R. (1986). Technology as an occasion for structuring: evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly*, 31 (1), 78-108.
- Brandon-Jones, A. and Van Raaij, E. (2006). Towards an improved e-procurement quality (EPQ) measurement scale. In IPSERA conference proceedings, San Diego, US.
- Croom, S. R. and Brandon-Jones, A. (2005). Key issues in e-procurement: procurement implementation and operation in the public sector. *Journal of Public Procurement*, 5 (3), 367-387.
- Croom, S. R. and Brandon-Jones A. (2007) Impact of e-procurement: Experiences from implementation in the UK public sector. *Journal of Purchasing & Supply Management*, 13 (4), 294-303.
- Croom, S. R. and Johnston, R. (2003). E-service: enhancing internal customer service through e-procurement. *International Journal of Service Industry Management*, 14 (5), 539-555.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, 13 (3), 319-340.

DeSanctis, G. and Poole, M. (1994). Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory. *Organization Science*, 5 (2), 121-147.

Dooley, K. and Purchase, S. (2006). Factors influencing e-procurement usage. *Journal of Public Procurement*, 6 (1&3), 28-45.

Giddens, A., *Central problems in social theory: Action, structure and contradiction in social analysis*, Berkeley, California Press, 1979.

Giddens, A., *The Constitution of Society: Outline of the Theory of Structuration*, University of California Press, Berkeley, CA, 1984.

Jaspersen, J. S., Carter, P. E. and Zmud, R. W. (2005). A comprehensive conceptualization of post-adoptive behaviors associated with information technology enabled work systems. *MIS Quarterly*, 29 (3), 525-557.

Jones, M. R. and Karsten H. (2008). Giddens's structuration theory and information systems research. *MIS Quarterly*, 32 (1), 127-157.

Kulp, S. L., Randall, T., Brandyberry, G. and Potts, K. (2006). Using organizational control mechanisms to enhance procurement efficiency: how GlaxoSmithKline improved the effectiveness of e-procurement. *Interfaces*, 36 (3), 209-219.

Limayem, M., Hirt, S. G. and Chin, W. W. (2001). Intention does not always matter: the contingent role of habit on IT usage behavior. In conference proceedings of the 9th European Conference on Information Systems: Global Co-Operation in the New Millennium, Bled, Slovenia.

Limayem, M., Hirt, S. G. and Cheung, C. M. K. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS Quarterly*, 31 (4), 705-737.

Orlikowski, W. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, 3 (3), 398-427.

Orlikowski, W. (2000). Using technology and constituting structures: a practice lens for studying technology in organizations. *Organization Science*, 11 (4), 404-428.

Poole, M. S. and DeSanctis, G. (1990), Understanding the use of group decision support systems. In J. Fulk and C. Steinfield (Eds.), *Organizations and Communication Technology*, Beverly Hills, CA:Sage, 173-193.

Pozzebon, M. and Pinsonneault, A. (2005). Challenges in conducting empirical work using structuration theory: learning from IT research. *Organization Studies*, 26 (9), 1353 – 1376.

- Reunis, M. R. B., van Raaij, E. M. and Santema, S. C. (2005). Actor-to-actor dissemination of e-procurement adoption: an exploration of influencing factors. *Journal of Purchasing & Supply Management*, 10 (4-5), 201-210.
- Reunis, M., Santema, S. and Harink, J. (2006). Increasing e-ordering adoption: A case study. *Journal of Purchasing & Supply Management*, 12 (6), 322-331.
- Reunis, M. and Van Raaij, E. (2006). Scale development for e-procurement (EP) adoption influence tactics. In IPSERA conference proceedings, San Diego, US.
- Santema, S., Harink, J. and Reunis, M. (2006). Achieving E-Ordering Adoption with a Benefit Imbalance. In IPSERA conference proceedings, San Diego, US.
- Schwarz, A. and Chin, W. (2007). Looking forward: Toward an understanding of the nature and definition of IT acceptance, *Journal of the Association for Information Systems*, 8 (4), pp. 230-243.
- Van Raaij, E. M., Brandon-Jones, A. and Reunis, M., (2007). The impact of e-procurement quality factors on user acceptance of e-procurement systems. In IPSERA conference proceedings, Bath, England.
- Venkatesh, V., Morris, M. G., Davis, G. B. and Davis, F. D. (2003) User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27 (3), pp. 425-478.
- Venkatesh, R. and Kohli, A. K. (1995). Influence strategies in buying centers. *Journal of Marketing*, 59 (4), 71-83.

Tables

Authors	Major findings/suggestions
Arbin (2003)	Discusses the impact of resistance to breaking up old business relationships on adoption behaviour. The impact of management support on e-ordering adoption was identified, and it was concluded that lack of management support negatively affects adoption of an e-ordering system.
Dooley and Purchase (2006)	Discusses the importance of encouragement from management and other departments, and the importance of having sufficient financial and resource backing as internal support for achieving adoption.
Kulp et al. (2006)	Describes a case in which it was difficult to motivate employees to create new supplier relationships due to already established relationships with local suppliers. It was argued that because employees are familiar with particular manufacturers and their products, they may be reluctant to change suppliers, i.e. order from new suppliers in the e-ordering system.
Croom and Brandon-Jones (2005)	Discusses composition of the implementation project team. It was found that project teams that incorporated representatives from purchasing, finance, IT and HR were more successful than were those driven only by the IT function.
Reunis et al. (2006)	Mandating systems were found to influence the intent to adopt the system. Also peers were found to have substantial influence on each other, influencing adoption both in a negative and a positive way. Enforcement was found to result in initial system usage only. One conclusion presented is that the prerequisites should be in place before a mandate is initiated. The authors found that nearly all of the influence tactics presented by Venkatesh et al. (1995) (request, information exchange, recommendation, promise, threat, and legalistic plea) had an effect on the cognitive mechanisms presented by Venkatesh et al. (2003).
Santema et al. (2006)	Discusses the need for enforcement or a mandating system. One conclusion presented is that the prerequisites should be in place before a mandate is initiated.
Van Raaij et al. (2007)	Van Raaij et al. (2007) examined the relationship between perceived e-procurement quality (processing, content, usability, training and professionalism) and user acceptance of e-procurement. Their research model uses the five e-procurement quality factors as external variables to the technology adoption model (TAM) model by Davis (1989). The study confirms that user-perceived usefulness and ease of use of the system are key determinants of the user's attitude towards the system and intention to use it. Perceived usefulness and perceived ease of use, in turn, were influenced by user-perceived order processing performance of the system, system usability, and the professionalism of the user support function.

Table 1. Research on e-ordering adoption within organizations.

Appendix

Journals and databases searched

The databases searched were: ABI Inform Global, Business Source Premier/EBSCO, Emerald and Jstor. The journals that were searched for articles on individual e-ordering adoption and acceptance were: Journal of Purchasing and Supply Management, Journal of Public Procurement, International Journal of Procurement Management, International Journal of Electronic Business, Electronic Markets and Supply Chain Management: An International Journal. The researcher further inspected the IPSERA conference proceedings from 2002 to 2007.

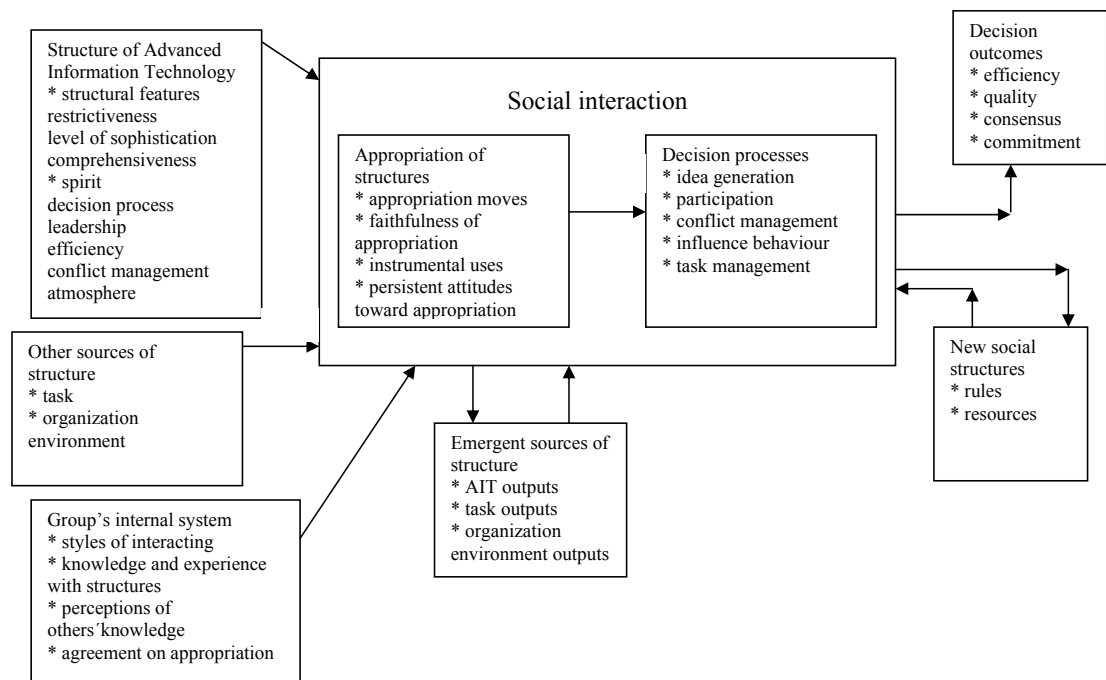


Figure 1. Summary of the major constructs and propositions of AST (DeSanctis and Poole, 1994).

Article 5

Individual e-ordering acceptance: An analysis of literature-generated practical recommendations

Katarina Arbin

Conditionally accepted for publication in International Journal of
Procurement Management.

Individual e-ordering acceptance:

An analysis of literature-generated practical recommendations

Abstract

The benefits of electronic ordering (e-ordering) systems are widely acknowledged, but achieving these benefits remains a challenge, in large part due to end-users' resistance to using such systems. The present paper aims at making a contribution to this area by analysing practical recommendations given in the literature on individual e-ordering acceptance, thus increasing our understanding of the possibilities managers have to influence adoption and use behaviour. The literature-generated recommendations are analysed using empirical data from a 4-year longitudinal case study conducted at an organization that in 2002 began implementing an e-ordering system and by 2006 had achieved the planned compliance rate.

Keywords: E-ordering, end-users, acceptance, adoption, use, practical/managerial recommendations

Introduction

The use of electronic ordering (e-ordering) systems combined with a centralized sourcing function holds the promise of reducing costs related to the purchase of indirect material (including both indirect products and services). The use of such systems for managing indirect purchases began at the beginning of 2000, and today (2008) most large organizations either have implemented, are about to implement, or are considering implementing an e-ordering system in order to reduce purchasing costs. E-ordering systems are used by end-users (requestors) in the organization when ordering indirect products and services (i.e., products and services that do not go directly into production). Such systems are viewed as one of the newer facets of electronic procurement and are currently being implemented in organizations worldwide (Schoenherr and Tummala, 2007).

One of the main motives behind a decision to implement an e-ordering system is the desire to reduce maverick or off-process purchases and to increase compliance (Croom and Johnston, 2003). Croom and Brandon-Jones (2007) identified two main areas of benefit to be achieved through e-ordering implementation: process cost improvements and purchase price reduction. They found that the costs associated with the procurement process were significantly reduced. The main route for achieving clear accountable costs savings, however, was through consolidation of specifications and suppliers, and greater compliance with existing contracts (Croom and Brandon-Jones, 2007).

In order to achieve these benefits, the system has to be adopted and used by individual end-users. Getting end-users to adopt and continue to use the system is viewed as difficult, and as important if an organization is to succeed with e-ordering implementation and to achieve reduced purchasing costs (Arbin, 2008; Reunis et al., 2004; Santema et al., 2006; Croom and Brandon-Jones, 2005; Reunis, 2005). There is a body of literature investigating what influences individual adoption and use of e-ordering systems, where 'intent to use' is used as the main proxy for behaviour (Van Raaij et al., 2007; Santema et al., 2006; Reunis et al., 2006). This literature, which contributes to a richer understanding of what influences individual end-users in their adoption and acceptance of an e-ordering system, has also presented practical implications and recommendations based on various findings. These implications and recommendations have rarely been commented on or discussed by subsequent research; they have, instead, been forgotten and connected solely with the theoretical findings in a specific article. This is the case despite the fact that indirect purchasing is currently receiving increased attention in organizations, and that many organizations are about to transform their indirect purchasing systems (Cox et al., 2005; Axelsson et al., 2005). Thus, there is a need for practical knowledge about how to affect individual end-users' adoption and continued use of tools such as e-ordering systems.

The present paper aims at aggregating these practical recommendations, which are based on theoretical findings, and at analysing the given recommendations. The analysis is conducted using empirical data from a longitudinal case study, in which the large organization under study implemented an e-ordering system in 2002 and achieved its planned compliance goal in 2006. The present paper thus aims at contributing to a greater understanding of practical recommendations intended to increase individual end-users' adoption and use of e-ordering systems.

The paper is structured as follows: First, practical recommendations generated from the literature on individual e-ordering adoption and use is presented, followed by a description of methodology. Thereafter, the case is briefly presented, followed by an analysis, in which practical recommendations generated by previous research on individual e-ordering adoption and use are analysed using empirical data from the case study. Thereafter, analysis conclusions are presented. The paper ends with a discussion section containing practical recommendations based on analysis conclusions.

Practical recommendations in the e-ordering literature

Focused on end-users' (requestors and authorizers) individual acceptance, i.e. adoption and use, of e-ordering systems in organizations, the literature-

generated practical recommendations, aimed at improving end-users' adoption and acceptance, are listed and aggregated in this section.

Previous research on individual e-ordering adoption was identified by studying academic journals and conference proceedings, and by searching on keywords such as e-ordering, individual, end-user, adoption, e-procurement, etc., in different combinations, in different databases (ABI Inform Global, Business Source Premier/EBSCO, Emerald and Jstor). (The journals that were searched for articles on individual e-ordering adoption and acceptance were: *Journal of Purchasing and Supply Management*, *Journal of Public Procurement*, *International Journal of Procurement Management*, *International Journal of Electronic Business*, *Electronic Markets and Supply Chain Management: An International Journal*. The researcher further went through the IPSERA conference proceedings from 2002 to 2007.)

Starting with work by Croom and Brandon-Jones (2005), they found that one of the key characteristics in achieving organizational support (i.e., individual adoption and acceptance) was the structure of the implementation project team. Croom and Brandon-Jones (2005) further recommended an inclusive project team structure (i.e., incorporating finance, IT, HR and other representatives), because this was found to allow far greater involvement by the system stakeholders and had the consequent benefit of directly addressing any user resistance.

Arbin (2003) claimed that lack of management support negatively influences individual end-users' adoption and continued use of the e-ordering system. Continuing by looking at the work of Axelsson (2005), he argued for the importance of achieving management support on all levels, not only the highest level, in order to encourage individual end-users to adopt and then continue to use the system. Axelsson et al. (2005) agreed with Croom and Brandon-Jones (2005) and stressed the importance of involving all stakeholders in the project in order to change purchasing behaviour. Axelsson et al. (2005) further recommended reserving sufficient resources in order to achieve end-user adoption and continued use of the system (i.e., to achieve the planned compliance goal).

Santema et al. (2006) and Reunis et al. (2006) have discussed the need for enforcement and mandating systems. In their work, Santema et al. (2006) and Reunis et al. (2006) showed the importance of mandating system usage to achieving higher and/or faster intra-organizational system adoption. It has been argued that a mandate results in near instant system compliance, and that persuasion and 'internal marketing' are very challenging due to the limited attractiveness of adoption at the end-user level. One recommendation to organizations using a mandate is that the prerequisites should be in place before the mandate is initiated (i.e., there should be suppliers to order from and products to order, and that the system itself should be defined). In order

to achieve intended end-user behaviour (i.e., the ‘right way’ of usage), an additional mandate was issued at the case organization studied by Reunis et al. (2006) (i.e., not paying invoices unless the purchase order was issued correctly), which caused end-users to order the ‘right way’.

Van Raaij et al. (2007) argued that processing (which includes order processing speed, order lead time, on-time delivery, and order accuracy) and usability (covering system availability, ease of navigation and screen loading) have the largest total affect on user acceptance, and that managers rolling out an e-ordering system should be aware of system selection and specification issues. Van Raaij et al. (2007) further recommended optimization of the order lead time, performance of the order processes and creation of an easy-to-understand user interface. Table 1 aggregates the literature-generated managerial recommendations on how to achieve individual end-user adoption and acceptance.

Insert Table 1 here.

Six different recommendation themes are presented. Four of the themes (management support, composition of the project team, resources and mandating systems) can be viewed as themes decided on and managed by managers on a high level. The two remaining themes (processing and usability) are connected to the e-ordering system specifically and how well it is functioning, offering advice more to people responsible for the actual e-ordering system and its technical features, such as system administrators and information technology experts.

Methodology

The present author has conducted a 4-year longitudinal case study at a large pharmaceutical organization, beginning in 2002 when the e-ordering system was introduced and ending in 2006, when the organization achieved its planned compliance goal of 80%.

Data collection

Thirty-three interviews have been conducted with different roles (Swedish purchasing manager, three different project managers for the e-ordering project, division purchasing manager, Swedish information manager, person responsible for system administration, system support persons, person responsible for the measurement model for e-ordering, external consultants involved in the e-ordering project, purchasers (working with sourcing), purchasing administration staff, system administrator at the division level, individual end-users; requestors, authorizers and goods receivers). Observations have been conducted for 28 full days in the daily work, at nine training sessions each lasting three hours and at other meetings about the e-ordering implementation. Further, an extensive amount of documentation about the e-ordering project has been collected.

The interviews were all semi-structured and lasted between 1-2 hours. Notes were taken during the interviews and were transcribed the same day into a Word document. At most interviews a tape recorder was used, which was useful when transcribing.

When observing, notes were taken during or just after the observations were made, and were transcribed the same day into a Word document.

How the analysis was conducted

The present author began by going through interview and observation protocols and other documentation, from the period January 2002 to September 2006, searching for empirical data about efforts made by the organization to achieve individual end-user adoption and acceptance of the e-ordering system, relating to the different recommendation themes. Text found about these efforts and their consequences was marked. By conducting the analysis this way, knowledge was obtained about how the organization had acted in relation to the literature-generated recommendations and, when recommendations were followed, how well they had worked, i.e. whether efforts had contributed to individual adoption and continued use of the e-ordering system.

The Case

The studied organization is one of the world's leading pharmaceutical companies, with 65,000 employees worldwide. The corporate headquarters are in London, UK, and the R&D headquarters are situated in Stockholm, Sweden. The research setting chosen for the study was the Swedish organization.

Purchasing at the Swedish organization had been decentralized for many years; the different divisions within the organization had managed both direct and indirect purchases by themselves with no interaction with other divisions. Divisions and departments had their own purchase-to-pay processes, which were different across departments and divisions.

In November 2001, a decision was taken to implement a standardized e-ordering system from Oracle. The Oracle system contains functions for ordering, authorization, goods reception and payment. Purchasing orders are made through the system, either from a supplier catalogue or through a descriptive free-text order. In 2001, the Swedish organization bought products and services for approximately \$2,150 million, of which half consisted of indirect spending. A business case study was carried out, in which yearly savings gained by using an e-ordering system in combination with a centralized sourcing were estimated to between \$30-50 million. The estimated savings of \$30-50 million would come from reduced purchasing prices (fewer suppliers, larger volume discounts and lower prices) and from a more efficient purchasing process. Ninety percent of the savings was estimated to come from reduced purchasing prices and the rest from a more efficient purchasing process.

The e-ordering project was divided into different phases, starting with a small roll-out of the system in August 2002 to 320 persons. The main roll-out was in February 2003, in which the system was to be rolled out to all divisions. At the end of March 2003, 2,000 potential users had received training. There was one problem, however: Potential users who had received training did not continue to use the system when ordering products and services. People tended to make purchases as they had done before, buying from their own preferred choice of supplier.

From April onwards, the emphasis laid on changing management in order to achieve changes in purchasing behaviour. In December 2003, 4,000 individuals had been trained to use the system. Use of the system was still relatively low, however, compared to purchases made outside the system. Efforts were made to increase usage of the system.

System use increased gradually, and since January 2006, it has remained at a stable level. The organization had achieved its compliance goal of 80% for indirect purchasing, of which 70% of all orders went through the system and 10% to suppliers with agreements, but not through the system.

Analysis of literature-generated managerial recommendations

The case organization finally managed to achieve its planned compliance rate of 80%, but only after having struggled with individual resistance to accepting the e-ordering system and to continuing to use it when ordering indirect products and services. This section aims at analysing the different managerial recommendation themes found in previous research dealing with individual e-ordering adoption and acceptance, presented in Table 1, in order to investigate their role in and importance for the successful outcome in this specific case.

Management support

Looking at the recommendation theme management support, one piece of advice to organizations introducing and implementing an e-ordering system is to make sure that management supports introduction and implementation. In the case organization, the e-ordering project and implementation has had support from the highest level of management from the beginning, throughout the introduction and implementation phases.

“It is good that the decision about the project has been taken in the highest management, by the CEO and the executive group, this will make it easier to roll-out the system.”

(E-ordering project manager 1, January 2002)

“Highest management is very clear about their view. It is the e-ordering system that shall be used when ordering products and services belonging to indirect material.”

(E-ordering project manager 2, July 2003)

“We have had management support throughout this time, for four years, that has been important to achieving this compliance rate of 80%.”

(Swedish purchasing manager and E-ordering project manager 3, September 2006)

Regarding support by other managers, on the division level and within different divisions, it has not been as clear.

“Right now, we are working with communicating and informing middle managers to get them to do what they should. We are currently facing some resistance from middle managers at the divisions. We now have to make sure that middle managers are working towards the e-ordering system being used when ordering indirect products and services. It will probably be easier when we start comparing usage figures among divisions and departments.”

(E-ordering project manager 2, July 2003)

“A general dissatisfaction has been communicated to division managers if their e-ordering usage figures have looked poor. It has then been up to the division manager to follow up and to push for change.”

(Swedish purchasing manager and E-ordering project manager 3, September 2006)

“One of the divisions that had relatively low usage figures made a huge effort last year, which has been driven by a strong focus from managers at that division, which paid off in greater usage of the system.”

(Swedish purchasing manager and E-ordering project manager 3, September 2006)

Initially there was no clear support for using the e-ordering system among middle managers within the organization, and among some managers, the e-ordering system did not receive the attention needed to get individuals at their division, department or group to adopt and then continue to use the e-ordering system (which can be regarded as natural, given that their core business and core working tasks do not concern purchasing). When the e-ordering project group had statistical usage figures to compare and show, however, the efforts made by middle managers to get individuals at their division, department or group to adopt and continue to use the system increased. As one of the quotations illustrates, after having shown the division manager at the division how low their division figures were compared to other divisions', a great effort was made at that division, resulting in an increase in individual adoption and continued use of the system.

The organization had support from the highest level of management, but initially lacked middle managers' attention and support. When it was possible to show and compare usage figures for different divisions, the attention and support among middle managers increased, resulting in more attention and focus from middle managers on how well individuals at their division were performing regarding use of the e-ordering system. The increased focus also resulted in more resources, which helped to achieve individual end-user adoption and continued use of the system. In the case organization, the support and attention of management, both on the highest level and among middle managers, have helped to allocate resources and to provide instructions to use the system that in turn have affected individual adoption and continued use of the system.

Composition of the project group

In previous research, it has been recommended that a project team have a structure that involves all stakeholders (i.e., incorporating finance, IT, HR and other representatives together with purchasing).

In the case organization, they did not live up to this recommendation initially. Different functions were represented, however, when deciding on which consultants would conduct the business case study for potential e-ordering implementation, i.e. one person from Finance, one from IT/IS and the Swedish purchasing manager at the time.

Initially, the project team consisted of a project manager with limited purchasing knowledge and several external consultants. The largest problem in regards to the composition of the project team was the lack of purchasing knowledge both in the project group and in the steering group, which initially consisted of the executive group.

“One problem was the lack of knowledge regarding purchasing within the organization, both in the project group and in the steering group.”

(E-ordering project manager 1, December 2003)

“The highest management was very supportive, but there was a gape between them and the project group, and I missed having a manager above the project for approximately 6 months before the new purchasing manager arrived. The project would also have needed a steering group that was more deeply rooted in business operations, and that had more practical knowledge about how purchasing currently worked and that had both formal and informal contacts in the organization.”

(E-ordering project manager 1, December 2003)

Later on in the project, the project group members were changed (to a smaller group, containing fewer consultants and more people employed by the case organization), and a new steering group containing individuals with purchasing experience was established. Representatives from purchasing within different divisions were also involved in the project, together with people from Finance and IT/IS (including IT/IS helpdesk persons). During one full day in June 2002, for example, approximately 40 people met to be informed about the project and to discuss it, representing different functions and different divisions within the organization.

Initially, the case organization had problems with getting end-users to use the system, which may have been influenced by the lack of purchasing knowledge and lack of knowledge about detailed business operations in the project group. Limited purchasing knowledge and business operations knowledge in the project team may have contributed to a more naive picture of reality, and contributed to not being able to anticipate impending problems related to purchasing and business operations. After purchasing representatives became more involved, system usage figures increased, which may be related to the addition of purchasing and business operations knowledge to the steering group and the project team.

Resources

The literature-generated recommendation is that sufficient resources should be available. At the case organization, resources were available throughout the project, and the highest management was willing to invest in the e-ordering project in order to reduce purchasing costs.

“In May 2002, we got acceptance from the executive committee for a changed budget and time-plan. The budget was enlarged and the time-plan was lengthened.”

(E-ordering project manager 1, December 2003)

In order to achieve the planned compliance goal more quickly, the project could have benefited from even more resources, because increased resources have contributed to increased adoption and continued use of the system. For instance, extra resources were invested at one of the divisions, which contributed to higher usage of the system by individual end-users.

“At one of the divisions, we made an investment in extra resources the last year. There were two to three extra persons from the project group situated at this division for six months, helping end-users at the moment of ordering, which increased use of the system at that division.”

(Swedish purchasing manager and E-ordering project manager 3, September 2006)

“We have so many users; we would like to go out to all users and say: Hi, now we are going to go through this. Going out and sitting next to people has proved to be very effective. One time is enough, approximately 20 minutes to get them to use the system in the right way. We should go out to each of them and help them at their own computers. But we don't have the time do to this.”

(Purchaser, responsible for the e-ordering system at one of the divisions, January 2004)

The recommendation theme resources seems to be important for organizations beginning their e-ordering journey, as the amount of resources can affect end-users' adoption and continued use.

Mandating systems

The case organization did not use a mandating system, thus, it did not force individual end-users to use the system.

“We have not chosen threats and constraints, we thus need to be patient, it must be allowed to take time.”

(Person responsible for system and process issues, part of the e-ordering project group, December 2003)

Although it did not use a mandate, the case organization managed to achieve the planned compliance rate. It did, however, use some enforcement in order to increase use of the system.

The practice of informing managers about low usage figures compared to other divisions and departments has functioned as a means of exerting pressure, leading to increased attention and focus among those managers exposed to such figures, which has led to increased resources to improve individual end-users' use of the e-ordering system.

"We are currently getting statistics from the system, where we have mapped all cost centres. So we can compare how much has been bought through the system with how much could have been bought through the system. For those departments that can increase their purchases through the system, we will go out and visit them at their workplace, showing how the system works."

(Purchaser responsible for the e-ordering system at one of the divisions, January, 2004)

Another example of a means of exerting pressure is an irritated reaction from the Finance function when making phone orders.

"I nowadays put all orders in the e-ordering system. You can't phone the supplier any longer, then you risk getting told off by the finance function."

(End-user (requestor) at one of the divisions, September 2006)

A third example of a means of exerting pressure is when the purchasing function at one of the departments said that they had stopped receiving paper orders.

"Previously we did manual purchasing orders. From a certain date the purchasing function at our division did not receive any manual paper orders. I don't know what would have happened if someone had sent a paper order after this date, it probably would have been processed, but no one did."

(Group manager at a department at one of the divisions, September 2006)

An external pressure that also functioned as a means of enforcement was that the organization had to follow the Sarbanes-Oxley Act of 2002, which requires increased transparency also in purchasing. This put pressure on managers at all levels to work towards increased transparency, i.e. to work towards increased use of the e-ordering system.

"An externally driven factor has been the Sarbanes-Oxley Act. Controls are made and then documentation has to be in place. This has made it important for the organization to also use the e-ordering system; in order to make transparent which suppliers we buy from and where the money goes."

(Purchasing manager and E-ordering project manager, September 2006)

The case organization did not use a mandate, yet it still managed to achieve its compliance goal through the system, which exemplifies that it is possible for organizations to achieve end-user adoption and continued use without using a mandating system. However, different ways of using enforcement can be useful tools in speeding up system use and in getting end-users to use the system as intended (i.e., to use catalogue orders to a large extent, and free-text orders to a lesser extent).

Processing & Usability

Previous research has claimed that “Processing” and “Usability” have the largest total effect on user intent to accept the system (Van Raaij et al., 2007). Processing includes ensuring that orders are processed quickly in the system, ensuring that orders get to suppliers quickly, ensuring that the lead time of orders is reduced with the system, and ensuring that orders arrive on time. Before continuing the analysis, the reader should understand that Van Raaij et al. (2007) claimed that “Processing” and “Usability” have the greatest effect on end-users’ system acceptance and that managers should be aware of this. Van Raaij et al. (2007), however, did not give any advice on how organizations should, for example, optimize order lead time, or on how they should ensure that orders arrive on time, only that it is important to achieving individual end-user uptake.

Processing

Looking at empirical data from the case organization in relation to “Processing”, one of the motives for implementing an e-ordering system was to achieve a more efficient purchasing process, i.e. orders were to be processed more efficiently than before. A standardized system from Oracle was bought and was intended to contribute to a more efficient purchasing process, through processing orders in the system. The idea was that orders were to be processed in the system, and that orders sent to suppliers were to be handled by the system. For the case organization, it was difficult to ensure that orders were processed quickly, that orders got to suppliers quickly, that lead time of orders was reduced (compared to prior to the system) and to ensure that orders arrived on time, because both individual end-users (requestors and authorizers) and the suppliers receiving the orders all played a part in how efficient the processing was to be. For the individual requestor, ordering through the system instead of using the phone or physically visiting the supplier was initially perceived as taking more time compared to before, in large part owing to the required behavioural change, i.e. having to fill in information, wait for authorization in the system, and then wait for the supplier to deliver the product (compared to the situation before, when the requestor either phoned the supplier, ordered the product, knowing when the product was to arrive, and got the formal authorization on the invoice after

the delivery of the product, or took a car to the supplier and bought the product instantly).

“Today it takes me 2 seconds, I just phone the supplier and tell him what I want and then he knows exactly what I need. I call the supplier and he fixes it, and the product arrives.”

(Craftsman, May 2003)

“When we are working, we often have to go by car up to the supplier to buy products; it may be urgent and important for the internal customer that the repair is made as fast as possible. You have to be able to go up to the supplier and buy your products. Sometimes it can be urgent and then you don’t have time to use the e-ordering system, you don’t have time to wait for the products to arrive. The e-ordering system should though be able to work sometimes, but it should also be ok to take the car up to the supplier, because the customer often wants the work done immediately.”

(Craftsman, November 2002)

One further issue that was viewed as positive from above (from a high management perspective) was that the order in the system was authorized in advance, before the order was sent to the supplier, which can be compared to the situation before, when orders were formally authorized at the same time as the invoice was authorized, which could be one month after the product had arrived. This new authorization routine worried some of the requestors, however.

“There is no chance that the manager will be able to authorize all orders; there are at least eight people who are buying a lot every day. Authorizing all orders only would be a fulltime job, he won’t have time for anything else.”

(Craftsman, November 2002)

So what did the case organization do to ensure an efficient “processing”? In order to simplify matters for managers who were authorizing, an e-mail was sent with information about orders, in which the manager could authorize instantly (this compared to having to log in to the system occasionally and authorize orders there).

For requestors who needed products quickly to be able to perform their work, a special solution was devised in which they (in special situations) could phone the supplier and order (in order to get the delivery the same or the next day). They were then to register the order in the system afterwards. The authorization issue was also solved with a special solution for people ordering many products who needed their products right away (i.e., needed authorization as fast as possible in the system). Under a certain amount, people working with purchasing were allowed to authorize orders in the system, i.e. so that orders could be authorized instantly, and thus requestors did not have to wait a day or two for the managers’ authorization, and for the order to be forwarded to the supplier.

The recommendation theme “Processing” is certainly something to think about before introducing such a system, taking into account the complexity of previous routines in combination with ordering products and services through an e-ordering system. “Processing”, however, has more to do with routines and how well these routines correspond with the e-ordering system than with the technical system itself.

Usability

Van Raaij et al. (2007) argued that “Usability” and “Processing” have the greatest total effect on user intent to accept the system. “Usability”, according to Van Raaij et al.’s (2007) definition, entails that the system should be available at all times, it should be possible to quickly move from one screen to the next, and easy navigation should be facilitated throughout the order process. Looking at the standardized Oracle system used by the case organization, it is available at all times; end-users can use the system whenever needed, not only during certain time intervals, for example. Further, the individual end-user can quickly move from one screen to the next and no signs of difficulties in navigation through the order process have been found in the empirical data. There has been another issue, however, related to usability that has influenced end-user use of the system, and this issue, i.e. the comprehensiveness and the restrictiveness of the systems structural features, is not included in the definition by Van Raaij et al. (2007). Users have initially found it difficult to use the system due to the extensive amount of information needed to place an order, compared to the situation before (i.e. in the system, information such as price, account number, delivery date and address have to be given for the order to go through).

The dialogue is written in italics, and explanatory text may follow in parentheses.

J: “I end up in shit directly. I’ve asked the supplier to fax me all information so I can fill it in, but there are problems all the time, I get so tired that I have to do this crap.”

(N from purchasing administration shows J how to fill in the requested information in the e-ordering system. First N helps J find the supplier. N then searches for the product/article number in the catalogue, without results. Because the product cannot be found in the catalogue, N places a free-text order, describing the product.)

J: “Now this will be sent to K.” (K is J’s manager and the person who authorizes J’s orders in the system.)

N: “When do you want the product?” (For the order to go through, information on the date when the product is wanted at the organization must be filled in.)

J: “Do you have to fill in that too... Well say Monday, the 23rd of June.”

N: "What's your delivery address, 318?" (Information about the delivery address has to be filled in for the order to go through, and number 318 is the number of the house where deliveries to the E&S division are normally sent.)

J: "No, I want the product to be delivered to 334."

(N tries to find number 334 in the system, but with no result.)

N: "You can't choose 334 in the system, you have to choose 318 and then write a message that the product should be delivered to 334."

(N is clicking her way through the system.)

N: "What account number is it?"

J: "Account number??!!" (J is very frustrated.)

N: "You have to go down and get the number." (J has information about the account number on the first floor, where he works.)

J: "What the hell, do you know how much time I've spent on this today."

N: "Should we do it later?"

J: "Delete the shit, and we'll do it next Monday."

Because the e-ordering system chosen by the case organization was a standardized system, only limited minor modifications in the technical system's structural features were possible. Efforts were instead made by the case organization to help end-users at the moment of ordering, and by offering the possibility to phone a special purchasing helpdesk and to ask for help and advice on what and how to fill in information in the system.

Any organization facing the start of an e-ordering project should be aware of that the system should be easy to use, because ease of use influences end-user adoption and use.

Analysis conclusions

Concluding the analysis, the case organization has acted in accordance with some (but not all) of the recommendations given in previous research. These decisions have not always been planned from the beginning, however, and solutions for getting individual end-users to use the e-ordering system have instead developed over time on the basis of experience.

Having the support of the highest level of management and the attention (and support) of managers on other levels as well have been shown to be important to achieving individual adoption and continued use of the e-ordering system, i.e. achieving and attaining the planned compliance rate. For

the case organization, support from the highest level of management has been present throughout the e-ordering project; though capturing the attention of managers on lower levels has been more challenging. This challenge has been overcome, however, in large part thanks to the support of the highest management and the use of statistical figures, which have been compared and shown to managers. These statistics helped capture the attention of managers who had not previously shown a great deal of interest in the e-ordering project or in individual use of the system at their divisions, departments and groups.

People working with purchasing were not involved in the project initially, which may have been one reason why it took more time than anticipated to get end-users to accept the system. The organization was not aware from the beginning, however, that the project group should contain representatives from different stakeholders, and it was difficult to find the suitable competence internally, which was one reason why the project team initially contained as many external consultants as it did. Over time, however, purchasing became more and more involved in the e-ordering project and increased their representation in the steering group and in the project group.

Having the support of the highest level of management throughout the project also meant that resources were available to the project. Had the organization invested even more resources (i.e., extra persons helping end-users at the moment of ordering, visiting them at their own working desk, etc.), however, it may have accomplished its goal of compliance earlier. At the case organization, an investment in a mobile helpdesk (i.e. persons helping end-users at the moment of ordering, at their own computer) at one of the divisions resulted in increased use of the e-ordering system. At a second division, visiting end-users at their workstations and showing them how to order in the system contributed to an increase in catalogue orders (end-users improved their knowledge of how to search in catalogues for their products, resulting in the use of catalogue orders instead of free-text orders).

The case organization managed to achieve its compliance goal without using a mandating system, e.g., telling employees that invoices originating from manual orders would not be paid, thus forcing end-users to use the system. Different kinds of enforcement were used at different divisions with the purpose of increasing adoption and continued use of the system. Enforcement methods used were: comparing and showing managers statistical usage figures, irritated reactions from the Finance department when phone orders were made, and communication from a purchasing function saying paper orders would no longer be processed.

The e-ordering system per se offered the possibility to achieve a more efficient process, but there were problems when end-users perceived their old purchasing behaviour to be more efficient (for them) than the purchasing

process offered by the system. The organization made an effort to overcome this problem by accepting special solutions for one division that had problems coordinating ordinary working tasks with ordering through the system.

End-users within the organization perceived the standardized e-ordering system to be accessible. It was also possible to move quickly from one screen to the next, and navigation throughout the order process was not experienced as a problem. The restrictiveness and comprehensiveness of the system's structural features, however, were perceived as a problem. To help end-users overcome the problem of the system being restrictive and demanding comprehensive information (compared to before when making phone orders or when visiting the supplier store), a helpdesk consisting of purchasing expertise was created that could help end-users answers questions about what information was needed and how to enter it into the system.

Summarizing the analysis conclusions, all recommendation themes proved relevant when looking at the case organization with regard to achieving end-user adoption and use of the system. The analysis, however, exemplifies that mandates are not always necessary in achieving individual use of the system. The analysis also shows that the recommendation themes "Processing" and "Usability" need to be expanded further in order to help organizations understand the complexity of dealing with end-user resistance to using the system, by including issues that influence the efficiency of the purchasing process other than the system itself.

Discussion and recommendations

For an organization that is about to introduce and implement an e-ordering system, it may be of great value to make sure in advance that as many of the literature-generated recommendations as possible are followed.

One recommendation that may be possible to follow from the beginning and that can be generalized to other organizations is to secure the support of the highest level of management and to successively work towards getting the attention and support from of managers on different levels within the organization. Getting the attention of middle management may be challenging, and if that is the case, one way of putting pressure on resistant or neglectful managers may be to show and compare usage figures between different departments, groups, etc. Another recommendation is to make sure that the e-ordering project team and steering group (and the likes) include people with both purchasing knowledge and knowledge about business operations. Further, both finance and IT/IS should be involved, because authorization and invoices are part of the e-ordering solution and because the e-ordering system is an information system that has to be run and hosted. A third recommendation to consider before introduction is the amount of

resources needed. Here, it is recommended that the organization save some resources for later, resources that can be transformed to mobile helpdesks and extra persons who can help end-users at the moment of ordering, after training sessions have ended and when end-users are supposed to continue to order by themselves in the system.

The organization studied here managed to achieve end-user adoption and continued use without using a mandate to force employees to use the system, thus showing that a mandate is not necessary, or may not be the most suitable method in all organizations for getting individuals to change their purchasing behaviour. This further shows that persuasion and ‘internal marketing’ can lead to individual end-users using the system, and using it in the intended way. It should be added that the studied pharmaceutical organization had a relatively decentralized culture, meaning that people working at the organization were used to taking their own initiatives and to carrying them through (which can be considered an important trait in people employed to generate ideas about new pharmaceuticals). People working at other functions were also used to having a task to perform and to solving it without constantly asking the manager for approval. It is difficult to say what would have happened if a mandate had been issued at the organization. System use could have increased faster or, on the contrary, resistance to using the system could have increased. Introducing a mandate in such a knowledge-based organization, which needs a decentralized culture in order to facilitate creativity and the discovery of new medications, could also have sent signals of a general increase in centralization, which in turn could have affected the pharmaceutical research being done.

It is difficult to give general recommendations about how to behave in order to ensure that orders are processed quickly in the system and that products arrive on time, because it can be argued that what is needed depends on business operations and on how orders have been made prior to the system. For an organization that includes business operations that are difficult to perform when ordering through an e-ordering system, one possible solution may be to accept special solutions for the specific group of people working with those operations.

That the system is user friendly – i.e. available at all times, allows movement from one screen to the next, and allows easy navigation throughout the order process – is something that the system software supplier has to consider when creating the system. Many organizations implementing e-ordering systems are large organizations that chose to buy a standardized system (compared to using an application service provider). Such a system gives the organization limited possibilities to adapt the system to its own special needs regarding usability. To those people responsible for selecting a system, however, one recommendation is to make sure that it is user friendly and that it is relatively well suited to the organization in question.

Finally, getting individual end-users to adopt and then continue to use the system is challenging, and many times the solutions that result in acceptance are based on the organization's own experience. If the organization (and highest management) is patient, individual end-user acceptance can be achieved and the compliance goal can be reached, the result being reduced purchasing costs for the organization.

References

- Arbin, K. (2003). E-procurement Maturity in Industry. *International Journal of Electronic Business*, 1 (4), 396-407.
- Arbin, K. (2008). The road towards successful e-ordering implementation: Success factors and barriers. *International Journal of Procurement Management*, 1 (4).
- Axelsson, B., Rozemeijer, F. and Wynstra F. (2005). The case for change. In Axelsson, B., Rozemeijer, F. and Wynstra F. (Ed), *Developing Sourcing Capabilities. Creating strategic change in purchasing and supply management*. John Wiley & Sons Ltd, Chichester, England.
- Axelsson, B. (2005). From buying to supply management at Nordic Construction Company (NCC). In Axelsson, B., Rozemeijer, F. and Wynstra, F. (Ed) *Developing sourcing capabilities. Creating strategic change in purchasing and supply management*. John Wiley & Sons Ltd, Chichester, England.
- Cox, A., Chicksand, D., Ireland, P. and Davies, T. (2005), "Sourcing indirect spend: a survey of current internal and external strategies for non-revenue-generating goods and services", *Journal of Supply Chain Management*, Vol. 41 No.2, pp.39-51.
- Croom, S. R. and Johnston, R. (2003). E-service: enhancing internal customer service through e-procurement. *International Journal of Service Industry Management*, 14 (5), 539-555.
- Croom, S. R. and Brandon-Jones, A. (2005). Key issues in e-procurement: procurement implementation and operation in the public sector. *Journal of Public Procurement*, 5 (3), 367-387.
- Croom, S. R. and Brandon-Jones A. (2007) Impact of e-procurement: Experiences from implementation in the UK public sector. *Journal of Purchasing & Supply Management*, 13 (4), 294-303.
- Reunis, M. R. B., van Raaij, E. M. and Santema, S. C. (2004). Actor-to-actor dissemination of e-procurement adoption: an exploration of influencing factors. *Journal of Purchasing and Supply Management*, 10 (4-5), 201-210.
- Reunis, M. (2005). Behaviorual interventions for intra-organizational adoption of EP. Proceedings of the 14th International IPSERA conference, Archamps, France.
- Reunis, M., Santema, S. and Harink, J. (2006). Increasing e-ordering adoption: A case study. *Journal of Purchasing and Supply Management*, 12 (6), 322-331.
- Santema, S., Harink, J. and Reunis, M. (2006). Achieving E-Ordering Adoption with a Benefit Imbalance. Proceedings of the 15th international IPSERA conference, San Diego.

Schoenherr, T. and Tummala, V. M. R. (2007). Electronic procurement: a structured literature review and directions for future research. *International Journal of Procurement Management*, 1 (1/2), 8-37.

Van Raaij, E., Brandon-Jones, A. and Reunis, M. (2007). The impact of e-procurement quality factors on user acceptance of e-procurement systems. Proceedings of the 16th IPSERA Annual Conference, Bath, England.

Tables

Recommendation themes	More in detail	From literature
Management support	Important to ensure support by highest management, and to ensure support on all managerial levels.	Arbin (2003) and Axelsson (2005).
Composition of the project group	A project team structure that involves all stakeholders is recommended (i.e. incorporating finance, IT, HR and other representatives together with purchasing).	Axelsson et al. (2005) and Croom and Brandon-Jones (2005)
Resources	Sufficient resources should be available.	Axelsson et al. (2005)
Mandating systems	Use of a mandate results in near instant system compliance. Additional mandates can be issued (for example, not paying invoices unless the purchase order is issued correctly) to achieve intended end-user behaviour.	Santema et al. (2006) and Reunis et al. (2006)
Processing	To ensure that orders are processed quickly in the system. To ensure that orders get to suppliers quickly. That the lead time of orders is reduced with the system, and to ensure that orders arrive on time.	Van Raaij et al. (2007)
Usability	The system should be available at all times. To quickly move from one screen to the next, and to allow easy navigation through the order process.	Van Raaij et al. (2007)

Table 1. Literature-generated managerial recommendations for achieving individual end-user adoption and acceptance.

EFI, The Economic Research Institute

Published in the language indicated by the title.

A complete publication list can be found at www.bhs.se/efi

Books and dissertations can be ordered from EFI via e-mail: EFI.Publications@hhs.se

Reports since 2006

2008

Books

- Breman, Anna. *Forskning om filantropi. Varför skänker vi bort pengar?* Forskning i Fickformat.
- Einarsson, Torbjörn. *Medlemskapet i den svenska idrottsrörelsen: En studie av medlemmar i fyra idrottsföreningar*. EFI Civil Society Reports.
- Helgesson, Claes-Fredrik and Hans Winberg (eds). *Detta borde vårddebatten handla om*.
- Jennergren, Peter, Johnny Lind, Walter Schuster and Kenth Skogsvik (eds). *Redovisning i fokus*. EFI:s Årsbok 2008. EFI/Studentlitteratur.
- Kraus, Kalle. *Sven eller pengarna? Styrningsdilemmat i äldreården*. Forskning i Fickformat.
- Petrelus Karlberg, Pernilla. *Vd under press – om medialiseringen av näringslivets ledare*. Forskning i Fickformat.
- Portnoff, Linda. *Musikbranschens styrningsproblematik*. Forskning i Fickformat.
- Sjöstrand, Sven-Erik. *Management: från kontorsteknik till lednings- och organisationsteori: utvecklingen på Handelsbögscholan under 100 år: 1909–2009*.
- Östman, Lars. *Den finansiella styrningens realiteter och fiktioner*.
- Östman, Lars. *Mycket hände på vägen från Buchhaltung till Accounting: delar av Handelsbögscholan under 100 år*.

Dissertations

- Axelsson, Mattias. *Enabling Knowledge Communication between Companies – the role of integration mechanisms in product development collaborations*.
- Benson, Ilinca. *Organisering av övergångar på arbetsmarknaden: en studie av omställningsprogram*.
- Elhouar, Mikael. *Essays on interest rate theory*.
- Farooqi Lind, Raana. *On capital structure and debt placement in Swedish companies*.
- Granström, Ola. *Aid, drugs, and informality: essays in empirical economics*.
- Hvenmark, Johan. *Reconsidering membership: a study of individual members' formal affiliation with democratically governed federations*.
- Höglén, Erik. *Inequality in the labor market: insurance, unions, and discrimination*.
- Johansson, Marjana. *Engaging resources for cultural events: a performative view*.
- Kallenberg, Kristian. *Business at risk. Four studies on operational risk management*.
- Kviselius, Niklas Z. *Trust-building and communication in SME internationalization: a study of Swedish-Japanese business relations*.
- Landberg, Anders. *New venture creation: resistance, coping and energy*.
- Pemer, Frida. *Framgång eller fiasko? En studie av hur konsultprojekt värderas i klientorganisationer*.
- Rosengren, Sara. *Facing Clutter: On Message Competition in Marketing Communication*.
- Schilling, Annika. *Kan konsulter fusionera?: en studie av betydelsen av identitet vid en fusion mellan konsultföretag*.
- Schriber, Svante. *Ledning av synergirealisering i fusioner och förvärv*.

- Sjödén, Henrik. *Tensions of extensions: adverse effects of brand extension within consumer relationship.*
- Strandqvist, Kristoffer. *Kritiska år: formativa moment för den svenska flygplansindustrin 1944–1951.*
- Strömqvist, Maria. *Hedge funds and international capital flow.*
- Söderström, Johan. *Empirical studies in market efficiency.*
- Sölvell, Ingela. *Formalization in high-technology ventures.*
- Thorsell, Håkan. *The pricing of corporate bonds and determinants of financial structure.*
- Ulbrich, Frank. *The adoption of IT-enabled management ideas: insights from shared services in government agencies.*
- Östling, Robert. *Bounded rationality and endogenous preferences.*

2007

Books

- Andersson, Per, Ulf Essler and Bertil Thorngren (eds). *Beyond mobility.* EFI Yearbook 2007. EFI/Studentlitteratur.
- Einarsson, Torbjörn and Filip Wijkström. *Analysmodell för sektorsöverskridande statistik: fallet vård och omsorg.* EFI Civil Society Reports.
- Ericsson, Daniel. *Musikmysteriet: organiserade stämningar och motstämningar.*
- Samuelson, Lennart (ed). *Bönder och bolsjevik: den ryska landsbygdens historia 1902–1939.*

Dissertations

- Ahlersten, Krister. *Empirical asset pricing and investment strategies.*
- Alexius, Susanna. *Regelmotståndarna : om konsten att undkomma regler.*
- Andersson, Magnus. *Essays in empirical finance.*
- Berg, Bengt Åke. *Volatility, integration and grain bank : studies in harvests, rye prices and institutional development of the parish magazines in Sweden in the 18th and 19th centuries.*
- Bianchi, Milo. *Of speculators, migrants and entrepreneurs : essays on the economics of trying your fortune.*
- Brodin, Karolina. *Consuming the commercial break : an ethnographic study of the potential audiences for television advertising.*
- Elger, Max. *Three essays on investment-specific technical change.*
- Hagberg, Axel. *Bankkrishantering : aktörer, marknad och stat.*
- Hinnerich, Mia. *Derivatives pricing and term Structure modeling.*
- Hjalmarson, Hanna. *En växande marknad : studie av nöjdheten med konsumtionsrelaterade livsområden bland unga konsument.*
- Hjelström, Tomas. *The closed-end investment company premium puzzle : model development and empirical tests on Swedish and British data.*
- Kraus, Kalle. *Sven, inter-organisational relationships and control : a case study of domestic care of the elderly.*
- Lindqvist, Erik. *Essays on privatization, identity, and political polarization.*
- Macquet, Monica. *Partnerskap för hållbar utveckling : systrar av Oikos och guvernanten som blev diplomat.*
- Melian, Catharina. *Progressive open source*
- Nilsson, Daniel. *Transactions in cyberspace : the continued use of Internet banking.*
- Petrelus Karlberg, Pernilla. *Den medialiserade direktören.*
- Portnoff, Linda. *Control, cultural production and consumption : theoretical perspectives, empirical dilemmas, and Swedish music industry practices.*
- Sköld, Martin. *Synergirealisering : realisering av produktsynergier efter företagssammanslagningar.*
- Sonnerby, Per. *Contract-theoretic analyses of consultants and trade unions.*

Tyrefors, Björn. *Institutions, policy and quasi-experimental evidence*.
Valiente, Pablo. *Re-innovating the existing : a study of wireless IS capabilities to support mobile workforces*.

2006

Books

Lundeberg, Mats, Pär Mårtensson and Magnus Mähring (eds) *IT & business performance: a dynamic relationship*. EFI Yearbook 2006. EFI / Studentlitteratur.
Thodenius, Björn. *Organisering av kunskap: en studie av Wallenberg Consortium North*. EFI Civil Society Reports.
Wijkström, Filip and Torbjörn Einarsson. *Från nationalstat till näringsliv?: det civila samhällets organisationsliv i förändring*.
Wijkström, Filip, Stefan Einarsson and Ola Larsson. *Staten och det civila samhället: idétraditioner och tankemodeller i den statliga bidragsgivningen till ideella organisationer*.
Östman, Lars. *Lysande ögonblick och finansiella kriser: Dramaten under ett sekel*.

Dissertations

Argentton, Cedric. *Quality provision in duopoly*.
Beckerman, Carina. *The clinical eye : construction and computerizing an anesthesia patient record*.
Borglund, Tommy. *Aktievärden i fokus : internationell påverkan på intressentrelationer vid förvärv och fusion*.
Breman, Anna. *The Economics of altruism, paternalism and self-control*.
Edquist, Harald. *Technological breakthroughs and productivity growth*.
Eklund, Jana. *Essays on forecasting and bayesian model averaging*.
Frostenson, Magnus. *Legitimitetskontrollen : en studie av etiska värderingars roll i gränsöverskridande förvärv och fusioner*.
Gaspar, Raquel M. *Credit risk and forward price models*.
Gustafsson, Peter. *Essays on trade and technological change*.
Hopkins, Elisabeth. *Is a higher degree of local currency pricing associated with lower exchange rate pass-through?: a study of import pricing in 51 Swedish industries*.
Kling, Ragnar. *Developing product development in times of brutal change*.
Langenskiöld, Sophie. *Peer influence on smoking : causation or correlation?*
Lychnell, Lars-Olof. *"Och fungerar det inte, gör vi på något annat sätt" : en klinisk fallstudie av IT-relaterat förändringsarbete i småföretag*
Meitz, Mika. *Five contributions to econometric theory and the econometrics of ultra-high-frequency data*.
Mendicino, Caterina. *Financial market imperfections, business cycle fluctuations and economic growth*.
Ovanfors, Anna. *Essays on nonlinear time series analysis and health economics*.
Paltseva, Elena. *Essays on commitment and inefficiency in political economy*.
Rogberg, Martin. *Den modeföljande organisationen : om acceptansen av TQM och andra populära managementmodeller*.
Silvennoinen, Annastiina. *Essays on autoregressive conditional heteroskedasticity*.
Sjögren, Ebba. *Reasonable drugs : making decisions with ambiguous knowledge*.
Slinko, Irina. *Essays in option pricing and interest rate models*.
Wilander, Fredrik. *Essays on exchange rates and prices*.