ROUTLEDGE STUDIES IN INNOVATION, ORGANIZATIONS AND TECHNOLOGY

Management and Information Technology

Challenges for the Modern Organization

Edited by
Peter Dahlin and Peter Ekman
Foreword by Lars Engwall

Management and Information Technology

Routledge Studies in Innovation, Organizations and Technology

1 **Innovation in the U.S. Service Sector**
Michael P. Gallaher, Albert N. Link and Jeffrey E. Petrusa

2 **Information and Communications Technologies in Society**
E-Living in a Digital Europe
Edited by Ben Anderson, Malcolm Brynin and Yoel Raban

3 **The Innovative Bureaucracy**
Bureaucracy in an Age of Fluidity
Alexander Styhre

4 **Innovations and Institutions**
An Institutional Perspective on the Innovative Efforts of Banks and Insurance Companies
Patrick Vermeulen and Jorg Raab

5 **Knowledge and Innovation in Business and Industry**
The Importance of Using Others
Edited by Håkan Håkansson and Alexandra Waluszewski

6 **Knowledge and Innovation**
A Comparative Study of the USA, the UK and Japan
Helen Brown

7 **Industrial Innovation in Japan**
Edited by Takuji Hara, Norio Kambayashi and Noboru Matsushima

8 **Managing and Marketing Radical Innovations**
Marketing New Technology
Birgitta Sandberg

9 **Mobility and Technology in the Workplace**
Edited by Donald Hislop

10 **Energizing Management Through Innovation and Entrepreneurship**
European Research and Practice
Edited by Milé Terziovski

11 **Innovating for Sustainability**
Green Entrepreneurship in Personal Mobility
Luca Berchicci

12 **Organizational Capital**
Modelling, Measuring and Contextualising
Edited by Ahmed Bounfour

13 **User-Innovation**
Barriers to Democratization and IP Licensing
Victor R. G. Braun and Cornelius Herstatt

14 **Working on Innovation**
Edited by Christophe Midler, Guy Minguet and Monique Vervaeke

15 Organization in Open Source Communities
At the Crossroads of the Gift and Market Economies
Evangelia Berdou

16 Theory and Practice of Triple Helix Model in Developing Countries
Issues and Challenges
Edited by Mohammed Saad and Girma Zawdie

17 Global Innovation in Emerging Economies
Prasada Reddy

18 Creativity and Innovation in Business and Beyond
Social Science Perspectives and Policy Implications
Edited by Leon Mann and Janet Chan

19 Managing Networks of Creativity
Edited by Fiorenza Belussi and Udo Staber

20 Managing Environmentally Sustainable Innovation
Insights from the Construction Industry
Bart Bossink

21 Management and Information Technology
Challenges for the Modern Organization
Edited by Peter Dahlin and Peter Ekman

Management and Information Technology

Challenges for the Modern Organization

Edited by Peter Dahlin and Peter Ekman

Foreword by Lars Engwall

Routledge
Taylor & Francis Group
NEW YORK LONDON

First published 2012
by Routledge
711 Third Avenue, New York, NY 10017

Simultaneously published in the UK
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

Routledge is an imprint of the Taylor & Francis Group,
an informa business

Typeset in Sabon by IBT Global.
Printed and bound in the United States of America on acid-free paper by IBT Global.

Library of Congress Cataloging-in-Publication Data

Management and information technology : challenges for the modern organization / edited by Peter Dahlin and Peter Ekman.
p. cm. — (Routledge studies in innovation, organization and technology ; 21)
Includes bibliographical references and index.
1. Management information systems. 2. Information technology—Management. I. Dahlin, Peter. II. Ekman, Peter.
HD30.213.M344 2011
658.4'038011—dc23
2011031158

ISBN: 978-0-415-88816-5 (hbk)
ISBN: 978-0-203-13452-8 (ebk)

To Professor Birger Rapp, Dean of the Swedish Doctoral Program Management and IT 2001-2011

Contents

Tables

Figures

Foreword

Computers, mobile phones, the Internet, and other features of modern information technology are omnipresent today. They have become the nerve system of modern society. Without them the organization of work both within and between organizations would look quite different, as would the everyday life of individuals in many parts of the world. However, it has not always been like this. It is not more than 65 years since the forerunner of computers, ENIAC (Electronic Numerical Integrator And Calculator), was ready for use.

ENIAC had a number of followers in different countries. They led to discussions of how many computers a country would need. Figures mentioned could often be counted on the fingers of one hand. Such conclusions were not unnatural, since the potential uses of these computers were difficult to imagine. In addition, the early computers were huge and required plenty of space. They were slow and were therefore tedious to use for a number of applications. For instance, it is mentioned in the literature that weather forecasting with ENIAC had its limitations since it took 24 hours to provide a forecast for the next 24 hours (Lynch, 2008, p. 50)! In addition, the early computers were somewhat unreliable, since they used radio tubes, which often broke down and had to be replaced.

Thus, if the computers from the time after World War II can be characterized as being few in number, very big, very slow, and relatively unreliable, the situation is completely different today. Computers are large in number. They can be found everywhere and in most cases are very small in comparison to the early ones. They are fast and are relatively reliable. This is indeed a revolution, which is well on par with the Industrial Revolution in the 18th and 19th century. It may even be argued that the revolution we have seen since 1945 has even wider implications than the Industrial Revolution.

We see more and more activities, where computers are competitive in relation to humans. The most recent example is the success of the computer Watson in playing Jeopardy against two earlier masters (*The New York Times*, February 17, 2011). And, as early as 1997 the computer Deep Blue defeated the then-World Chess Champion Garry Kasparov (IBM Research, 2011). In addition to these two spectacular examples of how computers not only match, but are superior to human capacity in more and more

dimensions, there is impressive evidence in present-day society that computers have what trade theorists since Ricardo (1817) have labeled comparative advantages in many cases.

The computer revolution has indeed been reinforced by the development of communication technology. The creation of the World Wide Web in the early 1990s, i.e. not more than two decades ago, facilitated the links between the multitudes of computers worldwide. In this way communication between organizations, between individuals and organizations, and between individuals has exploded. In this process the development of mobile phones in the direction of palm-sized computers has been extremely important. It has entailed not only an expansion of verbal communication but also of written communication through the Short Message Service (SMS), Facebook, Twitter, and other social media.

There can be no doubt that the previously-mentioned features of the development in the area of information technology during the past half-century or so have had wide implications for the management of organizations. This is true in terms of internal processes as well as of external relationships. With respect to the former, it is standard in all organizations today to have more or less sophisticated information systems to handle economic control, personnel planning, internal communication, etc. This has implied that much of what was previously manual work has become standardized in information systems. Nevertheless, there are few signs that the administrative overhead in organizations is decreasing. Rather the conclusion seems to be that new tasks have appeared through which employees interact through information systems.

In terms of the external relationships, the development of information technology has entailed that organizations now have new opportunities to communicate with their environment. A significant tool in this context is the website, through which modern organizations diffuse images of their excellence but also provide opportunities for their clients to have questions answered and to buy their goods and services. The latter is particularly true in relation to private consumers. As far as commercial relationships between organizations (i.e. suppliers, middle-men, and buyers) are concerned, modern information technology even makes it possible to integrate the activities of partners through joint systems for inventory reporting, cost accounting, scheduling, etc. In this way the networks of suppliers and buyers, which existed even before the IT revolution (cf. Håkansson, Ford, Gadde, Snehota, & Waluszewski, 2009), are reinforced. It will also have significant impacts on the level of stock-in-trade and the working capital of producing companies and trade companies.

Hence, the development of information technology has had significant implications for organizations in general. Certain industries have faced stronger effects, however. One of them is the financial service industry. Their working conditions changed dramatically in 1990s as a result of the development of information technology. What once was possible to lock in nationally

(financial capital) is nowadays floating instantaneously and globally between different financial institutions as well as between institutions and individuals. For this change, information technology can be considered to have been even more important than the changes in regulation that took place in the 1990s (cf. e.g. Engwall, 1994). In addition, the interaction between financial institutions, on one hand, and retail as well as wholesale clients, on the other hand, is increasingly handled within electronic systems.

Another industry, where the development of information technology has been extremely important, is the media. It started out as early as the 1970s as computer technology was entering the publishing houses, making the traditional graphical workers redundant (cf. e.g. Littleton, 1992). After this beginning of the use of information technology by journalists, it has become a significant part of journalistic work with the passage of time. What once was a field dominated by publishing houses, with reporters who wrote their stories one afternoon to have them printed on paper at midnight and distributed the next day, is now an industry including a multitude of electronic channels for immediate distribution. Needless to say, this has meant that the earlier newspaper publishers have had to consider the message of Theodore Levitt (1960) not to be myopic but to take a wider perspective.

All of the previously-mentioned points have also had implications for academic institutions. The measurement of citations and impact has become more and more sophisticated, thereby providing the basis for the allocation of resources between individual researchers as well as between institutions (Whitley, Gläser, & Engwall, 2010). It has also had significant effects on the opportunities for collaboration between scholars all over the world in joint research projects as well as in terms of the exchange of ideas.

At the same time it has not been obvious how the consequences of the effects of information technology should be treated in education and research within academic institutions. Over time we have seen in many universities the creation of departments of computer science in faculties of natural science and technology as well as departments of informatics in faculties of social sciences. While the departments in the first group primarily focus on computer design, data processing, and systems control, those in the second group are more directed towards behavioral aspects of computers. However, at the same time neither computer science nor informatics has become a major base for recruitment to management positions. Instead, programs of business studies have assumed that role, which in turn has made them a dominant feature in most modern universities (cf. e.g. Engwall, Kipping, & Üsdiken, 2010). Since this education traditionally has been directed towards the functional areas of accounting, administration, finance, and marketing (see e.g. Engwall, 2009), doctoral students in the management area have tended to specialize in these four areas. As a result the effects of information technology on organizations in general and business firms in particular have received less attention than might be desirable. It was therefore more than welcome when the Swedish Ministry

of Education in 2000 mentioned "Economic Sciences and IT" as one of 10 fields of priority when it invited universities and university colleges to formulate joint proposals for national doctoral programs (Government Bill, 2000/01:3, p. 154).

In response to the call, a group of professors from Swedish departments of management as well as informatics was able to create a consortium in order to make a tender. This group represented four seats of learning: the universities of Uppsala, Linköping, and Karlstad as well as the Blekinge Institute of Technology. The proposal of the consortium was eventually approved by Government. As a result the national doctoral program "Management and IT" was able start in the fall of 2001, as collaboration between seven seats of learning with Uppsala University as the host institution. Since then the program has enrolled altogether more than 100 doctoral students, who as of early 2011 have produced 32 doctoral theses and 35 licentiate theses. In this volume some of these authors present the findings of their research. In this way they are making an important contribution to the important and badly needed bridging between management and information technology.

The volume can be seen as a strong sign of the positive effects of a national doctoral program such as "Management and IT." The publication is the result of a bottom-up-project that was launched and pursued by the graduates themselves with no intervention from their former supervisors. Hence, my colleagues on the Program Board and I are very proud of the author group and feel that they have accomplished an important piece of work. On behalf of the Board I want to thank them all, particularly the two editors, Peter Dahlin and Peter Ekman, for their efforts and I wish that this book will become much appreciated reading among many scholars in the field of management and information technology. Last, but not least, I would like to express my deep thanks to my long time collaborator, Professor Birger Rapp, who took the initiative for our consortium and who for 10 years was the Dean of the National Doctoral Program Management and IT. The dedication of the book from the authors to him is extremely well deserved.

Lars Engwall
Senior Professor of Business Studies, Uppsala University
Chairman of the Doctoral Program Management and IT

REFERENCES

Engwall, L. (1994). Bridge, poker and banking. In D. E. Fair & R. J. Raymond (Eds.), *The competitiveness of financial institutions and centres in Europe* (pp. 227–239). Amsterdam: Kluwer.

Engwall, L. (2009). *Mercury meets Minerva. Stockholm: The Economic Research Institute of the Stockholm School of Economics* (First edition published 1992, Oxford: Pergamon).

Engwall, L., Kipping, M., & Üsdiken, B. (2010). Public science systems, higher education, and the trajectory of academic disciplines: Business studies in the United States and Europe. In R. Whitley, J. Gläser, & L. Engwall (Eds.), *Reconfiguring knowledge production: Changing authority relationships in the sciences and their consequences for intellectual innovation* (pp. 325–353). Oxford: Oxford University Press.

Government Bill. (2000/01:3). Forskning och förnyelse (Research and Renewal). Stockholm: Riksdagens tryckeriexpedition.

Håkansson, H., Ford, D., Gadde, L.-E., Snehota, I., & Waluszewski, A. (2009). *Business in networks*. Chichester: Wiley.

IBM Research. (2011). *Kasparov vs Deep Blue—The Rematch*. Retrieved March 14, 2011, from http://www.research.ibm.com/deepblue

Levitt, T. (1960). Marketing myopia. *Harvard Business Review*, 38(4), 45–56.

Littleton, S. M. (1992). *The Wapping dispute. An examination of the conflict and its impact on the national newspaper industry*. Aldershot: Avesbury.

Lynch, P. (2008). The ENIAC forecasts: A recreation. *Bulletin of the American Meteorological Society*, 89, 45–55.

The New York Times. (2011, February 17). Computer wins on 'Jeopardy!': Trivial, it's not, Page A1.

Ricardo, D. (1817). *On the principles of political economy and taxation*. London: John Murray.

Whitley, R., Gläser, J., & Engwall, L. (2010). *Reconfiguring knowledge production: Changing authority relationships in the sciences and their consequences for intellectual innovation*. Oxford: Oxford University Press.

1 Introduction

Peter Dahlin and Peter Ekman

In different ways and degrees, companies and organizations of today embrace the promises of productivity, knowledge development, and inter-organizational connectivity that contemporary information technology (IT) offers. Whether the motives are internal needs or external demands, the goal is increased efficiency or effectiveness, and whether the argumentation emphasizes added capability or decreased costs, companies have made IT an integral part of today's business world. This may be manifested in the form of enterprise resource planning (ERP) systems from SAP, knowledge management systems (KMS) from IBM, office packages from Microsoft, or network solutions from Cisco, but organizations likewise face a challenging integration of IT with their established business. By now, many organizations have already passed several cycles of IT implementation, and their current challenges are thus often a matter of migration rather than clean-slate implementations.

Information technology has changed companies as well as industries, and created new arenas for e-commerce, consultancy, outsourcing, and various types of services. The effects have been seen both within and between organizations, and in business-to-consumer as well as business-to-business settings (Leek, Naudé, & Turnbull, 2003). Through its important role for both business strategy and everyday operations, many organizations have continuously invested in IT and become increasingly dependent on it. As a result, they have also steadily increased their IT departments' resources and assigned chief information officers (CIOs) or chief technology officers (CTOs) when attempting to gain competitive advantages through the use of information technology. It has been put forth that future CIOs need to be recruited from business areas such as marketing or supply-chain managers, so that they can approach the issue with a holistic approach and have an understanding of the fundamental business functions that information technology is thought to support (Groysberg, Kelly, & MacDonald, 2011). These developments have also come to challenge and affect fields of academic research, both as information technology has made its entry into business and management studies, and as former technology-focused

research approaches have made room for perspectives that include the whole organization, and even external stake-holders. IT-related issues have attracted the interest of management researchers, and journals such as the *Academy of Management Journal*, *Management Science* and *Organization Science* have published numerous studies on IT. Several professional journals, such as *Harvard Business Review* and *MIT Sloan Management Review*, are also presenting current IT trends on a regular basis.

A discipline with a particular interest in the intersection between management and IT is Management Information Systems (MIS), for which IT is a focus, but the business context is a natural foundation. The discipline was manifested in the late '70s though the journal *MIS Quarterly* (Dickson, 1977), and has since been growing to constitute an established domain. The field has been shaped by the idea that IT-related research has been too closely focused on technical issues rather than managerial challenges (Grover & Sabherwal, 1989; Kling & Schacchi, 1982) and that there has been a gap between research and managerial practices (Lee, Gosain, & Im, 1999). There has also been a call for rich empirically grounded research to complement the conceptual or single-variable studies (Hamilton & Ives, 1982). With managerial trends like business process reengineering (Hammer, 1990; Davenport, 1992; Hammer & Champy, 1993) and knowledge management (Hansen, Nohria, & Tjerney, 1999; Nonaka, 1991), where the inclusion of information technology is one central theme, the discipline of MIS has found its role as an integrated approach towards management and IT.

Many relevant lessons can surely be learnt from studying information technology through managerial lenses and theories of business, organizations, and markets. There is a trend for references used in major MIS journals to be predominantly from the management field (Chapman & Brothers, 2005), and some of the top journals in the area, such as *MIS Quarterly* and *Information Systems Research*, are today highly ranked also in the wider field of management. Further work is needed, however, to synthesize the management streams in the MIS field to more achieve a more comprehensive understanding (Wu et al., 2006), and better theoretical and methodical distinctiveness is also called for (Avgerou, 2000). Thus, the current state of the MIS discipline is far from a technology issue *per se*—it is rather a managerial challenge where the nature of the technology needs to be understood. Business and IT strategies must be seen as one (Smaczny, 2001), which makes IT a naturally integrated part of management practice and management research. This also means that Information Technology, and Management Information Systems, are a natural part of research and education at today's business schools.

The focus of this book is precisely the challenging encounter between management and information technology (IT). It thus deals with how IT has come to influence business, as well as how business has come to influence IT. It contains 13 chapters to follow, by 13 scholars, representing both the business and the information systems disciplines. With its roots in the

forefront of the field, each chapter presents a contemporary study of how modern organizations utilize IT and the transformative aspect of information technology. Different theoretical approaches are combined with empirical renderings that provide insight into current practices in various domains, thereby offering an up-to-date selection of topics in the borderland between management and IT.

The volume offers substantiated lessons that hopefully are of interest to both academics and practitioners. To assist the reader, each chapter highlights some recommended reading that enables a deeper quest into the topic of that chapter and also includes a set of questions to inspire further discussion related to it. The structure of the book follows four different themes. The first part deals with organizational implications and challenges that reside within companies undergoing change or trying to uphold an entrepreneurial and learning spirit. The second part elaborates on the inter-organizational implications, i.e. how the modern organization's external partners influence the utilization of IT. The third part deals with the diffusion of IT and its effects on whole markets and industries. Finally, the chapters in the fourth part provide important input on how you, as a researcher or manager, can understand the meeting between IT and the organization. Each chapter is presented briefly below.

PART 1: ORGANIZATIONAL IMPLICATIONS

The chapter by Eva Lövstål presents how three expanding companies use formal control systems and IT, and discusses the common assumption that entrepreneurship and control are two business entities that are hard to combine. The chapter analyzes how managers in different organizations deal with IT given that computer-based information systems impose a dimension of control—something that can hamper the entrepreneurial drive of the firm. To be able to analyze and understand the effects of IT she proposes a levels of control (LOC) framework that includes different means of control and the codification and diffusion of IT. The result highlights important challenges that managers of entrepreneurial organizations face when they formalize their control forms, but also how IT can support this endeavor.

Chapter 3 by Gunilla Myreteg presents a medium-sized company's implementation of an enterprise resource planning (ERP) system, and it analyzes the different roles the employees take on when they face a new technology. Inspired by structuration theory, the analysis reveals how management and users interact with each other and with the technology, while striving to find an information system that fits them. The study highlights how the perception of IT can differ between the management and other organizational members, and the conclusions presented are valuable for any manager that is about to impose a new organization-wide technology.

Chapter 4 by Leon Michael Caesarius presents a pharmaceutical company's implementation of a knowledge management system (KMS) that was developed to share and expand its current knowledge and to obtain new knowledge. The chapter elaborates the need to include actors outside the organization when developing a knowledge management system and how this widened scope makes the venture more challenging. However, such ambitions may also lead to the development of knowledge that was formerly unknown to the company, which may enhance the organization's future business. The company in this case terminated its KMS project, but the chapter shows how they still gained from this venture, given that they discovered previously unknown and embedded knowledge.

Knowledge also entails the process of learning. Chapter 5 by Stefan Hrastinski discusses different modes of e-learning, i.e. IT-supported learning, and how management and organizations can gain from understanding the differences between different modes of learning. Through analysis of e-learning situations in management courses, the chapter contrasts asynchronous and synchronous e-learning. The results show that both have their advantages: While asynchronous e-learning gives the participants time to process the information offered and hence to increase their knowledge, synchronous e-learning allows for direct interaction which leads to a stronger learning experience and hence increased motivation.

PART 2: INTER-ORGANIZATIONAL IMPLICATIONS

Chapter 6 by Peter Ekman contains two case studies of the utilization of enterprise systems by multinational companies (MNCs). Supported by theories focusing on the inter-organizational aspects of business, including interpersonal interactions and relationships, the chapter shows how production-focused enterprise systems are not very well suited to the specific needs of the companies' marketers and salesmen. The study reveals a limited use of the enterprise systems in inter-organizational interaction, which is explained by inappropriate alignment of the features of the enterprise system.

Chapter 7 by Cecilia Lindh elaborates on how IT becomes an integrated part of inter-organizational business relationships, based on the analysis of survey data covering 353 companies' use of IT in their business relationships. The chapter presents how business relationships include elements of both exchange and behavior and that the involved companies' joint activities open up for the inclusion of IT in their future business. It also shows that the integration of IT in business relationships correlates with the strength of these relationships. Thus, the managerial implication is that a company's integration of IT is an indicator of how strong the company's business relationships are, as the two goes hand in hand.

Chapter 8 by Lars Frimanson presents case studies of how two companies use internal accounting information systems (e.g. balanced scorecard

and customer accounting practices) for inter-organizational coordination. Following the managerial trend of including more than merely financial data in company accounting systems, the analysis shows how such internal accounting information systems influence not only internal but also externally focused managerial decision-making to achieve inter-organizational coordination.

PART 3: INDUSTRY AND MARKET DYNAMICS

In Chapter 9, Peter Dahlin describes the emergence and development of business areas in tandem with technological development. Through an empirical study of mergers and acquisitions during 1994–2003, it presents a number of illustrative examples of how the IT sector was combined with other industries to form new business areas. The chapter discusses the expansion of the scope of a business sector on both a firm level, where a company strives to increase its set of products, resources, technology, and knowledge, and on a market level, where the expansion is about increasing business exchanges and expanding the business network.

Turning to economic factors of IT in Chapter 10, Maria Kollberg Thomassen presents the results of a study where she investigates the role of IT in the logging industry over several decades. A conclusion from this chapter is that managers need to incorporate more than short-term return on investments when measuring and evaluating the effects of IT investments. By elevating the perspective beyond the own organization, managers may assess the impact of IT investments from an industry perspective and also include how customers and suppliers are affected.

This is followed by Mathias Cöster's study, presented in Chapter 11, on how IT has affected the graphic industry. Cöster presents theories of economic development and applies these in an empirical study depicting the industry. The study describes how IT has had a major impact on the graphic industry's internal processes and on industry markets. One managerial implication is that the movement towards more IT-based production processes has forced the industry to make tacit knowledge explicit—i.e. what used to be based on the employees' craftsmanship is now handled by computer-based information systems that have embedded this formerly tacit knowledge in its functionality.

Pontus Fryk presents a longitudinal case study of digitization in health care in Chapter 12. His study shows that companies may benefit from approaching the process in terms of digitization, consolidation, and optimization, paying careful attention to the sequence. The study also illuminates the nature of the health care industry as a system constituted by complex organizations with multiple layers of actors—all of them with different needs and cultures. This diversity shapes the conditions for management and IT strategy development.

PART 4: RESEARCH AND METHODOLOGICAL CONSIDERATIONS

Chapter 13 by Christina Keller presents a discussion about the use of technology acceptance theories. The chapter describes the contemporary technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT), two established theories in the information systems discipline. The chapter contains a comparative case study of the use of virtual learning environments in higher education. Based on her empirical study, Keller offers criticism and reflections on the use of technology acceptance research, where one important lesson is that the acceptance of IT is colored by the organizational culture and whether there is support for the new technology throughout the organization. Another conclusion is that the information system needs to show proof of performance early in the implementation process to gain acceptance.

Finally, in Chapter 14, Magnus Hansson offers guidelines for analyzing qualitative data. The advantages of qualitative studies are that they allow the researcher to gain direct contact with the empirical material and they allow for exploration and theorizing. However, following the demand for rigor in research, it also comes with a number of challenges. Hansson presents how these challenges can be met through the use of a structured approach for theorizing qualitative data.

REFERENCES

Avgerou, C. (2000). Information systems: What sort of science is it? *Omega*, *28*, 567–579.

Benbasat, I., & Zmud, R. (1999). Empirical research in information systems: The practice of relevance. *MIS Quarterly*, *23*(1), 3–16.

Chapman, K., & Brothers, P. (2005). A reference study of leading MIS journals: Identifying formats, frequency, and journal subjects. *Journal of Business & Finance Librarianship, 10*(2), 17–29.

Davenport, T. H. (1992). *Process innovation: Reengineering work through information technology*. Boston, MA: Harvard Business School Press.

Dickson, G. W. (1977). Editorial preview. *MIS Quarterly*, *1*(1), iii.

Grover, V., & Sabherwal, R. (1989). An analysis of research in information systems from the IS executive's perspective. *Information & Management, 16*(5), 233–246.

Groysberg, B., Kelly, L. K., & MacDonald, B. (2011). The new path to the C-suite. *Harvard Business Review*, *89*(3), 60–67.

Hamilton, S., & Ives, B. (1982). MIS research strategies. *Information & Management*, *5*(6), 339–347.

Hammer, M. (1990). Reenginering work: Don't automate, obliterate. *Harvard Business Review*, *64*(4), 104–112.

Hammer, M., & Champy, J. (1993). *Reenginering the corporation: A manifesto for business*. New York: HarperBusiness.

Hansen, M. T., Nohria, N., & Tierney, T. (1999). What's your strategy for managing knowledge. *Harvard Business Review*, *77*(2), 106–116.

Kling, R., & Scacchi, W. (1982). The web of computing: Computer technology as social organization. *Advances in Computers*, *21*, 2–90.

Lee, Z., Gosain, S., & Im, I. (1999). Topics of interest in IS: Evolution of themes and differences between research and practice. *Information & Management*, *36*, 233–246.

Leek, S., Turnbull, P. W., & Naudé, P. (2003). How is information technology affecting business relationships? Results from a UK survey. *Industrial Marketing Management, 32*(2), 119–126.

Nonaka, I. (1991). The knowledge creating company. *Harvard Business Review*, *69*, 96–104.

Smaczny, T. (2001). Is an alignment between business and information technology the appropriate paradigm to manage IT in today's organizations? *Management Decision*, *39*(10), 797–802.

Wu, W. W., Lin, S.-H., Cheng, Y.-Y., Liou, C.-H., Wu, J.-Y., Lin, Y.-H., & Wu, F. H. (2006). Changes in MIS research: Status and themes from 1989 to 2000. *International Journal of Information Systems and Change Management*, *1*(1), 3–35.

2 Balancing Between Entrepreneurship and Control Through the Use of Management Control Systems and Information Technology

Eva Lövstål

Entrepreneurship is often associated with the creation of new ventures by individual entrepreneurs. But entrepreneurship has also been vividly discussed in the context of established companies, normally under the label 'corporate entrepreneurship' (Dess et al., 2003; Phan, Wright, Ucbasaran, & Tan, 2009). Entrepreneurship in a corporate context is often related to a particular way of running a company, characterized by a focus on, e.g. creativity, opportunity-seeking, and risk-taking (Meyer & Heppard, 2000a). It is suggested that such an entrepreneurial approach leads to innovations and thereby creates competitive advantage and improves the performance of the company (Covin & Miles, 1999; Ireland, Covin, & Kuratko, 2009). Consequently, managers within many large companies strive to create entrepreneurial ways of running the company, whereas managers in emerging and growing companies strive to preserve entrepreneurship (Meyer & Heppard, 2000a; see also Stevenson & Jarillo-Mossi, 1986).

However, several researchers stress that corporate entrepreneurship involves a challenge of dealing with tensional requirements (Stevenson & Jarillo, 1990; Meyer & Heppard, 2000b; Morris, Van Vuuren, Cornwall, & Scheepers, 2009). At the same time that managers have to administer existing products and processes and improve efficiency, they also have to create new ideas and support uncertain experiments. Accordingly, managers in many modern organizations face the challenge of balancing between such aspects as structure and chaos, creativity and efficiency, and freedom and control. This chapter addresses one such managerial challenge of tensional requirements: *the challenge of balancing between entrepreneurship and control.*

There are many forms of controls. They have been described and categorized in several different ways, for example, as formal and informal controls; administrative and social controls; and market, bureaucracy, and clan controls (Langfield-Smith, 1997). Social controls and clan controls are often informal, being based on unwritten policies, norms, and personal interaction. These types of controls are common in small organizations (Chenhall, 2003). They have little formal structure and control is mainly based on trust and

personal contacts. However, when companies grow there is a need to formalize the control forms and to introduce management control systems (MCS), such as planning and budgeting systems, performance measurement systems, and project management systems (Simons, 1995, p. 127; Davila, Foster, & Oyon, 2009). MCS are often assumed to be contradictory to entrepreneurship. In Meyer and Heppard (2000a), for example, it is stressed that many performance measurement systems—and related compensation systems—measure and reward managers based on short-term results, whereas entrepreneurship and innovations require a long-term perspective (see also Kanter, 1985). It is also stressed that MCS are based on ideas about stability and predictability, whereas entrepreneurship is surrounded with uncertainty, chaos, and ambiguity (Jelinek & Litterer, 1995). MCS have therefore been perceived as a hindrance to innovation efforts and entrepreneurial approaches. In line with this, the conclusion has sometimes been that the role of MCS should be minimal in entrepreneurial settings (Davila et al., 2009). However, findings from some empirical studies indicate the opposite, that MCS are appreciated and highly used in entrepreneurial settings (Lövstål, 2001) and also improve the performance of the companies (Simons, 1987).

Despite the need for both entrepreneurship and control in contemporary organizations and despite the assumed challenge of combining these elements, there are few management control frameworks that explicitly deal with this challenge (Morris et al., 2006). As Davila et al. (2009) stress, traditional management literature and management models do not handle the dynamic nature of entrepreneurship and do not incorporate the entrepreneurship part of management. The work by Simons (1995) can be seen as an exception, addressing elements related to corporate entrepreneurship. He presents a control framework that captures innovation, freedom, and creativity on the one hand, and control and predictable goals on the other hand. Simons argues that a balanced use of different MCS can create a dynamic tension between these conflicting elements. He also discusses the role of information technology (IT) when dealing with tensional requirements. He argues that IT—if properly designed and used—can allow for a more efficient and balanced use of MCS.

In this chapter Simons's framework and his ideas regarding the use of MCS and IT is presented. Empirical findings from three growing companies are then discussed in relation to his framework. The aim of the chapter is to use Simons's framework as an analytical tool when dealing with questions such as (cf. Mundy, 2010):

- How do managers use MCS and IT in their attempts to preserve and to foster entrepreneurship?
- In what respects do managers think of MCS and IT as enabling forces to entrepreneurship, and how is this reflected in the use?
- Are there unused potentials of MCS and IT when aiming for entrepreneurship?

A second aim of the chapter is to discuss the usefulness of Simons's framework when dealing with corporate entrepreneurship, and particularly in the context of growing companies.

In next section, Simons's framework is presented. Thereafter conducted empirical studies are described, both with respect to research methods and included cases. Each case is then described regarding the managers' thoughts and use of MCS and IT, and thus in line with Simons's framework. These descriptions reveal three different approaches to the use of MCS and IT, when attempting to balance between entrepreneurship and control in a growth situation. The chapter ends with a concluding discussion and some suggestions regarding the use of Simons's framework.

A PRESENTATION OF SIMONS'S LEVERS OF CONTROL FRAMEWORK

Simons's control framework—sometimes called the levers of control (LOC) framework (Bisbe & Malagueño, 2009)—has in recent years been acknowledged as an interesting alternative to more traditional management control models (Collier, 2005; Davila et al., 2009). Not only is it presented as an interesting alternative in a time when entrepreneurship and innovations are asked for. Some researchers do also emphasize—more generally—the occurrence of contradictory elements in today's business life and the need for frameworks and practices that capture and deal with such tensions (e.g. Sánches-Runde & Pettigrew, 2003).

Simons's framework is based on the idea that different control levers should be carefully balanced in order to handle tensional requirements of the business. Simons's framework and his original articles (e.g. Simons, 1987, 1990) have also been used as a base for empirical studies focusing on control aspects in dynamic and innovative settings (e.g. Davila, 2000; Bisbe & Malagueño, 2009). Besides that, the framework has been presented as a fruitful analytical tool, a tool for exploring those balancing challenges that managers face when using MCS (Mundy, 2010). Few researchers have, however, elaborated on Simons's ideas on information technology (IT) and how IT can be used when aiming for a balanced use of different MCS. Considering the importance of IT in most business operations today (Dewett & Jones, 2001), it is relevant to include this discussion when presenting and discussion Simons's work. Previous findings suggest that the introduction and use of IT can improve control processes and develop the competiveness of a company (Olugbode, Richards, & Biss, 2007).

Simons's framework consists of four types of MCS: belief systems, boundary systems, diagnostic control systems, and interactive control systems. Each system is related to a specific purpose, rather than to a host in the organization or to a specific type of information. Consequently, Simons stresses the importance of managers' *use* of different information-based systems. He says (1995, p. 4):

> *"The solution to balancing the above tensions [e.g. freedom and constrain] lies not only in the technical design of these systems but, more important, in an understanding of how effective managers use these systems."*

In the core of Simons's framework is business strategy (see Figure 2.1). The overall aim of the framework is to accomplish an effective implementation of the organization's business strategy, resulting in profitable growth. Accordingly, Simons has his roots within the field of strategic management, similar to many researchers discussing and researching corporate entrepreneurship (e.g. Meyer & Heppard, 2000b).

Figure 2.1 illustrates the purposes of each system. Compared to Simons's original figure, a modification has been made to capture the supporting role of IT. In a concluding chapter, Simons—referring to Boisot—stresses two information attributes which are important when discussing managers' need for control (1995, p. 184). These are information codification and information diffusion. *Information codification* relates to the degree in which raw data is compressed and codified into aggregated formats.

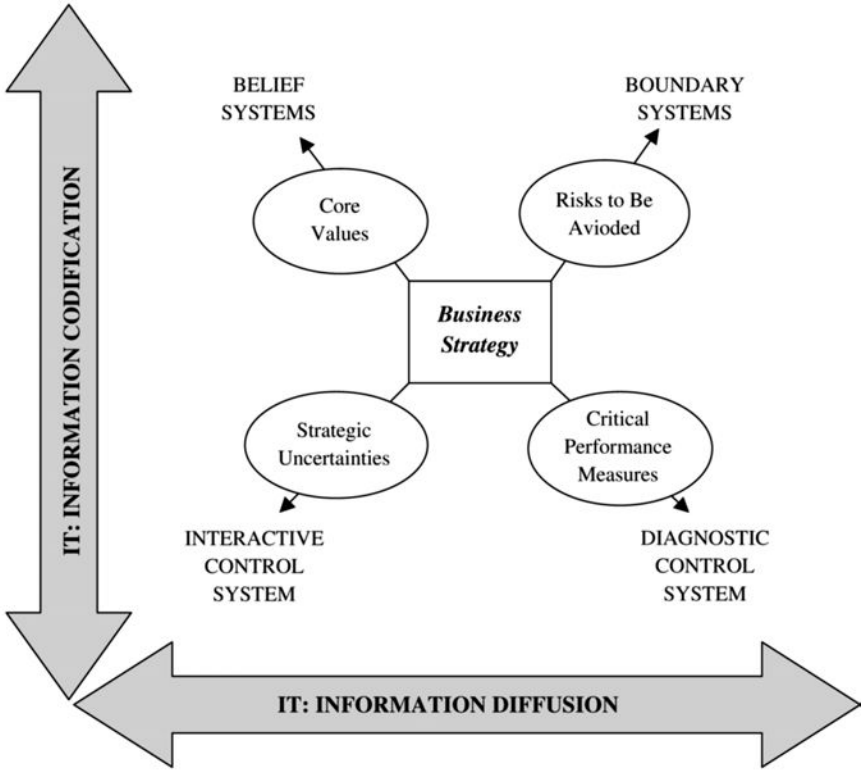

Figure 2.1 Simons's levers of control and the role of IT.

Information diffusion refers to the degree of information sharing within organizations. Simons stresses that different control systems have different information purposes and therefore should be codified and diffused in various degrees.

Belief systems reflect core values and should—according to Simons—inspire and direct the search for new opportunities. Examples of formal information-based systems which can be used for this purpose are mission and vision statements. This kind of information is hard to code (Simons, 1995, p. 188). However, IT can overcome distance and time and thereby increase the diffusion of uncoded and highly personal information. This becomes important as an organization grows and face-to-face meetings with all organizational members are hard to accomplish.

Boundary systems focus on risks that should be avoided and set limits on opportunity-seeking behavior. Capital budgeting systems, strategic planning systems, and codes of business conducts are examples of documents and systems that can be used for this purpose. Boundary systems, which should restrict search activity, hold information that is mainly rule-based. This kind of information is hard to codify and should be diffused only to those groups that are concerned (Simons, 1995, p. 189). Despite limited opportunities for codification and diffusion, IT can assure that boundaries are continually being communicated, without the involvement of managers.

Diagnostic control systems are designed to ensure predictable goal achievement. It should focus on critical performance measures. These systems are traditional feedback systems (see e.g. Anthony & Govindarajan, 2001). Performance and reward systems, profit plans and budgets, and project monitoring systems are some typical diagnostic control systems. Also Kaplan and Norton's balanced scorecard (1996) can be described as a diagnostic system. It is based on the idea that measures from several categories should be used when guiding the business towards desired goals. IT involves a possibility to increase the codification of the information transmitted in diagnostic control systems. More variables can be coded, enabling e.g. a balanced scorecard. IT also involves great opportunity with respect to diffusion. However, here it is—as Simons stresses (1995, p. 191)—important to design the system in a way that *restricts* the diffusion, in order to avoid divert attention and to prevent a surveillance climate.

Interactive control systems, lastly, direct attention to strategic uncertainties. They are used to stimulate organizational learning and the emergence of new ideas and strategies. They are formal information systems that managers use to involve themselves regularly and personally in subordinates' decision-making. Simons stresses that an interactive system is *not* a unique type of control system (1995, p. 96). Many different types of control systems, e.g. profit planning systems, revenue systems, and project management systems, can be used interactively by managers. When used in this way, control systems focus attention and force dialogue throughout the

organization. When it concerns interactive control systems, IT can increase both the degree of codification and diffusion. With the support of IT, the user may get better, more timely and relevant data. But an interactive control system must still rely on human interaction and face-to-face communication, since the main purpose of this system is to stimulate dialogue and learning (Simons, 1995, p. 193).

According to Simons, the power of his framework does not lie in how each system is used alone but how they are used together. For managers, the crucial thing is to select among systems and to use them in a way in which they complement each other. Belief systems and interactive control systems, which create more positive and inspirational forces, should be balanced with boundary and diagnostic control systems that are more negative and constraining systems. Systems that focus on strategy formation (belief and boundary systems) should be complemented with diagnostic and interactive control systems that are more focused on strategy implementation.

Simons's framework can be criticized. For example, it does not include informal controls. Shared values and norms, for example, are often created and communicated through informal controls, such as unwritten policies (Langfield-Smith, 1997). This may particularly be important when studying smaller organizations where informal controls often are important. It can be argued that the effectiveness of formal control systems is dependent on the nature of informal controls (Langfield-Smith, 1997). Simons's work does further reflect a traditional hierarchical idea, making a clear distinction between top management (who performs control) and lower levels of the organizations (that are controlled). An alternative model images managers more as co-participants in, e.g. the process of learning (Gray, 1990). Still another view is presented by Jelinek and Litterer (1995) when introducing the notion of 'shared management'. They argue that subordinates in entrepreneurial organizations are expected to take responsibility and to act as managers—and they also do. Hereby, the distinction between managers and subordinates becomes less prevalent than Simons seems to assume. On the other hand, the strength of Simons's framework is that it does not relate formal control systems with only financial control and accounting information, which is often the case (Langfield-Smith, 1997). Also, it does not equal financial control and accounting systems with a diagnostic use. These systems can also be used interactively.

A PRESENTATION OF THE CASES AND THE CASE STUDIES

The empirical illustrations—which will be used in this chapter—come from two different studies (Lövstål, 2001, 2008). The first can be described as an exploratory case study (Yin, 1994). The aim of the study was to explore managers' thoughts and use of MCS in a growing company, where entrepreneurship was stressed and aimed for. Some findings

from this study were quite unexpected and pointed at some interesting solutions to the tension between entrepreneurship and control. The second was a follow-up study, aiming at developing and testing results and interpretations from the exploratory study. In the second study, two other companies were included. Also these two companies were medium-sized and growing. They were also known as innovative, in the sense of searching and taking advantage of new opportunities.

However, the companies were in different growth stages and were standing in front of different challenges with respect to formalization and control. The managers did also have various solutions to the ambition to remain innovative and creative. These differences are summarized in Table 2.1.

The smallest company—here labeled '*the entrepreneur-led company*'—had recently passed the number of 30 employees at the beginning of the study. In this company, there were two people who were particularly important: the founder and an appointed CEO. They could be called the entrepreneurs of the company, since entrepreneurship was very much linked to them personally. In this company, they had just recently started to write down fundamental ideas and formalize the organizational structure, as well as the division of labor and responsibility. They were also looking for new ways of informing and communicating with the staff.

The company in the exploratory study—captured in the middle column in Table 2.1—had 35 employees at the beginning of the study. Two years later there were over 65 employees. The company was founded by four colleagues who all seemed to have an entrepreneurial mind-set (cf. McGrath & MacMillan, 2000). In this company, entrepreneurship was treated as an organizational culture by the founders, which explains the label *'the entrepreneurial company'*. The leading managers had initiated formalization of documents for a while. At the time of the study, they were focusing on decentralization, making organizational changes with the aim of creating departments with financial responsibilities.

The third and biggest company had approximately 100 employees during the initial interviews. Less than 2 years later, they had passed 150 employees. This company was part of a group of companies and had reporting

Table 2.1 Challenges in Studied Companies With Respect to Entrepreneurship and Control

Challenge \ *Company*	**The entrepreneur-led company**	**The entrepreneurial company**	**The development company**
Entrepreneurship	Continue being a risk-taker and pioneer	Create an entrepreneurial culture	Create creative and efficient development processes
Control	Increase documentation and formalization	Increase decentralization	Refine the control system

obligations to the head office of the parent company. The company was characterized by a more formal kind of control than the previous ones and a main focus was on refining the control system. In this company, managers stressed the importance of creating innovative and efficient development processes. Since development and the development process were at the core of this company, it is called *'the development company'*.

The empirical material from the two studies is primarily based on interviews with founders and managers. The main reason for choosing interviews was to investigate not only how managers used formal MCS but also how managers described and argued for this use, or non-use.

THE CASE OF 'THE ENTREPRENEUR-LED COMPANY'

Belief and Boundary Systems

Simons's framework primarily addresses *formal* information-based systems. In the entrepreneur-led company, there were quite few of them. At this point in time, the company was still small and there was little need for this kind of systems. Organizational control could yet be performed in an informal and personal way. Planning and financial control were mainly a matter for the entrepreneurs themselves, who still could have an overview of the business.

However, the entrepreneurs realized the need for an increased formalization and decentralization as the number of employees increased. Therefore, they had recently started to write down principles for the way of running and organizing the business in a quality manual. This document held fundamental ideas related to the company, what they called their 'quality policy'. It was made available on the company's website, and was in this sense diffused to costumers and other stake-holders. Since some of these quality policies had the character of core values and behavioral rules, the quality manual can be seen as an attempt to construct a formal belief and boundary system. But this was in principle their only formal belief and boundary system. They did not have a strategic planning system nor a capital budgeting system, two common systems which Simons presents as possible boundary ones, and they had no intention to introduce any of them. The entrepreneurs explained this by referring to their entrepreneurial way of planning and making decisions. According to the founder, they had always managed the business without any strategic and long-range plans. Instead, the business had been managed based on feeling, intuition, and quick decision. He says:

> *"It is about intuition. [. . .] We have never had any long-range plans, no five-year-plans, nothing. Instead, we have been sitting around the table for an hour or so and then stated: Now, we do that, and that, and that."*

He also says:

> *"It is the opportunity that makes the chief. And it is the same with business."*

Accordingly, the preparation of strategic and long-range plans was not in line with the entrepreneurs' planning philosophy; a philosophy that can be described as a practice of 'feeling one's way' and 'catching of opportunities'. Regarding decision-making, the entrepreneurs perceived themselves as being risk-takers and pioneers. And they were afraid that a capital budgeting system would make them slow and over-cautious in decision-making. This view was expressed by one of the entrepreneurs when he described a large and risky project. He says:

> *"If we had been accountants, we would never have done it. It was too expensive. [. . .] If we had made any calculations, then we would not have had the courage. . . ."*

To sum up, the only formal system in the entrepreneur-led company that had the character of a belief and boundary system was a ***quality manual***. Besides that, their belief system can mainly be understood as ***informal and personal***. And there was a ***conscious lack of formal boundary systems***, due to their entrepreneurial way of running the business. Since organizational control and communication were conducted personally and since planning and decision-making were made intuitively by the entrepreneurs, there was ***a limited use of IT***. It was mainly used to diffuse their quality policies to different stake-holders, by making them available on the website.

Diagnostic and interactive systems

In order to formalize their control system, the entrepreneurs had recently agreed upon some simple targets, e.g. growth rate and gross margin. The chief executive also revealed in a late interview that he had started to prepare a yearly income budget. He explained though that it was not an official budget and still only in his own computer. And the targets that they recently had agreed upon were labeled 'ambitions', as a way of playing down the importance of these. Besides that, they were not strictly followed up. Therefore, these targets did not really work in line with a diagnostic control system, as described by Simons.

The same related to their monthly reports. Each month, the accountant closed the books and prepared a monthly report for the company as a whole. These reports were appreciated by the entrepreneurs, but mainly in order to confirm what they already knew about the income result and financial position. Since they did not prepare any official budgets, the reports were not really compared with budgeted figures. Therefore, no variance analysis was

conducted. In this sense, neither of their monthly reports functioned as a diagnostic control system. And if targets were only ambitions and budgets unofficial there was no need to fulfill them, the entrepreneurs seemed to reason. Hereby, there was still room for risky and unplanned decisions.

The most important system in the entrepreneur-led company was the project costing system, which estimated costs for producing a machine and also measured and reported actual costs. One of the entrepreneurs expressed this in the following way:

> *"What is very interesting and what I regularly want reports on, is the project costing."*

This system was also the one that was mostly discussed, by the entrepreneurs and the production manager. Information from this system was used for improving the production process, but also for deciding upon what types of machines to invest in. This was probably the most interactive control system in the company, even if only involving three people in the dialogue.

Regarding the project costing system, IT played an important role since their computer-based system made it possible to register data in detail, such as data on used materials and production time in different operations. Hereby, the entrepreneurs could receive quite detailed reports and also ask for more information from the accountant if needed, something they stressed as an advantage. However, the possibility to diffuse information to staff and to themselves, through the use of IT, was not acknowledged and used. Costing reports were not made available on an intranet or similar network. The same related to monthly reports and financial targets. In general, financial information was not distributed regularly and systematically to employees, since it was seen as a matter for the entrepreneurs mainly. Some selected pieces of information were instead once in a while told orally at staff meetings.

To sum up, in the entrepreneur-led company they had a project costing system and a number of financial targets. They also prepared a yearly budget and monthly financial reports. When considering how these were used, their management control system can be described as having a ***'loose' diagnostic control system*** and a ***'limited' interactive system***. Targets and budgets were not strictly followed up and were seen as unofficial ambitions. The project costing system did only involve three people, hereby being quite limited. IT was mainly used for ***codification***.

Conclusion

In the entrepreneur-led company, the founder and the chief executive associated MCS with mainly negative and constraining forces, in relation to their entrepreneurial ambitions. They did not consider that MCS—if used in a proper and balanced way and with the support of IT—could foster

entrepreneurship and innovation. This explains why they delimited the use of formal planning and control systems. And the systems that they actually had were used 'loosely' and mainly by the entrepreneurs themselves. However, this does not seem to be a long-termed solution. It may work as long as the entrepreneurs have the financial responsibility and make all important decisions. But when they have to start to delegate, there will be a need for more formal control systems.

THE CASE OF 'THE ENTREPRENEURIAL COMPANY'

Belief and Boundary Systems

The entrepreneurial company gives us an example of a more developed and balanced MCS. First of all, managers at this company worked systematically and thoroughly with core values, or what they called the company's 'lodestars'. These lodestars had been written down by the founders as a way of preserving and communicating the core of the business as the company grew in number of employees. The lodestars were published in information pamphlets and on the company's website. They were also repeated and returned to in, e.g. introduction courses for newly employed and in staff meetings. These loadstars worked in accordance with the belief system that Simons describes. They also had a number of clear and strict behavioral rules, establishing limits for organizational members' actions and decisions. Some of these rules were written down. Others were communicated more personally and symbolically, e.g. through the founders' stories about previous times and examples of good and bad behavior. For example, the founders repeated all the time that it was better to make a mistake than to do nothing. Interesting was also how they used accounting information, e.g. sales information in order to illustrate proper behavior. For sales staff and agents, they told the story of the agent who became satisfied, who settled down, and started to administer existing business instead of searching for new markets, deals, and opportunities. His sales curve inevitably dropped, clearly illustrated in a sales chart. Hereby, the founders signaled that they did not want to have satisfied agents. They wanted hungry ones. And it was not proper behavior to stop searching for new market opportunities. These examples suggest that the founders and managers of the entrepreneurial company also worked systematically with boundaries, and also with the support of IT. IT made it possible to present data in diagrams, thus strengthening and visualizing a message.

To sum up, within the entrepreneurial company they had a '***tight' belief system,*** since the managers worked very much with core values, both formally and informally. They also had a clear boundary system, which was communicated both ***formally and symbolically***, for example

through the use of accounting figures. IT was actively used for ***diffusing*** core values as well as boundaries, however complemented by story-telling and personal meetings.

Diagnostic and Interactive Control Systems

In the company, they had one grand goal, as was declared by one of the interviewees:

> *"Growth is our aim!"*

The focus on growth had implications on their control system. They had clearly stated growth targets with respect to sales and revenues. Being a 'critical performance variable' (cf. Simons, 1995, p. 63), revenues were followed up closely and regularly. Variances from budgeted figures were analyzed further, in line with a diagnostic control system. However, the main aim of this follow-up was not to take corrective actions or to reward managers or sales people. The main aim was to motivate and learn. Therefore, the whole company celebrated when revenue goals were reached. Revenues and sales information also caused a lot of dialogue, among the founders, managers, subordinates, and agents. Accordingly, their revenue and sales system operated as an interactive system.

They had recently started to delegate financial responsibility at the time of the study. It meant that each department was organized as a revenue center or cost center. Based on growth targets, managers prepared departmental budgets. They were also requested to follow up the results of their department. Therefore, they received monthly reports that were used for comparing actual with budgeted numbers. Their budgeting system was then used in line with Simons's diagnostic control system. However, departmental heads did not have to report to a superior manager and account for taken actions. It was taken for granted that departmental heads read the reports, made necessary analysis and took corrective action, if needed. Their diagnostic control system was, in other words, based on trust. Being in a turbulent environment, they further stressed the importance of getting updated information quickly to concerned persons. Here then, IT played an important role. IT was also used for codification. However, there was no ambition to get a lot of different kinds of information, something that would be possible with the help of IT. Instead they stressed the importance of keeping the control system simple and of getting the right kind of information.

To sum up then, in this company some control systems caused a lot of discussion, particularly information related to sales and revenues. Therefore, it can be argued that they had a ***'tight' interactive system***. Their diagnostic control system can be described as ***'trusted'***, not really involving superior managers. IT played an important role, for ***codifying*** relevant data and for ***diffusing*** it quickly to those that were concerned.

Conclusion

In the entrepreneurial company, the founders worked with all levers of controls, in a balanced and fruitful way. By using all levers of control, they managed to both inspire for opportunity-seeking and to delimit the attention. The founders also used IT in a way that supported their control efforts. They used IT to overcome constrains in distance and time (cf. Simons, 1995, p. 186), and to make visual presentations. The founders also realized that some kind of information is not possible to code, and some should not be widely diffused. Also, by having a diagnostic control system that was based on trust, they avoided a surveillance culture where subordinates had to account for their actions and results to a superior.

THE CASE OF 'THE DEVELOPMENT COMPANY'

Belief and Boundary Systems

In the development company, the picture was somewhat different from previous ones. They had many formal control systems, particularly quantifiable controls. And contrary to the others, the managers did not talk much about core values. Actually, they did not seem to have any formal belief system, communicating such values. Or if they had one, they did not talk about it, signaling that it was not very important. They had, however, two formal control systems, which can be interpreted as boundary systems: a strategic planning system and a capital budgeting system. The strategic planning system was constituted by a number of critical success factors, which worked as a strategic framework. The framework was then translated into a plan on how to realize these success factors. Before making any strategic investment, they further had to determine if it involved a positive 'business case'. In order to do that, they used a capital budgeting system, which should prove that the value of a new component or a new product exceeded the cost to produce it. Both these systems obviously restricted the search for new strategic opportunities, and thus worked in accordance with a boundary system. Since these systems mainly concerned top management, IT was limited used.

To sum up, in the development company they had two systems that can be described as ***'strict' boundary systems***. Their critical success factors and the requirement of a positive 'business case' obviously restricted their search for new strategic opportunities. Their MCS can further be understood in terms of a ***lack of formal belief systems***. IT played a ***minor role***.

Diagnostic and Interactive Systems

In the company, they had a project management system, in which each project was planned and followed up. They further prepared a yearly budget for

the company as a whole as well as for departments. This budget was broken down into monthly periods and carefully followed up. All departments were cost centers, with financial responsibility. They worked very much with measurable targets. They had all types of goals: financial goals, activity goals, strategic goals, project goals, personal goals, department goals. As one manager explained:

> *"We have no grand and very critical goal. We have many small goals, in order to keep track of our development."*

They also had a formal performance measurement system, which they called the performance matrix. It was described as a curve chart and based on the idea that managers should collect points during the year, reflecting goal fulfillment. There was also a bonus system connected to this matrix. Besides these formal quantifiable control systems, they also planned to introduce a balanced scorecard.

IT was used for diffusing information to the staff. Internal monthly reports were published by the controller on the intranet and made available to managers. In these reports, managers also got some minor comments from the controller regarding budget deviations. The rest of the staff received information about the financial situation in a net-based newsletter. IT was also used for informing managers about subordinates' progresses. Several managers said that once a week they received an e-mail from their subordinates in which employees gave a brief report on what they had done during the week, and also their plans for the next week.

The use of these systems and of IT indicates that the control philosophy within the company was—what is sometimes called—output control or result accountability (e.g. Emmanuel, Otley, & Merchant, 1995). The idea was that organizational departments and members should be measured and rewarded based on output. This meant that most systems, e.g. the project management system, the budgeting system, and the performance measurement system, were used as a diagnostic control system. This concerned the company as a whole, all the way down to individual employees who had to account for their results and activities in relation to individual goals. The managers did not question the use of these control systems and they did not see any problems using them. They did, however, stress the importance of keeping them simple and to use the systems in a sensible and flexible way. They did not want to *"become a slave under the system,"* as one manager said.

A resource planning system, which they called the program plan, stated when and in what project different types of human resources should be involved. This program plan caused some dialogue among managers and organizational members, thereby having some interactive features. It was an important system since it centered on development projects and human resources, a crucial bottleneck within the company. The program plan was constantly changing and consequently not used for control, in the sense

of achieving goal congruence. However, discussions around the program plan seemed to be more of acute problem-solving than of identifying new opportunities.

To sum up then, the MCS in the development company can be described in terms of a ***'heavy' diagnostic control system***. Of course, there were some elements of the interactive control lever as well, however not so prevalent. Therefore, it can be argued that they had a ***'light' interactive system***, captured mainly in the program plan. ***IT was actively used***, particularly for diagnostic purposes. IT—through its codification—made it possible to have several systems and to monitor many different variables. IT was also used to diffuse information to managers with financial responsibility, and to collect information from lower organizational levels.

Conclusions

The development company had a formal control system that was dominated by a diagnostic use. This did not bother the managers and they did not ask for another type of control system, which created and supported entrepreneurship and innovation. One explanation is that they did not reason in line with this. They did not regard themselves as an entrepreneurial company, searching for new opportunities. Rather, they saw themselves as a development company which had to use resources efficiently and in a creative way in order to develop as many ideas as possible. As one manager expressed:

> *"We do not lack ideas. We have difficulties in developing them all. [. . .] We have a limited amount of resources."*

But as in the first case, it can be questioned if this is a long-termed solution since it does not involve a balance between, e.g. efficiency and innovation. Their MCS was focused on making processes more efficient, and left little room for strategy formation and for creative search of new opportunities.

DISCUSSION AND CONCLUSIONS

Previously, three different approaches to the use of formal MCS and IT in growing companies have been presented. We have 'the entrepreneur-led company' where the entrepreneurs are reluctant to the introduction of formal MCS since they believe that an increased use of these systems will make them less entrepreneurial. We have 'the entrepreneurial company' where the managers use MCS with the support of IT in a way that fosters entrepreneurship. And finally, we have 'the development company' in which managers mainly use control systems for boundary or diagnostic purposes.

What can be said about Simons's framework then? First of all, it can be argued that the framework is useful when describing empirical material, by providing a model with central control concepts and a link between them. The framework also helps us interpret and explain empirical observations. To give an example, Simons's framework makes it possible to understand the strength of the entrepreneurial company. It explains why the managers in this company managed to neatly balance between entrepreneurship and control, and between such things as efficiency and innovation. Simons's framework also makes us understand the use—and 'non-use'—of a formal management control system in the entrepreneur-led company. In this company, formal control systems were mainly related to negative forces, and they did not see the potential in a balanced and complementary use of different control levers. Neither did they see how IT could be used to overcome some of the constraints of the systems. They were still very much focused on personal and oral communication and information sharing.

Simons's model also provides us with some ideas on how management control can be improved and developed when aiming for both entrepreneurship and control. In this case, it gives us some hints on how the entrepreneur-led company and the development company can develop their control system, as well as the use of IT for control purposes. For example, by complementing a diagnostic use with Simons's other levers of control, a more balanced management control system may be created, a management control system which also leaves room for opportunity-seeking and creative learning.

However, and after having used Simons's framework in this chapter, there are some suggestions to make. A first suggestion is related to IT. Few researchers have studied and discussed the use of IT in relation to Simons's levers of control. After having included this dimension in the discussion, it can be claimed that IT adds an important dimension to the question of management control. It draws the attention to the fact that—besides a neat balance between different levers of control—there also needs to be a balance with respect to information codification and information diffusion.

It can also be noted that the work by Simons is mainly based on observations from large and mature organizations (see e.g. 1987) and the circumstances that characterize these companies, something that may explain his focus on formal controls and a 'top-down' approach. Considering this, it is also understandable why some of the observations are not really captured in the model. In the entrepreneur-led company, for example, organizational control was still performed in an informal and personal way. Information from formal systems was mainly used for and by the entrepreneurs themselves. Consequently, formal control systems were not used to control employees and to interact in subordinates' activities and decisions. Also, at the entrepreneurial company, there was not a clear division between superiors and subordinates, an assumption underlying Simons's framework. In this company, all employees were seen as managers at the same time as

no one actually used the title 'manager'. Considering this, the framework needs to be developed to also suit small and growing companies. Some initial developments have been presented here, by, e.g. drawing attention to informal control forms, but also by using terms such as 'trusted' diagnostic control system, 'tight' interactive control, and 'heavy' diagnostic control systems, as a way of creating a more nuanced picture of different uses of Simons's control levers. However, more empirical studies on small and growing companies are needed in order to continue this development.

DISCUSSION QUESTIONS

Based upon this chapter:

1. How can 'the entrepreneur-led company' and 'the development company' develop a more balanced control system, in line with Simons's framework?
2. How can the same system, e.g. a revenue system, be used for several of the purposes that are reflected in the different levers of control?
3. How can IT be fruitfully used—for each lever of control—when diffusing strategically important information to organizational members? And how can IT be misused?

RECOMMENDED FURTHER READING

Davila, A., Foster, G., & Oyon, D. (2009). Accounting and control, entrepreneurship and innovation: Venturing into new research opportunities. *European Accounting Review*, *18*(2), 281–311.

Meyer, G. D., & Heppard, K. A. (Eds.). (2000). *Entrepreneurship as strategy*. Thousand Oaks, CA: SAGE Publications.

Simons, R. (1995). *Levers of control*. Boston: Harvard Business School Press.

REFERENCES

Anthony, R. N., & Govindarajan, V. (2001). *Management control systems*. Boston: McGraw-Hill.

Bisbe, J., & Malagueño, R. (2009). The choice of interactive control systems under different innovation management modes. *European Accounting Review*, *18*(2), 371–405.

Chenhall, R. H. (2003). Management control systems design within its organizational context: Findings from contingency-based research and directions for the future. *Accounting, Organizations and Society*, *28*, 127–168.

Collier, P. M. (2005). Entrepreneurial control and the construction of a relevant accounting. *Management Accounting Research*, *16*, 321–339.

Covin, J. G., & Miles, M. P. (1999). Corporate entrepreneurship and the pursuit of competitive advantage. *Entrepreneurship Theory and Practice*, *23*(3), 47–63.

Davila, A. (2000). An empirical study on the drivers of management control systems' design in new product development. *Accounting, Organizations and Society*, *25*, 383–409.

Davila, A., Foster, G., & Oyon, D. (2009). Accounting and control, entrepreneurship and innovation: Venturing into new research opportunities. *European Accounting Review*, *18*(2), 281–311.

Dess, G. G., Ireland, R. D., Zahra, S. A., Floyd, S. W., Janney, J. J., & Lane, P. J. (2003). Emerging issues in corporate entrepreneurship. *Journal of Management*, *29*(3), 351–378.

Dewett, T., & Jones, G. R. (2001). The role of information technology in the organization: A review, model, and assessment. *Journal of Management*, *27*(3), 313–346.

Emmanuel, C., Otley, D., & Merchant, K. (1995). *Accounting for management control*. London: Thomson Business Press.

Gray, B. (1990). The enactment of management control systems: A critique on Simons. *Accounting, Organizations and Society*, *15*(1), 145–148.

Ireland, R. D., Covin, J. G., & Kuratko, D. F. (2009). Conceptualizing corporate entrepreneurship strategy. *Entrepreneurship Theory and Practice*, *33*(1), 19–46.

Jelinek, M., & Litterer, J. A. (1995). Toward entrepreneurial organizations: Meeting ambiguity with engagement. *Entrepreneurship Theory and Practice*, *19*, 137–168.

Kanter, R. (1985). Supporting innovation and venture development in established companies. *Journal of Business Venturing*, *1*, 47–60.

Kaplan, R. S., & Norton, D. P. (1996). *The balanced scorecard: Translating strategy into action*. Boston: Harvard Business School Press.

Langfield-Smith, K. (1997). Management control systems and strategy: A critical review. *Accounting, Organizations and Society*, *22*(2), 207–232.

Lövstål, E. (2001). *A quest for accounting and control within entrepreneurial organisations—the Roxtec Odyssey*. Licentiate Thesis. Lund University, Sweden.

Lövstål, E. (2008). *Management control systems in entrepreneurial organizations—A balancing challenge*. Doctoral Dissertation. Jönköping International Business School, Sweden.

McGrath, R. G., & MacMillan, I. (2000). *The entrepreneurial mindset*. Boston: Harvard Business School Press.

Meyer, G. D., & Heppard, K. A. (2000a). Entrepreneurial strategies. The dominant logic of entrepreneurship. In G. D. Meyer & K. A. Heppard (Eds.), *Entrepreneurship as strategy*. Thousand Oaks, CA: SAGE Publications, 1–22.

Meyer, G. D., & Heppard, K. A. (Eds.). (2000b). *Entrepreneurship as strategy*. Thousand Oaks, CA: SAGE Publications.

Morris, M. H., Allen, J., Schindehutte, M., & Avila, R. (2006). Balanced management control systems as mechanism for achieving corporate entrepreneurship. *Journal of Management Issues*, *18*(4), 468–493.

Morris, M. H., van Vuuren, J., Cornwall, J. R., & Scheepers, R. (2009). Properties of balance: A pendulum effect in corporate entrepreneurship. *Business Horizons*, *52*, 429–440.

Mundy, J. (2010). Creating dynamic tensions through a balanced use of management control systems. *Accounting, Organizations and Society*, *35*, 499–523.

Olugbode, M., Richards, R., & Biss, T. (2007). The role of information technology in achieving the organisation's strategic development goals: A case study. *Information Systems*, *32*, 641–648.

Phan, H. P., Wright, M., Ucbasaran, D., & Tan, W.-L. (2009). Corporate entrepreneurship: Current research and future directions. *Journal Business Venturing*, *24*, 197–205.

Sánches-Runde, C. J., & Pettigrew, A. M. (2003). Managing dualities. In A. M. Pettigrew, R. Whittington, L. Melin, C. Sánches-Runde, F. Van den Bosch, W. Ruigrok, & T. Numagami (Eds.), *Innovative forms of organizing*. London: SAGE Publications, 243–250.

Simons, R. (1987). Accounting control systems and business strategy: An empirical analysis. *Accounting, Organizations and Society*, *12*(4), 357–374.

Simons, R. (1990). The role of management control systems in creating competitive advantage: New perspectives. *Accounting, Organizations and Society*, *15*, 127–143.

Simons, R. (1995). *Levers of control*. Boston: Harvard Business School Press.

Stevenson, H. H., & Jarillo, J. C. (1990). A paradigm of entrepreneurship: Entrepreneurial management. *Strategic Management Journal*, *11*, 17–27.

Stevenson, H. H., & Jarillo-Mossi, J. C. (1986). Preserving entrepreneurship as companies grow. *Journal of Business Strategy*, *7*(1), 10–23.

Yin, R. K. (1994). *Case study research: Design and methods*. Newbury Park, CA: SAGE Publications.

3 The Challenge of Differing Actor Groups Within an Enterprise Resource Planning Project

Gunilla Myreteg

Enterprise resource planning (ERP) systems are integrated software packages that consist of a number of modules with a mutual database. All vendors offer their unique package of design, content, and technology. ERP systems are used in companies of all sizes, and promise benefits such as learning of best practices, better coordination, and adaptation due to real time data. Despite these promises, many companies implementing an ERP system express dissatisfaction with the system (Robey, Ross, & Boudreau, 2002). To advance our knowledge on how to take advantage of the possibilities of information technology (IT), it is important to understand why ERP systems do not perform as expected.

Findings from previous research are not complete and are to some degree conflicting. One problem lies in the fact that whether an ERP project is judged successful or not depends on who makes the judgment, when, and on what parameters. Another involves finding critical success factors or investigating risk factors in some phase of the ERP project (Aloini, Dulmin, & Mininno, 2007). That involves focusing on explanations of variations in outcome with the help of predictor variables, which has been criticized for yielding only a limited contribution to our understanding (Robey et al., 2002). Thus, one suggestion is to use process research to better explain how change emerges and develops over time (Covaleski, Dirsmith, & Michelman, 1993).

A seldom discussed aspect of ERP is who the users are, and why they express dissatisfaction with the system. Often we take for granted that everyone within a company shares the same view of the business and of its goals, the need for information, or the necessity of support with IT artifacts. This is an overly simplified view of the organization. Accounting research supports the notion of organizations as consisting of groups of actors with different interests (Boland, 1993; Spybey, 1989) or with different logics, regarding the need for information and accounting languages (Scapens & Roberts, 1993; cf. Burns, 2000). Evidence has been put forward on tensions or conflicts between production managers and sales managers due to differences in targets (Roberts & Scapens, 1990), or conflicts based on differences in logics (production logic vs. accounting logic; Scapens & Roberts,

1993; Burns, 2000). We lack any deeper knowledge on these differences in logics of thought, why they occur, where, and how we might spot them. Research has not investigated the occurrence and importance of groups of actors in the context of ERP systems. The present study addresses this gap. What actor groups can be identified, and how do they deal with the selection and implementation of an ERP system?

ORGANIZATION AND ERP SYSTEMS: AN INTERACTION BETWEEN HUMAN ACTORS AND TECHNOLOGY

One basis for the chapter is an assumption that ERP systems are embedded systems. By this is meant that an ERP system as an artifact is developed, or grows, out of a complex and dynamic social context. ERP systems cannot be viewed as the dependent or independent variable, but instead is embedded in the circumstances of its use (see Orlikowski & Iacono, 2001). It is not technology *per se* that changes the behavior within an organization; an ERP system does not determine action. Actors and technology interact (Orlikowski, 1992, 2000).

Another starting point for the chapter is the theoretical view of social life as a duality between structures and actions (see Giddens, 1984). Structuration theory has been criticized for being too difficult to use in an empirical investigation (Archer, 1995), and Giddens has counseled researchers to use his model as a sensitizing device, as a means of directing the researcher's interest. In a social system, as in an organization, structure is orienting the conduct of agents by constraining and enabling activities. The selection and use of an ERP system is therefore not an issue that can be isolated from what organizational structures have developed over time, throughout the history of the organization (cf. Barley & Tolbert, 1997; Burns & Scapens, 2000).

Analytically, structures can be divided into three dimensions, where actors draw upon structures when they act. Using the structuration model as a sensitizing device in the setting of selection and implementation of an ERP system, Giddens's three dimensions were adapted into *participation* in the process (domination, facility), *perceptions* of ERP (signification, interpretative scheme), and *norms* of ERP use (legitimation, norm; cf. Christiansen & Skaerbaek, 1997; Hartwick & Barki, 1994). *Participation* relates to actors' possibilities to take part in the ERP project, compared to their power base, time available, and IT competence. *Perceptions* involve questions on how actors view IT and ERP systems: are they necessary and what sort of impact does they have? *Norms*, finally, are related to notions of how, when, and why the ERP system should be used. Based on these theoretical assumptions, this study investigates how user groups within an organization differ with regard to participation in the process,

perceptions of ERP, and norms of ERP use. The aim is to identify actor groups and to explain how they deal with the selection and implementation of an ERP system.

METHOD

The chapter is based on a case study that was carried out from June 2003 to April 2005. The case company is a medium-sized manufacturing company (ABG). The case was constructed on the process of selection and implementation of an ERP system. Information about the organization, participating actors, and the process was collected through interviews, observations, and documents. The ambition was to achieve thick descriptions of the process, so the case would reflect the history and pluralistic context of the organization studied (cf. Klein & Myers, 1999).

Interviews were carried out twice with the same 24 interviewees (the second time 22 of them) in different positions. The first round of inquiries was made in November and December 2003, during the ERP selection phase. The follow-up interviews were performed in December 2004 and January 2005, after the kick-off of the implemented ERP system. The aim was for the interviewees to be representative of the organization, having different interests and tasks. Every interviewee had at least some prior experience of using IT. The interviews lasted between 45 and 85 minutes and were all recorded and transcribed. In addition, several informal interviews were carried out: with the project leader, who was also the CFO, and with participants of the project group.

Observations were made throughout the study, for example in September 2003 when alternative ERP systems were demonstrated by vendors, of meetings with management and the project group in different stages of the process, and of individual and group training sessions. Documents consisted of business plans, financial reports, notes from project meetings, and the specification of ERP system requirements.

The analysis was conducted as an iterative process, where theory was used as a sensitizing device (cf. Giddens, 1984) to search for actor groups by the notions of *participation* in the process, *perceptions* of ERP, and *norms* of ERP-system use, as described in transcripts from interviews and observations. An actor group was defined as a group of people with formal relationships, shared interests, and mutual purposes. An objective was to reach credibility and trustworthiness, together with authenticity in the connections between concepts and the case studied (cf. Guba & Lincoln, 1994). The analysis resulted in six actor groups, the Leaders, the Trusted, the Followers, the Protectors, the Pragmatist, and the Forgotten. For presentation purposes the result of the analysis is summarized in Table 3.1.

Table 3.1 Six Actor Groups Found in the Study

	The Leaders	*The Trusted*	*The Followers*	*The Protectors*	*The Pragmatists*	*The Forgotten*
	Management	The democratic workgroup	Administrative, clerical staff	Actors in production	Actors in production	Actors from support staff
Participation in process						
Powerbase	High	High/medium	Medium	Medium	Medium	Low
Time available	Medium	Medium	Medium	Low	Low	Medium
IT competence	Low (external help)	Increasing	Medium	Low	Medium/high	Medium/high
Perceptions of ERP						
Simple/complex	Simple (tool)	Complex (strategic)	Simple (tool)	Simple («pen & paper»)	Simple (tool)	Complex (flow)
Necessity	High	High	High	Low	Medium/high	High
Impact on tasks	High	High	Medium	Low	Medium	Medium/high
Importance of selection	Low (external help)	High	Medium (Trusted)	Low	Medium (Trusted)	High
Norms of ERP use						
When?	Always	Always	Always	If time permits.	According to needs.	According to needs.
How and why?	—Consistently —Improved performance.	—Consistently —Improved performance.	—Consistently —To avoid IT mistakes.	—Experience is more important than IT support. —Performance is hampered by taking time at the computer.	—Documentation of critical instructions. —Support to avoid and learn from mistakes.	—Project score-keeping. —Integration of departments.

CASE BACKGROUND

Three Companies within the Company

ABG is a medium-sized manufacturer founded in the 1960s. It consists of three distinct business areas (Alpha, Beta, and Gamma) that develop, manufacture, and sell machinery, equipment, and tools on a national as well as international basis. The business areas are supported by production service (tools supply, incoming and outgoing goods, etc.), a metallurgy department, and administration. Management consists of a CEO, a CFO, a personnel and quality manager, and three business area managers.

When actors describe ABG they use an expression that recurs in several interviews and meetings: "We are three companies within the company," signifying that people in different business areas work and think very differently from one another. According to the CEO, on the one hand this facilitates commitment and expertise in each business area, leading to positive economic outcomes. On the other hand, he argues, it also entails managerial difficulties, bringing about a lack of control and a risk of economic sub optimization.

Business area Alpha is focused on large, expensive machines in a number of basic, standardized designs. Despite the ambition to standardize, machines are often custom-tailored to suit customer needs. The number of sales fluctuates considerably over time. It is difficult to forecast customer demands, so planning is difficult. Employees at Alpha mention flexibility and the ability to please customers as critical aspects of their activities.

Business area Beta develops and manufactures tools and related products in great variation and in small volumes. Long-term relationships are built with customers as well as with suppliers. Employees at Beta mention the ability to solve problems, find new solutions, and achieve a high degree of precision as critical aspects of their activities.

Finally, business area Gamma also develops and manufactures tools, but for other purposes and other customers than Beta. The tools are standardized, but the products are continuously developed to last longer, to function more efficiently, or to be cheaper. Competition is tough in this business area, and the demand fluctuates highly. Customers often have a weak ability to pay, so credit is restricted and closely controlled. Employees at Gamma mention successful research and development activities, a wise pricing strategy, and an urge for continuous improvements of the products as critical aspects of their activities.

CASE FINDINGS: SELECTION OF AN ERP SYSTEM

Participation in the Selection Process

In April 2003 management decided to implement an ERP system. The old production planning system and an unsuccessful administrative system

were to be replaced. The CEO was experiencing a lack of "respect" among users of the planning system, leading them to disregard the system. This could sometimes result in a delay of delivery due to poor planning, or even of staff forgetting to bill the customer since no information was entered into the IT system about, for example, a special case delivery. The CEO was fed up with this "attitude problem," and declared: "We need a system and some sort of order here!"

Now, he was putting his trust to the ERP system that was about to come. The CEO considered an ERP system to be a powerful management tool that would have considerable impact on employee behavior. From autumn of 2003 and onwards, the message from him to all and everyone in ABG was: "When we have implemented an ERP system, it has to be used! Each and every time!"

ABG had made a bad IT investment in the past. In 2001 it bought an IT system for administrative purposes. At that time the CEO made the decision on his own. The investment turned out to be unsuccessful. Users believed that greater success would have been achieved if they had been listened to. This story was told during a meeting with management in the summer of 2003. It was recaptured as a lesson learned for the CEO and for management. They wanted to avoid making the same mistake again. This time all staff would have a say in the matter. The CEO proclaimed the ERP project to be carried out as a democratic effort. This should assure all employees that the selection and implementation of an ERP system would be carried out efficiently. All users' needs and wishes would be taken into consideration this time.

A "democratic workgroup" was appointed, with members representing all departments in ABG. The group was led by the CFO. Its main tasks were to be responsible for evaluating three alternative ERP systems, taking part in deciding which of these was the most appropriate system for ABG, and finally, being in charge of training and implementation. The workgroup also studied a number of reference companies, using the alternative ERP systems, to make a better decision. The vivid image of ABG as "three companies within the company" was considered a potential obstacle to finding out all user needs as well as gaining acceptance. Formal power and time were bestowed upon the group, which made it different from most other actor groups in ABG. Only management could compare to this amount of formal power. The analysis identifies the workgroup as the Trusted (Table 3.1).

To evaluate the three alternative systems, management needed a specification of ABG's ERP system requirements. There was a general lack of experience within the company regarding how to specify the requirements of an IT system, and management too had little knowledge of ERP systems and how to evaluate them. Consequently, management gave the assignment to an external consultant (Consultant A). The workgroup put together a list of 28 people that Consultant A should interview in order to construct a detailed description of ABG's needs. According to a workgroup protocol he would need knowledge of "how we work, and what we want."

Consultant A spent two days at ABG making interviews with some of the employees from the list, but not all of them. For example, he left out the staff at the Metallurgy department. Not only were they neglected by Consultant A, they also did not receive information about the whole ERP project until late in the process. A metallurgist said: "We are used to being the last to know!" The analysis identifies the metallurgists as the Forgotten (Table 3.1).

The message of the workgroup's role in making the project a democratic effort was successfully spread throughout the company. During the winter of 2003 several actors testified to the elaborate work and energetic devotion put into the evaluation process. Especially administration and some of the production staff emphasized how they put their trust in the workgroup to make a wise selection. These two actor groups share many similarities, but are separated by time available for participation and by their view of norms of use (Table 3.1). The Followers consist of administration, while the Pragmatists are composed foremost of production staff from Beta. Other production staff, from Alpha and Gamma, did not worry so much because they did not believe the selection to be crucial; all ERP systems were judged to be of the same kind, and anyway, they said, "an IT-system can never replace the importance of experience." The analysis assigns them to the actor group the Protectors.

A first specification of ERP system requirements was submitted to ABG by the consultant in November 2003. It was discussed by management and the workgroup, and later redone by Consultant A into a second version. Five vendors of the three alternative ERP systems were invited to make an offer and were also invited to present their system on ABG's premises in September 2003. These presentations were attended by the workgroup as well as a number of invited employees from different departments. Each presentation had an audience of about 15 people. However, few employees from production attended these presentations. Administration and clerks attended to a higher degree. The CFO was concerned about the low attendance, and pointed out that the intention had been to have an audience at least twice the size. That people did not come to the presentations could be interpreted as a lack of time to participate, which was also one reason employees gave, especially actors from production (the Protectors and the Pragmatists). Time was considered a restriction also among the other actor groups.

Perceptions of ERP: "What are we looking for?"

The low number of employees attending the demonstrations of the alternative ERP systems could be explained, as previously mentioned, by employees not having the necessary time. However, the CEO believed the low numbers should be explained by lack of interest in the project, saying employees "act like nestlings: just wait to be fed, instead of finding information themselves!"

In the perspective of perceptions of ERP, a lack of interest in the project could be explained by how important or necessary employees judged the ERP system to be. Management (the Leaders), the workgroup (the Trusted), and administration and clerical staff (the Followers) were to a higher degree represented at the demonstrations, as these groups judged the ERP system to be necessary to the company. Production staff (The Protectors and the Pragmatists) had scarce time, and also judged the ERP system to be less necessary than other actor groups did. It is not reasonable to sacrifice your valuable time to attend a demonstration if you are not convinced that the ERP system is necessary, either to you or to the company.

During the presentation of the ERP systems, the audience was split up for presentation of the modules for production planning and finance. Administrative staff went into another room to have the presentation of the finance module, while staffs from sales and production entered more deeply into the already sketched modules that support production. This did not, however, enhance an understanding of the integration of the system. Administration, who are included in the Followers, had experienced the problem of employees in production not realizing that information they enter to the IT system has an impact on tasks in administration. Every mistake made by other actor groups had to be corrected by the Followers. That is: *if* a mistake was in fact spotted. By separating users during the demonstrations, an opportunity was missed to further explain the purpose of an integrated system. Only within the democratic workgroup, the Trusted, could greater IT competence be spotted. By the definition of its tasks, this actor group was stimulated to study the matter from every possible perspective. This made the Trusted assert the necessity of the ERP system as well as how it, hopefully, would impact work tasks in the company. The group also came to the conclusion that it was important to make a wise selection, since an ERP system was viewed as a complex system of strategic importance.

In interviews at this same time, paradoxically, the Forgotten, the metallurgists, showed a well-developed understanding of what an ERP system is, and what is meant by a system being integrated. Since the group was not paid any particular attention to during the project, its ideas regarding how the ERP system might better support the work flow within ABG and of how departmental "walls" could be torn down were not spread to the other actor groups.

Norms of ERP use: "When, how, and why do we need IT support?"

Common to management (the Leaders), the democratic workgroup (the Trusted), and administrators and clerks (the Followers) is that they all proposed that the ERP system should be used in every instance, and that all users should work alike when they input data in the system (Table 3.1). Consistency is important to all of them, but while management and the workgroup first and foremost consider this a basis for improved performance

("getting the business right"), administrators have the avoidance of data-entry mistakes in mind ("getting the numbers right"). Administration is affected by other users' IT mistakes, since this is the group that most often detects the mistakes. If all users committed to using the ERP system in a consistent manner, mistakes would be avoided.

Employees in production who focused especially on pleasing the customer by customizing the standardized product to suit the unique demands (mostly in Alpha) or with attention to a continuous improvement of the product, due to high competition (mostly in Gamma), emphasized the importance of experience and know-how. Using IT was mostly seen as stealing time from performing activities that were actually increasing customer value. Since sales were shifting over time and customer demands were difficult to forecast (Alpha and Gamma), employees had difficulty imagining how the ERP system would solve their problems. The needed flexibility was judged to contradict the standardized modes of any IT usage. They felt that the planning modules of the system could never replace the human ability to make reasonable judgments. Analysis classifies these actors as belonging to the Protectors (Table 3.1).

At the same time, employees in Beta experienced as their foremost problem knowing just *how* to perform specific critical operations. When raw material is very expensive and production involves precision work, it is crucial to keep waste and customer complaints to a minimum. This could be achieved by avoiding mistakes. Users reasoned that a well-functioning use of the ERP system might help them to document and re-use smart solutions, and provide an opportunity to write down best practices as instructions for critical operations. This would support fewer mistakes, increase learning, and decrease customer complaints. The actor group consists of the Pragmatists.

CASE FINDINGS: FINAL SELECTION AND IMPLEMENTATION OF AN ERP SYSTEM

Participation in the Final Selection

In January 2004, offers submitted were judged by Consultant A on two parameters: costs (fixed and variable) and function (compared to the specification of ERP system requirements). Management arranged a meeting with Consultant A, the workgroup, and union representatives. The task was to eliminate one of the three alternatives. Management declared that it would be sufficient if the ERP system "fulfills its purpose," which would mean that "its functioning is in accordance with details in the specification of requirements." Judged by costs, the three alternatives belong to different price ranges: low, medium, and high price. Judged by function, all three alternatives were estimated to function in accordance to the specification.

The decision was made to eliminate the most expensive ERP system. The meeting participants did not agree on this, but the will of the majority prevailed. Participants from the workgroup would rather have eliminated the low-price alternative, since they believed this system had more limited functionality and fewer features compared to the other two.

After arranging workshops on the two remaining alternatives, a new meeting was held by management and the workgroup in late February 2004. The final decision was to implement the low-price alternative. Consultant A judged it to adequately meet the requirements. Management declared that the decision was unanimous, even though participants from the workgroup voted for the other option. Of the employees that had participated in the two workshops, only 7 out of 29 voted for the winning alternative.

The analysis notices how management (the Leaders) used an external consultant as a support, to add to the group's limited knowledge. This was possible since the group had a high degree of formal power. As a result, management took control of the final selection of ERP system. Thereby, the opposition coming from the democratic workgroup (the Trusted) was avoided. In the same way, the opinions of other employees—to the extent they participated in the workshops and gave their vote—were disregarded by management.

Participation in the Implementation Process

A decision was made by management to use the ERP system in its standard form, without making any customized adaptations. Everyone seemed to agree on that. ABG had had a bad experience with the development of an IT system that was adapted, since it got more and more difficult to use, update, and administer over time. Employees spoke of how a "once coherent IT system would over time more and more resemble a patchwork quilt." Also, the vendor explained that by using the standard solutions and logic users would take advantage of all the smart ways of handling tasks, thereby having the opportunity to rethink some of the old routines and practices.

A plan of the implementation process with a time schedule and a what-to-do-list was written by the project leader, two members of the workgroup, and two employees from the ERP vendor. A new external consultant (Consultant B) was contacted to help ABG convert data from the old IT system. Consultant B supported the decision to stick to the standardized set up and avoid making adaptations.

Conversions were planned to occur twice: first in August, and then just before the kick-off on November1st. Due to great difficulties, only one conversion was performed, in August 2004. As a result, data were lost between August and October of 2004. Necessary information about current orders, new articles, and new customers had to be manually keyed in during a hectic weekend before kick-off. Employees from different departments were helping out. This is an example of how the implementation and use of an

ERP system can force actors to use the system, increasing the level of participation, even if he or she is reluctant about the necessity of the system. Generally, the level of participation throughout the implementation was low. The democratic workgroup was the most active part.

Perceptions of ERP: "What are we implementing?"

Training was accomplished during September 2004. The vendor arranged training for selected "key users" (all members of the work group, the IT coordinator from the finance department, and the production manager from each business area). They subsequently arranged and carried out training for the remaining users at ABG. Employees were divided into groups, depending on their position in the organization and type of work tasks. People from production were kept together according to which business area they belonged to and further separated based on work tasks (for example manufacturing or assembly). Some of them could not participate in all of their training sessions, because they were needed in production. This was especially true for personnel from Alpha. Sales personnel made up one group, regardless of business area. Administration was a separate group in training sessions. Most of management did not participate in all of the planned training, due to travels and lack of time. Overall, this design of the training reproduced user groups' perceptions of the ERP system (cf. Table 3.1).

Norms of ERP use: "When, how and why do we need IT-support?"

The kick-off took place on November 1, 2004, and the democratic workgroup was dissolved at the end of December. The ERP system was now up and running. Users in production were in a state of uncertainty as to how the remaining implementation process ought to be designed and carried out. Some relied on the workgroup to lead the process, while others realized that a dissolved group could not have any duties. Some users (the Pragmatists) wanted more training, and judged the accomplished training as insufficient or even inadequate to make the necessary changes in work tasks and routines. At the same time, other users (the Protectors) emphasized a need to move ahead slowly so that new knowledge and abilities could develop and come to maturity without tension or pressure. The CEO regarded the formal training as complete, and imagined that every user would find his or her own routines on the job—possibly with the help of key users or support from the vendor. The expressed norm was that the ERP system had to be used in all situations, meticulously and consistently. No deviation was allowed.

For the most part, users were not sure what this meant. Either they had forgotten what was said during training, or few exact routines had been expressed. There had been no simultaneous project to reengineer the

business process or overhaul of the workflow, apart from some directions and recommendations the vendor presented at project meetings with the workgroup. Therefore, most users tried to carry on as before. The biggest difference to most of them was that they did not know where to find the computer routines or the information they needed. When they found the routine they wanted, they did not always know how to work it, or when it would be suitable to perform the routine. Questions were also raised concerning who actually ought to perform each work task, in order to create the most efficient workflow. The expressed norm of using the ERP system in all situations, meticulously and consistently, gave little support and few answers to users trying to figuring out how to handle the system.

CONCLUDING DISCUSSION

This study has identified six actor groups: the Leaders, the Trusted, the Followers, the Protectors, the Pragmatists, and the Forgotten (Table 3.1). The groups acted differently (participation) during the process, had different opinions of what an ERP system is and of its importance (perceptions), and of how it could, or should, be used (norms). Actor groups have different needs and expectations regarding information and IT support. These differences, together with confused relations of power, made it difficult to implement the ERP system consistently throughout the company. The effect was that not all the promises of the chosen ERP system were realized with its implementation. In retrospect, the actor groups said the ERP project was a series of compromises. Therefore, it is not possible to appoint one actor group as the winner or the loser of the game (cf. Christiansen & Skaerbaek, 1997). The following discussion will summarize the intricate interplay between participation, perceptions, and norms. It will start by relating the latter two dimensions to one another, and will then return to the first, participation.

The present study has confirmed differences between actor groups due to targets (cf. Roberts & Scapens, 1990), but has shown that they are not restricted to the classical tensions between production and sales, but are also relevant for other types of actor groups. Differences in targets due to different ranges of products, with different critical areas in production, may lead to differences in perceptions of ERP: the need to have a system, its impact on tasks, the importance of selection (the Protectors and the Pragmatists), and also different ideas of the norms on ERP use. In the case this was linked to the situation of three business areas, and actors' notion of "three companies within the company."

The study also confirms the distinction between an accounting logic and a production logic (cf. Burns, 2000). The Leaders, the Trusted, and the Followers share the normative view that the ERP system has to be used, always and consistently, which corresponds to an accounting logic. This can be

contrasted to the views of the Protectors, the Pragmatists, and the Forgotten that the ERP should be used if time permits or when it is needed, which in this case corresponds to a production logic. However, what is revealed by the present study is that the similar normative stance within these two logics conceals differences in the underlying reasoning about how and why the ERP system should be used. What appears to be a single logic actually comprises two different stances. Concerning accounting logic, one stance is held by the Followers, who see regular and consistent ERP use as a means of avoiding data-entry mistakes ("getting the numbers right"), while the other stance is held by the Leaders and the Trusted. These actor groups view regular and consistent ERP use as a means to achieve improved performance ("getting business right").

Similarly, the differences in stance within different production areas are quite distinct. The Pragmatists are more positively prepared to use the ERP system than the Protectors are. This can be explained by the Pragmatists' view of the system as a means to fulfill their information needs, and thereby reach higher targets. The Protectors, on the other hand, are more reluctant towards using the system since the group does not judge the use of an ERP system to be especially helpful in reaching targets. They view experience as a more valuable trait than an IT system's ability to keep information in a data base. The present study has thus shown that there is neither a single accounting nor production logic in a complex organization. Therefore, it is not sufficient to distinguish between a production and an accounting logic (cf. Burns, 2000).

Process-oriented research aims at developing a framework of ideas that may straighten out the "dynamics of processes of change in unique organizational settings" (Burns, 2000, p. 588). At ABG we saw how intricate the perceptions of ERP work together with the ideas of norms for ERP use and participation in the process, when actor groups deal with the project of selection and implementation of an ERP system. The opinions regarding the necessity of the system and its impact on work tasks (perception) are especially important, since an actor group that judges the necessity and impact as low has little or no incentive to participate in the process. Also, the case shows how an impact on work tasks is more easily avoided by the users when the norms for ERP use are vague. Further, the case illustrates how an actor group that is actively participating in the process shows the most marked increase in its IT competence, which in turn affects the way the group perceives an ERP system and also reproduces or produces ideas of norms for ERP use. One conclusion is that participation raises awareness, at the same time as awareness raises participation.

There were different incentives for actor groups to act or refrain from action in the process of selection and implementation of an ERP system. A practical implication is that it is difficult to get an actor group involved, if that actor judges that his/her work tasks and routines will not be affected. If the purpose of an ERP project is to create change, it is important to

identify what incentives exist in the current situation, and to create a plan of action for how to treat, or take advantage of, these incentives. If management aims at creating active and participating employees, the importance of making actors identify themselves as the Trusted cannot be overestimated.

DISCUSSION QUESTIONS

Based upon this chapter:

1. An aspect that was not investigated during the present study is the role of leadership. In the case study, leadership could be characterized as *laissez-faire*. What, if any, do you believe were the implications of this leadership style?
2. The case company did not have an IT department. How would the selection process have been carried out and developed if it was planned and run by IT experts?
3. It might be interesting to further develop and analyze the six actor groups. One aspect that was not focused on during the present study was the concept of resistance to change. What is resistance? How can we identify and measure resistance? Was it an act of resistance to change within the actor group the Protectors when it claimed the right to avoid using any IT support if time was too limited—which was contrary to the message from the CEO that the ERP system had to be used, always and consistently? Was it an act of resistance when the actor group the Forgotten accepted being kept outside, instead of struggling to participate in the process?

RECOMMENDED FURTHER READING

Christiansen, J. K., & Mouritsen, J. (1995). Management information systems, computer technology and management accounting. In D. Ashton, T. Hopper, & R. W. Scapens (Eds.), *Issues in management accounting* (pp. 215–235). London: Prentice Hall.

Newell, S., Huang, J. C., Galliers, R. D., & Pan, S. L. (2003). Implementing enterprise resource planning and knowledge management systems in tandem: Fostering efficiency and innovation complementarity. *Information and Organization, 13*(1), 25–52.

REFERENCES

Aloini D., Dulmin, R., & Mininno, V. (2007). Risk management in ERP project introduction: Review of the literature. *Information & Management, 44*(6), 547–567.

Archer, M. S. (1995). *Realist social theory: The morphogenetic approach.* Cambridge, New York: Cambridge University Press.

Barley, S. R., & Tolbert, P. S. (1997). Institutionalization and structuration: Studying the links between action and institution. *Organization Studies, 18*(1), 93–117.

Boland, R. J. (1993). Accounting and the interpretive act. *Accounting, Organizations and Society, 18*(2–3), 125–146.

Burns, J. (2000). The dynamics of accounting change—Inter-play between new practices, routines, institutions, power and politics. *Accounting, Auditing & Accountability Journal, 13*(5), 566–596.

Burns, J., & Scapens, R. W. (2000). Conceptualizing management accounting change: An institutional framework. *Management Accounting Research, 11*(1), 3–25.

Christiansen, J. K., & Skaerbaek, P. (1997). Implementing budgetary control in the performing arts: Games in the organizational theatre. *Management Accounting Research, 8*(4), 405–438.

Covaleski, M., Dirsmith, M., & Michelman, J. (1993). An institutional theory perspective on the DRG framework, case-mix accounting systems and health-care organizations. *Accounting, Organizations and Society, 18*(1), 65–80.

Giddens, A. (1984). *The constitution of society.* Los Angeles: University of California Press.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105–117). Thousand Oaks: SAGE Publications.

Hartwick, J., & Barki, H. (1994). Explaining the role of user participation in information systems use. *Management Science, 40*(4), 440–465.

Klein, H. K., & Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly, 23*(1), 67–93.

Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science, 3*(3), 398–427.

Orlikowski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science, 11*(4), 404–428.

Orlikowski, W. J., & Iacono, S. C. (2001). Research commentary: Desperately seeking the "IT" in IT research—A call to theorizing the IT artifact. *Information Systems Research, 10*(2), 121–134.

Roberts, J., & Scapens, R. W. (1990). Accounting as discipline. In D. J. Cooper & T. M. Hopwood (Eds.), *Critical accounts* (pp. 107–125). Basingstoke: Macmillan.

Robey, D., Ross, J. W., & Boudreau, M.-C. (2002). Learning to implement enterprise systems: An exploratory study of the dialectics of change. *Journal of Management Information Systems, 19*(1), 17–46.

Scapens, R. W., & Roberts, J. (1993). Accounting and control: A case study of resistance to accounting change. *Management Accounting Research, 4*(1), 1–32.

Spybey, T. (1989). Frames of meaning as a concept of organization. *International Studies of Management & Organization, 19*(3), 16–33.

4 Expanding the Knowledge Structure of Firms

An Illustration of How Organizations Experiment With Information Technology to Harness the Knowledge of the Masses

Leon Michael Caesarius

Organizations are believed to function fundamentally by competing on knowledge (Bell, 1976/1999; Drucker, 1993). This renders them services from resources they possess or made accessible to them in other ways (Penrose, 1959). Knowledge has therefore been identified as the single most important feature of a modern organization, and scholars have explored numerous ways by which to frame, define, and describe the nature of knowledge and how it can be managed (Boisot, 1998; Davenport & Prusak, 1998; Leonard-Barton, 1995; Nonaka & Takeuchi, 1995). A common phenomenon today in organizations is therefore engaging in the experimentation and development of knowledge management practices. Such endeavors recurrently involve information technology (IT) solutions that are often referred to as knowledge management systems (KMS) or more broadly as knowledge management technologies (Hendriks, 2001; Venters, 2006; Swan, Scarbrough, & Preston, 1999; Tsui, 2005). The basic idea behind the design and implementation of such systems and technologies is to support the firm's management of knowledge.

An absolute majority of KMS-cases reported have focused on managing knowledge internally, i.e. within the boundaries of the firm, portraying knowledge development processes as only involving actors from an intra-organizational domain (see e.g. Currie & Kerrin, 2004; Schultze & Boland, 2000). Consequently it can be argued that the focus of the organizations deploying such systems is on enabling intra-organizational knowledge re-use. This places limitations on the knowledge development process, as it only focuses on re-using existing knowledge, or as termed in this chapter, the firm's *known knowns*. It does not focus on expanding this knowledge; hence there is little or no development of knowledge to speak of. Moreover, judging from recent research such knowledge management endeavors, and systems in particular, produce outcomes that do not satisfy the expectations

held *a priori* due to unintended consequences (e.g. Orlikowski, 1992, 2000) as users often appropriate them differently.

KMS are often described as poorly functioning black boxes, which are deployed in organizations often based on oversimplified beliefs about what this combination of knowledge and technology can bring to the firm (Malhotra, 2004, 2005). Some critics argue that IT in general has simply refused to concur with the idea of being the instrumental vehicle in supporting knowledge management practices of this kind (McDermott, 1999). Yet the popularity of such systems, judging from their recurrence, is not diminishing. On the contrary, they have become accepted as necessary tools in the management of knowledge and are often praised in the business world.

However, this study indicates that recent advances in IT, coupled with often changing conditions that affect conventional knowledge development processes, have redirected the attention of firms towards key external target audiences, such as customers and consumers. Firms have simply discovered that knowledge development can no longer be a practice conducted either in isolation or with only a few close collaborators. Given the previously-mentioned advances, firms have therefore discovered and begun experimenting with IT to attempt to harness the knowledge of the masses (customers and consumers). This new and inter-organizational approach to knowledge development promises insights beyond those that conventional collaborations of this kind can deliver. For instance, although firms may hold deep knowledge about their goods and/or services, the consumption or use of these products and the circumstances under which this is done remain well-protected secrets.

An inter-organizational approach to knowledge development therefore promises firms insight into this black box. This marks a deviation from the previously recurrent focus on the re-use of knowledge within a firm, i.e. from *known knowns*, to the creation of new knowledge that can close existing knowledge gaps of the firm, i.e. on *known unknowns*. Such knowledge management endeavors and systems expand their operational span and purpose in comparison to their predecessors by adding knowledge exploration processes to the already existing knowledge exploitation processes. However, our knowledge of how such endeavors and systems are brought about is limited. Few studies, if any, explicate how firms go about developing and using such inter-organizational systems targeting key external audiences such as customers and consumers.

The purpose of this chapter is therefore to illustrate how organizations go about experimenting with information technology to gain knowledge from the masses. The chapter draws on a longitudinal case study on the pharmaceutical industry and on a knowledge management endeavor in one of the world's largest pharmaceutical firms. The case study is based on information collected from multiple sources between mid-2001 until early 2007, encompassing both vast amounts of documental material and more than 70 personal interviews with internal and external project members. It centers

on AstraZeneca and its development and launching of a KMS called LinkMedica directed at doctors (customers) and asthmatic patients (consumers). The endeavor stretched beyond the firm's boundaries; it was a managerial initiative that has not been studied in the same way as purely internal initiatives. The chapter also presents a theoretical model for the concept of the knowledge structure of the firm (Caesarius [Kaiserlidis], 2001), and a definition of the firm's knowledge as comprising four dynamic states that vary in terms of levels of awareness and uncertainty, the so-called *known knowns*, *known unknowns*, *unknown knowns*, and *unknown unknowns* (Caesarius, 2008). This model can be used for understanding the states of knowledge that firms aim to transform and hence also to better evaluate the role KMS is given.

The remaining part of this chapter is structured the following way: First a brief insight into the pharmaceutical industry, its key characteristics, and the driving forces of change. Second, a closer look at the focal firm, AstraZeneca, its knowledge management effort, and the system it gave birth to, LinkMedica. Third and last, an analytical discussion using the previously-mentioned model to discern more precisely how AstraZeneca went about experimenting with information technology to gain knowledge from the masses.

THE PHARMACEUTICAL INDUSTRY AND ITS KEY CHARACTERISTICS

The pharmaceutical industry of today can be broadly explained as the industrialization of the old practice of remedy preparation dating back to ancient times. This modern incarnation developed in a single century from small-scale chemical laboratories to the present state high-technology knowledge-intensive mode with a global market scope. The pharmaceutical industry is today considered one of the largest and most profitable business sectors in terms of number of employees and turnover size. Members of this industry are involved in a vast line of research and business operations in the areas of medicinal chemistry and healthcare. Often these members are commercial organizations that are licensed to engage in the discovery, development, production, and marketing, as well as promotion and sales of pharmaceutical products. The latter are generally divided into the categories of ethical drugs, over-the-counter drugs (OTC), generic drugs, and biologic drugs.

Strategies employed in the industry vary greatly, depending on the type of drug produced. For instance, producing ethical drugs requires major investments in R & D as well as in sales and marketing. The success of proprietary drugs (OTC), on the other hand, is to a large degree dependent on the firm's ability to market these products directly to consumers. Since generic drugs compete on price with their original equivalent, supply chain

management and manufacturing cost leadership are important ingredients for successful operations.

Together with its marketing, promotion, and sales operation, new product development is perhaps the most characteristic aspect of the pharmaceutical industry. It is highly idiosyncratic, a complex and multifaceted process. The period from drug discovery to product approval is assumed to be 12 years on average. While past discoveries were made either serendipitously or by identifying the active element in traditional remedies, contemporary methods are grounded in understanding how the mechanisms of a disease are controlled at the molecular level. Eventually thousands of compounds are evaluated but usually only a few are considered safe enough to test on humans. These so-called lead compounds are compared in vivo and in vitro to identify safe and effective candidates for an upcoming medicine, moving the process to the drug development phase. This phase in turn consists of a series of time-consuming, resource-demanding, and hence highly expensive evaluation sequences that also involves clinical trials with no advance guarantees of a particular candidate's level of success.

The Industry's Driving Forces of Change

The pharmaceutical industry entered the 21st century in a paradoxical state. The industry was marked by increased consolidation following a string of mergers, limited return on investments, and uncertainty related to upcoming patent expiries and highly increased costs for product development, yet with profits at unprecedented levels. In just a few years five distinct but interrelated driving forces of change had rendered an industry different than that of the past. New technological advancements and innovations brought about changes particularly affecting R & D operations. New regulations that concerned price controls, patents, marketing, and advertising authorizations primarily affected pharmaceutical firms' marketing, promotion, and sales operations. Increased competition mainly from generic drug production affected both operations. The final two categories of driving forces of change relate to two different actors: on the one hand, the purchaser and, on the other hand, the patients (consumers). Both categories primarily affected the firm's marketing, promotion, and sales operations. Meanwhile consumer awareness increased drastically due to the advent of the Internet. Today patients are better informed about pharmaceutical products and therapeutic options, making them more inclined to affect prescription decisions by their doctors.

Despite these changes more than 10 multinational pharmaceutical firms had revenues in the year 2000 that surpassed $9 billion, with an outlier that reached $40 billion. With such profits comes power that can be used to influence those who influence the conditions of the industry. For instance, during the US presidential election in 1999, the pharmaceutical industry was reported to have the single most powerful lobby. It had the largest

lobbying and campaign contribution budget and the greatest number of lobbyist, outnumbering even the members of Congress.

ASTRAZENECA AT THE TURN OF THE CENTURY

The world's third largest multinational pharmaceutical firm at the time, AstraZeneca, was established on April 6, 1999 as a result of a merger between Swedish Astra AB and British Zeneca Group PLC. The firm employed more than 50,000 employees in a cross-functional organizational structure focused around seven main therapeutic areas and with distribution of products in more than a hundred countries.

A few weeks after the merger, AstraZeneca began to assess its strategies for maintaining its leadership position within several therapeutic areas. The pharmaceutical landscape had grown increasingly competitive, and the firm was forced to re-evaluate its two basic but fundamentally important operations: on the one hand, R & D, and, on the other hand, marketing, promotion, and sales (*henceforth* marketing). The firm's position could only be sustained if it managed to cost-effectively develop new innovative products and launch them in the market. The conditions had changed, and AstraZeneca could not continue on the same strategy as its merging predecessors, i.e. promoting in-house development of new compounds. Knowledge development in isolation or with few selected collaborators was simply becoming a less economically viable option in the long run. That such processes should be shared and involve external actors was not unheard of, either at AstraZeneca or at among its competitors. In fact, many pharmaceuticals had already partly implemented such a strategy, although on a very limited scale. Now it had to become a *de facto* standard operating procedure. Acting differently would be too costly and too risky. Decades-long R & D projects starting from scratch and consuming immense amounts of resources and then failing could ultimately jeopardize the future of the firm.

The firm was to embark on a voyage of knowledge exploration and exploitation that would take its collaboration far beyond its boundaries. It was to seek out and establish relationships with external research projects that were fertile enough, for instance, or projects that would help discover new treatment areas for already existing products. It was to harness the knowledge of others and, in light of that, to turn known blind spots on its map into secured areas, i.e. to turn known unknowns in its knowledge structure into known knowns. But collaborations en masse necessitate some form of mediating or supporting technology, and the recent advances in information technology in general and the Internet in particular were like answers to the firm's prayers. They provided a viable platform to move AstraZeneca into an experimental phase to attempt to harness the knowledge of others. All that was needed was to find a match between internal knowledge needs,

blind spots on its map, with key external audiences, and the experimentation could commence. The firm began searching for ways to leverage the power of information technology for knowledge development purposes. It was about to engage in an innovative and complex knowledge management endeavor that would eventually lead to the development of a KMS, called LinkMedica, by which it could harness the knowledge of the masses.

The LinkMedica Effort

The idea and driving forces behind the knowledge management initiative LinkMedica came from two influential departments of the firm, marketing and R & D. Following the turn of the century the latter had begun developing tools for acquiring information on test results from their studies through the use of the Internet. IT and the Internet were believed to bring increased quality and speed to this process, and in a very cost-effective way. If the department could get patients to report test results to the firm by using this channel of communication it would be a highly coordinated and structured way of collecting data which would enable a much faster analysis and a thereby faster transformation of information into knowledge. Meanwhile in the marketing department awareness began to evolve of increased pressure from competitors for market share. The sales force had begun to complain more and more about doctors not having enough time to meet and discuss with them when they visited their practices, because time spent with sales reps is highly limited for a doctor and this time is constantly decreasing. To gain doctors' attention one has to provide him or her with something more valuable that just another bottle of pills. Time, then, became an important first step to deal with; the doctors did not have time to spend with the firm's sales reps, and the people at R & D could not afford it and thus needed to speed things up. The solution to the problem was to create time for the doctors that they did not have and to save time for the people at R & D that they in turn could not afford.

The effort began by mid-2000 and involved a plethora of external actors: medical experts, strategy and marketing consultants, and system developers. Together they were to help AstraZeneca make a pilot effort, one that had to be coordinated in order to satisfy the needs of both departments. The knowledge management endeavor eventually settled on the respiratory disease asthma, targeting asthmatics (consumers) and asthma healthcare professionals (customers). The reason was simple: AstraZeneca was about to introduce a new and highly individualized asthma treatment product, and the market for this treatment was expected to grow rapidly. The new product rested on a self-management principle, which according to experts would benefit asthmatics. The dose would be adjustable so as to handle variations in the symptoms when they occur; it would not be fixed.

If a KMS could be developed and launched both to support the use of this treatment among asthmatics and to gain knowledge of its effects on

patients, it would help both R & D and the marketing department. It would involve both patients and doctors. Patients would get automated personalized treatment recommendations on the Internet using the drug based on daily data input to the system about their health status via the Internet, by mobile text messages (SMS), or should they prefer by interactive voice response using an ordinary phone. Doctors, on the other hand, would have immediate access to this data and to analytical tools online enabling them to monitor their patients and free up time as appointments with asthmatics would not mainly be wasted calculating the patient's historical health status data. AstraZeneca in turn would have access to all these data on an aggregated level. The firm would gain important insight into the use and non-use (non-compliance) of asthma drugs and their effects on patients as well as insight into the procedures of the doctors in terms of their treatment recommendations and prescriptions. Thus knowledge of the customer (doctors) and that of the consumer (patients) could be harnessed, but it required the firm to provide knowledge in the first place, in this case in the form of embedded practices in an information system such as a KMS. For AstraZeneca to get "informated" then, it needed to automate parts of the practices of both actors, the asthmatic's practice of self-treatment and the doctor's practice of treating asthmatics (Zuboff, 1988).

The LinkMedica System

LinkMedica, a web-based knowledge management system, was launched in early 2001. At its core it was structured around two main parts or centers, each with their sets of functions. The first part was the so-called Asthma Management Center (AMC), the main interactive feature of the system for patients and healthcare professionals to collaboratively monitor and manage asthma. Embedded in the AMC were a collection of algorithms based on commonly accepted guidelines and drawing on data input from patients as well as on the particular asthma management plans set up by healthcare professionals. Through an underlying health status function a set of simple algorithms could calculate and present, on the one hand, patients with information on their health status by the use of color classifications and furthermore provide them with instructions on how to manage their asthma. On the other hand, based on the very same data, a set of far more complicated algorithms produced information on the patients' health status and provided decision support for healthcare professionals thereby aiding and assisting them in their evaluation of and decision about proper asthma treatment adjustments.

The second part of LinkMedica was the so called Knowledge Center (KC), a set of databases containing asthma-related information on numerous issues structured in various forms for different audiences based on a variety of sources, academic and otherwise. Interactive features were included, such as discussion forums granting opportunities for patients, doctors, and other experts in particular fields to discuss related matters.

Besides their functionality, the basic difference between these two main parts was their availability to the users. While the KC with its databases as well as some other features were accessible to any user irrespective of their having registered or not, using the AMC required the user to register. A patient could register by herself and choose to assign a healthcare professional the right to get access to her files and to help her manage the disease. A healthcare professional, on the other hand, for security, legal, and liability reasons had to apply with AstraZeneca for the authorization to set up a so-called 'online clinic.' Upon receiving the application, the firm investigated the healthcare professional's license to practice medicine against public records. If proven authentic and if there was no violation against the terms of use, a pin access code was delivered through a sales representative to the healthcare professional, enabling him or her to set up the 'online clinic.'

The Use and Outcome of LinkMedica

Close to 2 years after its launch, by spring 2003, almost 8,000 users had registered, 1,200 of whom had granted their doctors access to their asthma diaries. The growth rate of registered users was significant in the first months after the launch, with one fourth of the 8,000 users registering. The year that followed saw one half, i.e. 4,000 users, registering, only for the growth rate to drop dramatically reaching about 50 new users a month by spring 2003. But these figures referred to the number of new registrants. The number of unique diary users, i.e. those who used the system continuously, which was necessary to gain any benefits as a patient, was far lower. From launch in late 2001 and until spring 2003, the number of unique diary users per month dropped from about 300 in the beginning to just 138. The system was officially discontinued on May 1, 2005.

For AstraZeneca the knowledge outcomes of LinkMedica were both direct and indirect. The system was developed with direct knowledge outcomes in mind; it was intended to function as an ongoing experiment focusing on finding answers to an already given set of questions. For instance the system was used for several clinical studies by the R & D department, some of which would later be published in respected medical journals, boosting the efficacy of their product and the legitimacy of the firm among competitors, doctors (customers), and even among knowledgeable patients (consumers). One example involved a major randomized trial study of their new asthma treatment product comprising more than 100 practices and doctors respectively, and even more patients. The purpose of this trial was to compare two different dosage regiments of the drug, one fixed and one with dosage individually adjusted twice a day. This would help them understand how to find the optimal benefits of the drug for a patient, when to find them, and why they occur. Recruiting patients was the responsibility of the trial-conducting practices, and the firm compensated them for each

new patient. Having equipped the practitioners with computers for them to access LinkMedica and patients with free supplies of the new drug during the trial period, AstraZeneca required each patient to be seen at three follow-up meetings during the 12 months the study was in progress.

The outcomes of LinkMedica were also indirect; AstraZeneca gained knowledge, or, put in other words, they gained answers to questions they did not pose but also answers they knew but had forgotten about. One example was the insight into the nature, psychology, and treatment practices of an asthmatic patient that could help explain the very high levels of non-compliance known among this population as well as the underlying reasons of those who in fact were compliant. Many asthmatics did not consider themselves sick, for instance, and hence commented on this in their diaries, in the forums of the system and in their communication with their doctors despite medical data in the system proving the opposite. These discrepancies between stated health status and symptoms became all the more prevalent the longer the system was operational. Asthma, to some patients, was simply an ordinary state of things as they were 'born with it.' Yet others would deny or refuse to think of asthma, as it brought negative connotations of limitations and exclusion from everyday life activities with non-asthmatics. These answers deepened AstraZeneca's knowledge and understanding of their key target audience of patients. It also reminded them paradoxically enough, although a bit too late, that their knowledge of the fact that asthmatic patients are notoriously difficult to reach on a continuous basis—in fact it was a general understanding in the industry—was valid. Since the symptoms for many asthmatics only appeared or worsened during certain times of the year, their self-identification as being "sick" would consequently only be valid during that period. Hence asthma, some project members argued, was in hindsight perhaps not the optimal candidate to build a KMS around should the firm want it to be used on a continuous basis.

DISCUSSION

The sheer amount of responses within the industry, in particular the increase in mergers, indicated that operational conditions for pharmaceutical firms were changing. At the turn of the century, the firms were faced with new circumstances that transformed the industry. Yet, they still conduct two basic operations, R & D and marketing. The difference then is not so much *what* they do as it is *how* they do it. The new conditions affected the modes of conduct, not necessarily the conduct per se, i.e. the two basic but fundamentally important operations. R & D is a knowledge-intensive operation, and this is also true of marketing, albeit in a different sense. Being the backbone of the pharmaceutical firm, these two operations can be likened to a lifecycle, one that constantly has to be sustained and if possible further

strengthened. In simplified terms, both operations consume resources to generate resources. They are mutually dependent; they cannot exist without each other. Should this lifecycle become interrupted it would pose a threat to the firm, and by extension, to the firm's existence.

While idiosyncratic, this lifecycle is not an isolated process. It is highly dependent on a constant interplay with external actors. It is here, in this interplay, at these very *points of interaction*, that AstraZeneca's knowledge is developed. And these points of interaction have traditionally been associated with high costs. Examples are the numerous points of interaction with individuals in clinical trials that lead to knowledge about candidate drugs or the numerous points of interaction with healthcare professionals during drug promotion by sales representatives and event marketing activities.

Information technology manifested as a KMS provided an alternative way to reach the key target audiences of the firm. It enabled them to develop a relationship and to ultimately learn from them by gaining answers to questions posed or not posed. It was a way to circumvent or to substitute the gradual chain of losses and to do so in highly idiosyncratic way. The knowledge management endeavor and system of LinkMedica enabled reaching these target audiences, initially on a continuous basis, and in a quick, cost-effective as well as controllable and manageable way. It did so in a proprietary way, completely protecting the interaction from any insight from competitors.

LinkMedica was the vehicle that provided AstraZeneca with new points of interaction, hence new potential to develop knowledge by harnessing the knowledge of others. But gaining access to the knowledge of others required AstraZeneca to provide these audiences with knowledge in the first place (Caesarius [Kaiserlidis], 2001). The firm had to automate parts of the audiences' practices and by doing so embed its own knowledge into a system. For instance, the procedure by which asthmatics had to input knowledge and the treatment recommendations they were given where all manifestations of AstraZeneca's knowledge. In order, then, for AstraZeneca to be "informated," i.e. to gain information from the audiences through the system, it first had to automate the practices and to "informate" the audiences (Caesarius [Kaiserlidis] & Lindvall, 2004; Zuboff, 1988).

To help enhance the understanding of a firm's knowledge quests, in this case AstraZeneca's, and to help evaluate the role given to a KMS, in this case LinkMedica, there is a need for an alternative conceptualization of knowledge. The concept of a firm's *knowledge structure* (see Figure 4.1) provides a promising beginning to such a conceptualization (Caesarius [Kaiserlidis], 2001). In accordance with this concept a firm's knowledge is defined as always comprising four dynamic states that vary in terms of levels of awareness and uncertainty: the so-called *known knowns*, *known unknowns*, *unknown knowns,* and *unknown unknowns* (Caesarius, 2008). Here knowledge parallels to some extent the notion put forward by Tsoukas (2005) as the ability of the holder to make distinctions, to see options and viable choices, that

permits the firm, for instance, to act, figuratively speaking. Consequently the first dynamic state, the *known knowns*, is knowledge that the firm is highly aware it possesses, knowledge that it has put into action and therefore discovered its effect or outcome. Hence the holder understands the uncertainty associated with this knowledge as being rather low. The second dynamic state, the *known unknowns*, is knowledge that the firm is highly aware of that it *does not* possess and consequently has not been able to put into action and discover its effect or outcome. Hence for the holder this knowledge is associated with a high level of uncertainty. The third state, the *unknown knowns*, on the other hand, is knowledge that the holder is unaware it possesses. Therefore the level of awareness is low, but the uncertainty associated with this knowledge is still high, since this knowledge has previously been put into action and the effects or outcomes explicated. Finally, the fourth state, the *unknown unknowns*, portrays knowledge that the holder neither knows about, i.e. has any awareness of, nor has ever put into action to discover its effect or outcome, consequently entailing a high level of uncertainty. The states are always dynamic, as the knowledge structure of the firm is affected by its interaction with other actors. Consequently, the size of each state fluctuates, and it cannot be defined with any precision in advance, either by the firm or by any outsider. Yet, by its very nature, the firm has a greater ability to manage *known knowns* and *known unknowns* than to manage *unknown knowns* and *unknown unknowns*.

When AstraZeneca developed and used the LinkMedica system to interact with the external target audiences, the firm, it has been argued, developed knowledge. Using the model (see Figure 4.1) it is possible to discern more precisely how this was brought about. Knowledge development with the help of LinkMedica was primarily, and intentionally, about the firm engaging in the exploration of *known unknowns* with aim of turning them into *known knowns*. To put it differently, it was about finding answers to a predefined set of questions by making sense, discovering patterns, and making distinctions on an aggregated level based on the highly structured information feeds the firm received from the system. This process slowly reduced the uncertainty of this emergent knowledge while simultaneously maintaining or increasing the awareness of it—slowly, because an aggregation takes time to build and so does the exploration of it. AstraZeneca used LinkMedica to get answers to questions that concerned the use and the effect of the use of their asthma products by patients. The R & D department for instance explored the how, when, and why of the product, enabling it to further develop both the drug and its method of treatment.

However, LinkMedica also unintentionally helped turn both *unknown unknowns* and *unknown knowns* into *known knowns*. For instance the diaries revealed the nature, psychology, and treatment practices of asthmatics that helped the firm understand why patients acted in a non-compliant manner to drug treatment. These were answers to questions the firm never posed, i.e. *unknown unknowns* that slowly became *known knowns* as the

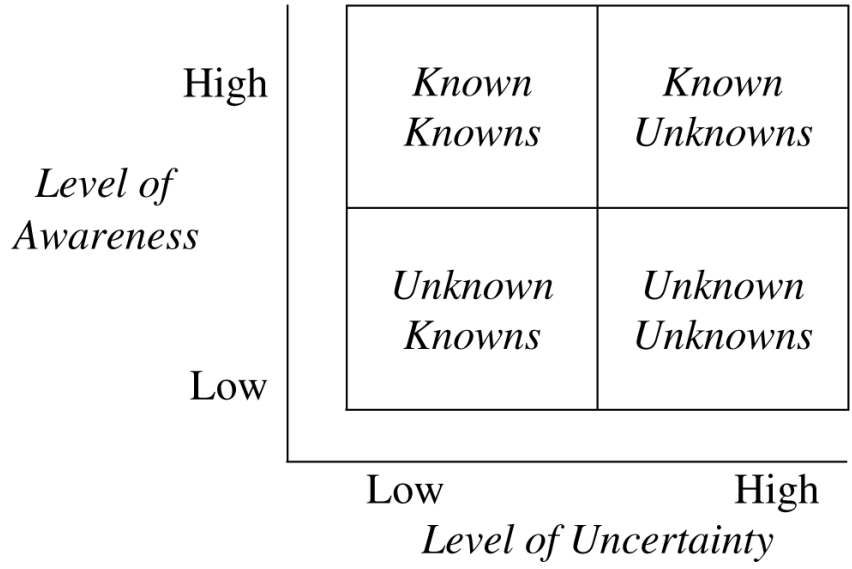

Figure 4.1 Knowledge structure of the firm (adapted from Caesarius, 2008).

firm identified recurrent discrepancies between stated health status and symptoms. Finally, patients' diminishing level of use of the system helped AstraZeneca remember what they knew but forgot or ignored while developing the system: that asthmatics are difficult to reach and to continuously interact with due to the nature of their disease and how they self-identify.

AstraZeneca discontinued LinkMedica on May 1, 2005 because asthmatics chose not to use the system on a continuous basis. However, LinkMedica had helped the firm expand its knowledge structure by turning primarily knowledge states of high uncertainty into states of low uncertainty. *Known unknowns* had become *known knowns* and so too had certain *unknown unknowns* and *unknown knowns*. AstraZeneca's knowledge management endeavor was indeed a sincere attempt to experiment with information technology in order to gain knowledge of the masses. In fact, they were ahead of their time in the industry.

This study illustrates both the possibilities and the limitations of using information technology for such purposes. KMS of this kind offers a quick, cost-effective as well as a proprietary, controllable, and manageable information flow by targeting specifically predetermined knowledge gaps in the firm. However, this assumed the firm has explicated and supported through embedded knowledge particularly important parts of the audience's practice to gain their continuous support in terms of use. Knowledge management efforts of this kind are therefore capricious; they are complex experiments that put the firm's innovativeness to the test.

DISCUSSION QUESTIONS

Based upon this chapter:

1. According to the study, in order for knowledge management systems to be used by external audiences, they first need to provide them with knowledge by simplifying and supporting a particular part of their practice. What are the main difficulties associated with such a task for the firm developing and launching such a system?
2. The system described, defined, and analyzed in this study focused on asthmatics and their doctors. In hindsight, the focal firm came to the conclusion that asthma and asthma patients were probably less suitable candidates to focus a KMS on, as their self-identification was disruptive in nature. What do you believe is necessary for firms developing KMS of this type to consider in terms of identities?
3. Explicating, simplifying, and supporting an audience's practice presupposes that there exists a rather coherent practice to begin with. This is not always the case, however. What are the challenges for the system-developing firm in situations where a coherent practice is lacking?

RECOMMENDED FURTHER READING

Caesarius, L. M. (2008). *In search of known unknowns: An empirical investigation of the peripety of a knowledge management system*. Doctoral Thesis No. 139, Department of Business Studies, Uppsala University, Sweden.

Schultze, U., & Boland Jr., R. J. (2000). Knowledge management technology and the reproduction of knowledge work practice. *Journal of Strategic Information Systems*, *9*(2/3), 193–212.

Tsoukas, H. (2005). *Complex knowledge: Studies in organizational epistemology*. Oxford, UK: Oxford University Press.

Venters, W. (2006). The use of technology within knowledge management: A review. *Journal of Intelligent Systems, 15*(1), 329–356.

REFERENCES

Bell, D. (1999). *The coming of the post-industrial society: A venture in social forecasting*. New York: Basic Books. (Original work published 1976)

Boisot, M. H. (1999). *Knowledge assets: Securing competitive advantage in the information economy*. Oxford, NY: Oxford University Press.

Caesarius, L. M. (2008). *In search of known unknowns: An empirical investigation of the peripety of a knowledge management system*. Doctoral Thesis No. 139, Department of Business Studies, Uppsala University, Sweden.

Caesarius, [Kaiserlidis] L. M. (2001). Endogenic value creation through knowledge acquisition in internet-based business relationships. *In The future of retail banking and customer relationships: A report from the first workshop of The Göran Collert Research Foundation* (pp. 53–67). Stockholm, Sweden.

Caesarius, [Kaiserlidis] L. M., & Lindvall, J. (2004). *On the duality of information technology: Understanding the connection between 'automate' and 'infomate'.* Paper in the proceedings of the Fifth European Conference on Organization Knowledge, Learning and Capabilities, Innsbruck, Austria.

Currie, G., & Kerrin, M. (2004). The limits of a technological fix to knowledge management: Epistemological, political and cultural issues in the case of intranet implementation. *Management Learning, 35*(1), 9–29.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know.* Boston: Harvard Business School Press.

Drucker, P. F. (1993). *The post-capitalist society.* Oxford, MA: Butterworth-Einhemann.

Hendriks, P. H. J. (2001). Many rivers to cross: From ICT to knowledge management systems. *Journal of Information Technology*, *16*, 57–72.

Leonard-Barton, D. (1995). *Wellsprings of knowledge: Building and sustaining the sources of innovation.* Boston: Harvard Business School Press.

Malhotra, Y. (2004). Why knowledge management systems fail: Enablers and constraints of knowledge management in human enterprises. In M. Koenig & T. K. Srikantaiah (Eds.), *Knowledge management lessons learned: What works and what doesn't* (pp. 87–112). Medford, NJ: Information Today.

Malhotra, Y. (2005). Integrating knowledge management technologies in organizational business processes: Getting real time enterprises to deliver real business performance. *Journal of Knowledge Management, 9*(1), 7–28.

McDermott, R. (1999). Knowledge management—Why information technology inspired but cannot deliver knowledge management. *California Management Review, 41*(4), 103–117.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation.* New York: Oxford University Press.

Penrose, E. T. (1959). *The theory of the growth of the firm.* New York: John Wiley and Sons.

Orliwkoski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science, 3*(3), 398–427.

Orliwkoski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science, 11*(4), 404–428.

Schultze, U., & Boland, R. J. (2000). Knowledge management technology and the reproduction of knowledge work practices. *Journal of Strategic Information Systems, 9,* 193–212.

Swan, J., Scarbrough, H., & Preston, J. (1999). *Knowledge management—The next fad to forget people?* In European Conference on Information Systems, Copenhagen, Denmark.

Tsoukas, H. (2005). *Complex knowledge: Studies in organizational epistemology.* Oxford, UK: Oxford University Press.

Tsui, E. (2005). The role of IT in KM: Where are we now and where are we heading? *Journal of Knowledge Management, 9*(1), 3–6.

Venters, W. (2006). The use of technology within knowledge management: A review. *Journal of Intelligent Systems, 15*(1), 329–356.

Zuboff, S. (1988). *In the age of the smart machine: The future of work and power.* New York: Basic Books.

5 Management of Asynchronous and Synchronous E-Learning

Stefan Hrastinski

There is an increasing need for education, since the workforce of today is expected to be highly educated and continuously improve and acquire skills by engaging in life-long learning. E-learning is a promising solution to enable lifelong, flexible, and on-the-job training. E-learning, here defined as learning and teaching facilitated online through network technologies, has been argued to be one of the most powerful responses to meet the growing need for education (Zhang, Zhao, Zhou, & Nunamaker, 2004). A key challenge is to manage e-learning in effective and efficient ways to support improved learning outcomes and the development of new skills. Some have been concerned with the learning outcomes of e-learners. However, a review of 355 comparative studies reveals that there is no significant difference in learning outcomes, commonly measured as grades or exam results, between traditional and e-learning modes of delivery (Russell, 2001).

In order to manage e-learning initiatives, organizations and educational institutions must understand benefits and limitations of different e-learning techniques and methods. This can help managers to evaluate their organization for readiness to implement e-learning and give them support when planning future e-learning initiatives. An important task for research is to support the management of e-learning by revealing the impact of different factors on e-learning effectiveness. Commonly, two basic types of e-learning are compared, i.e. asynchronous and synchronous e-learning. Until now, e-learning initiatives have mainly relied on asynchronous means for teaching and learning (Romiszowski & Mason, 2004; Hrastinski & Keller, 2007). However, recent improvement in technology and increasing bandwidth have led to the increasing popularity of synchronous e-learning (Kinshuk & Chen, 2006).

My work has been focused on the benefits and limitations of asynchronous and synchronous e-learning, and addresses questions such as when, why, and how to use these two modes of delivery. Many organizations and educational institutions are interested in using and developing both asynchronous and synchronous e-learning but have limited understanding of the benefits and limitations of these types of e-learning. The research has departed from a view of learning as participation in the social world (Wenger, 1998), which implies that learning is dialogue, both by internal and social negotiation (Jonassen & Land, 2000).

ASYNCHRONOUS AND SYNCHRONOUS E-LEARNING

There is an ongoing debate on the usefulness of asynchronous and synchronous e-learning. *Asynchronous e-learning*, commonly supported by media such as e-mail and discussion boards, enables work relations among learners and with instructors, even when participants cannot be online during the same time and is thus a key component of flexible e-learning. In fact, many take online courses because of their asynchronous nature, which can be combined with work, family, and other commitments. Asynchronous e-learning makes it possible for learners to log on to an e-learning environment at any time and download documents or send messages to instructors or peers. Since more time may be spent on refining contributions, they are generally considered as more thoughtful when compared with synchronous communication (Hrastinski, 2008).

Synchronous e-learning, commonly supported by media such as videoconference and chat, has the potential to assist e-learners in the development of learning communities. It is experienced as more social and as avoiding frustration by making it possible for learners and instructors to ask and answer questions in real-time (Hrastinski, 2008). Synchronous live sessions help e-learners feel like participants rather than isolates: "Isolation can be overcome by more continued contact, particularly synchronously, and by becoming aware of themselves as members of a community rather than as isolated individuals communicating with the computer" (Haythornthwaite & Kazmer, 2002, p. 459).

The debate on the benefits and limitations of asynchronous and synchronous e-learning seems to have left its initial stage, where researchers have tried to determine which medium works "best"—such studies generally yield no significant differences (Gunawardena & McIsaac, 2004). Consequently, instead of choosing the "best" medium, we need to understand when, why, and how to use different types of e-learning. It should also be noted that it is the users that decide how to use a medium. For example, in some instances e-mail has been reported to be used near-synchronously since users may remain logged in and monitor their e-mail continuously (Markus, 1994). Thus, the difference between asynchronous and synchronous e-learning is often a matter of degree.

THREE TYPES OF COMMUNICATION

Haythornthwaite (2002) argues that three types of communication in particular are important for building and sustaining e-learning communities, namely, content-related communication, planning of tasks, and social support (see Table 5.1). Firstly, the importance of communication related with the content of the course is essential for learning. Just as in traditional education, e-learners need to be able to ask questions and share information

Table 5.1 Three Types of Exchanges (Adapted From Haythornthwaite, 2002)

Type of exchange	Examples
Content-related	Ask or answer a content-related question Share information Express an idea or thought
Planning of tasks	Plan work, allocate tasks, coordinate joint efforts, or review drafts Negotiate and resolve conflicts
Social support	Express companionship, emotional aid, or advice Emoticons (e.g. ☺, ☻) Support during an upset (e.g. support when having technical difficulties) Talk about things other than class work

and ideas. Secondly, support for the planning of tasks is essential, especially when learners produce some kind of product, such as an assignment, in collaboration with peers. Finally, social support relations are desirable for creating an atmosphere that fosters collaborative learning.

BACKGROUND TO THE RESEARCH

This chapter is focused on the analysis of asynchronous and synchronous online seminars in two e-learning classes. The first class included 3 females and 5 males with a mean age of 38 years. The second class included 14 females and 5 males with a mean age of 43 years. Both classes studied knowledge management on the master's level. By comparing these classes, potential differences between different group sizes can be suggested. In order to understand learner opinions of asynchronous and synchronous e-learning, 12 half-hour telephone interviews were also conducted. Four of the interviewees were enrolled in the first class, and 8 were enrolled in the second class. The interviews were recorded and transcribed, and were conducted within 1 month after the seminars were conducted.

In the online seminars, the instructor suggested questions for the class to discuss and also asked learners to submit questions for discussion on the course literature. The synchronous discussions were conducted by chat and were scheduled for 3 hours. The asynchronous discussions were conducted by discussion board and were scheduled over a week. Two asynchronous and two synchronous discussions from the middle of each course were chosen for further analysis. The same literature was used, and the suggested questions were similar in character, namely, to stimulate reflection and sharing of personal experiences relating to the literature, in both the asynchronous and synchronous settings. After the online discussions had been conducted, the written sentences were classified according to the three types

of exchanges described in the previous section. Some sentences included more than one type of exchange and were counted in each category.

It should be borne in mind that the studies reported on here were conducted in a specific context and that the sample size was small. However, the key arguments of this paper are also supported theoretically, as will become evident. Learning outcome measures were not used, because only two passing grades were used in the courses, which make it difficult to identify statistically significant differences in small populations. Instead, this paper relies on measures and perceptions of communication, which have been shown to have a positive effect on perceived learning, grades, and quality assessment of assignments (e.g. Fredericksen, Picket, Shea, Pelz, & Swan, 2000; Hiltz, Coppola, Rotter, Turoff, & Benbunan-Fich, 2000).

BENEFITS AND LIMITATIONS OF ASYNCHRONOUS E-LEARNING

The classification of sentences is presented in Table 5.2. It can be noted that more or less every sentence in the asynchronous discussions of the smaller group, and a vast majority of sentences in the larger group, were classified as content-related. This is a remarkable result—imagine if learners on campus spent more than 90% of their time discussing issues related to course content. However, these results may also be interpreted as problematic. For example, if e-learners seldom meet face-to-face and instructors mainly rely on asynchronous e-learning, learners may feel isolated and may not feel part of learning communities, which is essential for collaboration and learning (Haythornthwaite & Kazmer, 2002; Haythornthwaite, 2002). When comparing the smaller and larger classes, it seems difficult to get asynchronous discussions going with few participants, a finding that is supported by previous research (Palloff & Pratt, 1999).

Table 5.2 Number of Sentences Categorized by Type of Communication and E-Learning

	Smaller class (n = 8)		**Larger class (n = 19)**	
	Synchronous Sentences (%)	*Asynchronous Sentences (%)*	*Synchronous Sentences (%)*	*Asynchronous Sentences (%)*
Content-related	876 (58)	369 (99)	1,816 (57)	2,438 (93)
Planning of tasks	507 (34)	5 (1)	935 (29)	131 (5)
Social support	198 (13)	2 (1)	572 (18)	124 (2)
All sentences	1,507 (100)	375 (100)	3,173 (100)	2,608 (100)

Robert and Dennis's (2005) cognitive model of media choice proposes that asynchronous communication enhances the ability to process information. The receiver has more time to comprehend a message, since an immediate answer is not expected. This argument is supported by the interviews, as illustrated by the following quote: "In the [asynchronous discussions] it is easier to find some more facts, maybe have a look in a book and do more thorough postings." In fact, according to Kock's (2005) estimate, an exchange of 600 words requires about 6 minutes for complex group tasks in face-to-face settings, while exchanging the same number of words via e-mail would take approximately 1 hour.

BENEFITS AND LIMITATIONS OF SYNCHRONOUS E-LEARNING

Table 5.2 makes it apparent that synchronous e-learning supports other types of communication, as compared with asynchronous e-learning. Almost 60% of the sentences were content-related, while a third of the sentences were related with the planning of tasks. This can be explained by the fact that these discussions were limited by time and the participants had to make sure that they did what was expected during the scheduled 3 hours. In synchronous discussions, participants also discussed things other than course work. This was especially evident at the beginning and end of each discussion, while it was more or less non-existent in the asynchronous discussions. No apparent difference could be discerned in the synchronous discussions when comparing the smaller and larger classes.

Kock's (2005) media naturalness hypothesis predicts that synchronous communication increases psychological arousal, and, similarly, Robert and Dennis's (2005) cognitive model of media choice predicts that synchronous communication increases motivation. Kock argues that each element that characterizes "natural" media (e.g. the ability to convey and observe facial expressions and body language) contributes to psychological arousal. However, if these elements are suppressed, a decrease in psychological arousal can be expected. The interviews revealed that many e-learners felt that synchronous communication was "more like talking" as compared with asynchronous communication. It seemed more accepted to exchange social support and discuss less "complex" issues. Consequently, the higher sentence counts when communicating synchronously (see Table 5.2) can be explained by the fact that the e-learners felt more psychologically aroused and motivated since this type of communication more closely resembles face-to-face communication. This finding was especially evident in the smaller class.

Synchronous communication enables monitoring the recipient's reaction to a message, which makes the recipient more committed and motivated to read and answer the message (Robert & Dennis, 2005). This argument was supported by the interviews of the empirical studies: "Even if I cannot see

the person, I write so to speak to the person directly and get an immediate answer." It can also be expected that the sender becomes more psychologically aroused and motivated because he or she knows it is likely that a response will be received. In synchronous e-learning, learners respond quickly since they do not want to disrupt the conversation. A downside revealed in the interviews is that the focus is often on quantity rather than quality, i.e. trying to write something fast before "someone else says what I was going to say."

COGNITIVE AND PERSONAL DIMENSIONS OF E-LEARNING

Factoring in the above, synchronous communication makes it possible to monitor the recipient's reaction to a message so that the recipient will be more committed and motivated to read it. However, when communicating asynchronously, the recipient has more time to comprehend the message since the sender does not expect an immediate answer. Thus, synchronous e-learning increases arousal and motivation, while asynchronous e-learning increases the ability to process information.

The concepts of *personal participation* and *cognitive participation* are introduced to describe the dimensions of learning that are supported by asynchronous and synchronous e-learning (see Figure 5.1). It is suggested that, other things being equal, synchronous e-learning better supports personal participation, while asynchronous e-learning better supports cognitive participation. Personal participation describes a more arousing type of participation and is appropriate for less complex information exchanges, including the planning of tasks and social support. Cognitive participation describes a more reflective type of participation and is appropriate for discussions of complex issues.

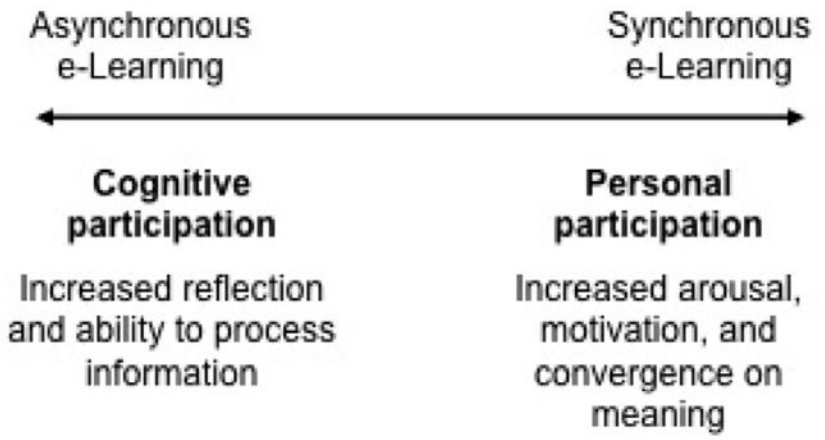

Figure 5.1 Cognitive and personal dimensions of e-learning.

IMPLICATIONS FOR MANAGING ASYNCHRONOUS AND SYNCHRONOUS E-LEARNING

An implication for the management of e-learning is to make several means of asynchronous and synchronous communication available so that appropriate means can be used for different learning activities. The research that has been discussed here underlines that asynchronous and synchronous e-learning complement each other. The combination of these two types of e-learning supports several ways for learners and instructors to exchange information, collaborate on work, and get to know each other (Haythornthwaite & Kazmer, 2002). As stated earlier, it must be borne in mind that many choose e-learning courses because of their asynchronous nature, which needs to be taken into account. In order for the discussion of complex issues to take place, synchronous e-learning, by media such as videoconference, instant messaging, and chat, or the arrangement of face-to-face meetings, may be essential as support in order for learners to get to know each other and for planning the tasks at hand. However, when the time comes for discussing complex issues in which time for reflection is needed, it seems preferable to switch to asynchronous e-learning and use media such as e-mail, discussion boards, and blogs. In conclusion, Table 5.3 summarizes when, why, and

Table 5.3 When, Why, and How to Use Asynchronous vs. Synchronous E-Learning

	Asynchronous e-learning	**Synchronous e-learning**
When?	Appropriate for reflecting on complex issues and when synchronous meetings cannot be scheduled because of work, family, and other commitments.	Appropriate for discussing less complex issues, getting to know each other, and planning tasks.
Why?	Students have more time to reflect because the sender does not expect an immediate answer.	Students become more committed and motivated because a quick response is expected.
How?	Use asynchronous means such as e-mail, discussion boards, and blogs.	Use synchronous means such as videoconference, instant messaging, and chat, and arrange face-to-face meetings.
Examples	Students who are expected to reflect individually on course topics may be asked to maintain a blog. Students who are expected to share reflections regarding course topics and critically assess the ideas of peers may be asked to participate in online discussions by discussion board.	Students who are expected to work in groups may be advised to use instant messaging as support for getting to know each other, exchanging ideas, and planning tasks. A teacher who wants to present concepts from the literature in a simplified way may give an online lecture by video conferencing.

how to use asynchronous vs. synchronous e-learning. These questions are essential to address when managing e-learning initiatives.

DISCUSSION QUESTIONS

Based upon this chapter:

1. Give examples of when you believe that asynchronous or synchronous e-learning is preferable.
2. How can communication between instructors and learners be promoted in asynchronous and synchronous e-learning settings?
3. How can future e-learning systems be designed to improve the support of personal and cognitive participation?

RECOMMENDED FURTHER READING

Haythornthwaite, C. (2002). Building social networks via computer networks: Creating and sustaining distributed learning communities. In K. A. Renninger & W. Schumar (Eds.), *Building virtual communities: Learning and change in cyberspace* (pp. 159–190). Cambridge: Cambridge University Press.

Hrastinski, S. (2008). The potential of synchronous communication to enhance participation in online discussions: A case study of two e-learning courses. *Information & Management*, *45*(7), 499–506.

Kock, N. (2005). Media richness or media naturalness? The evolution of our biological communication apparatus and its influence on our behavior towards e-communication tools. *IEEE Transactions on Professional Communication, 48*(2), 117–130.

Robert, L. P., & Dennis, A. R. (2005). Paradox of richness: A cognitive model of media choice. *IEEE Transactions on Professional Communication, 48*(1), 10–21.

REFERENCES

Fredericksen, E., Picket, A., Shea, P., Pelz, W., & Swan, K. (2000). Student Satisfaction and Perceived Learning with On-line Courses: Principles and Examples from the SUNY Learning Network. *Journal of Asynchronous Learning Networks, 4*(2), 7–41.

Gunawardena, C. N., & McIsaac, M. S. (2004). Distance Education. In D. H. Jonassen (Ed.), *Handbook of Research on Educational Communications and Technology* (pp. 355–395). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Haythornthwaite, C. (2002). Building Social Networks Via Computer Networks: Creating and Sustaining Distributed Learning Communities. In K. A. Renninger & W. Schumar (Eds.), *Building Virtual Communities: Learning and Change in Cyberspace* (pp. 159–190). Cambridge: Cambridge University Press.

Haythornthwaite, C., & Kazmer, M. M. (2002). Bringing the Internet Home: Adult Distance Learners and Their Internet, Home, and Work Worlds. In B. Wellman & C. Haythornthwaite (Eds.), *The Internet in Everyday Life* (pp. 431–463). Malden, Massachusetts: Blackwell Publishing.

Hiltz, S. R., Coppola, N., Rotter, N., Turoff, M., & Benbunan-Fich, R. (2000). Measuring the Importance of Collaborative Learning for the Effectiveness of ALN: A Multi-Measure, Multi-Method Approach. *Journal of Asynchronous Learning Networks, 4*(2), 103–125.

Hrastinski, S. (2008). The Potential of Synchronous Communication to Enhance Participation in Online Discussions: A Case Study of Two e-Learning Courses. *Information & Management*, 45(7), 499–506.

Hrastinski, S., & Keller, C. (2007). Computer-Mediated Communication in Education: A Review of Recent Research. *Educational Media International, 44*(1), 61–77.

Jonassen, D. H., & Land, S. M. (2000). Preface. In D. H. Jonassen & S. M. Land (Eds.), *Theoretical Foundations of Learning Environments* (pp. iii–ix). New Jersey: Lawrence Erlbaum.

Kinshuk, & Chen, N. S. (2006). Synchronous methods and applications in e-learning. *Campus-Wide Information Systems, 23*(3).

Kock, N. (2005). Media richness or media naturalness? The evolution of our biological communication apparatus and its influence on our behavior towards e-communication tools. *IEEE Transactions on Professional Communication, 48*(2), 117–130.

Markus, M. L. (1994). Electronic mail as the medium of managerial choice. *Organization Science, 5*(4), 502–527.

Palloff, R. M., & Pratt, K. (1999). *Building learning communities in cyberspace: Effective strategies for the online classroom*. San Francisco: Jossey-Bass.

Robert, L. P., & Dennis, A. R. (2005). Paradox of richness: A cognitive model of media choice. *IEEE Transactions on Professional Communication, 48*(1), 10–21.

Romiszowski, A., & Mason, R. (2004). Computer-mediated communication. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 397–431). Mahwah, NJ: Lawrence Erlbaum.

Russell, T. L. (2001). *The no significant difference phenomenon*. Montgomery: International Distance Education Certification Center.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge: Cambridge University Press.

Zhang, D., Zhao, J. L., Zhou, L., & Nunamaker, J. F. J. (2004). Can e-learning replace classroom learning? *Communications of the ACM, 47*(5), 75–79.

6 The Limitations of Enterprise Systems for Marketers and Salesmen

Peter Ekman

Enterprise systems, also called enterprise resource planning (ERP) systems, have been widely implemented by large firms since the 1990s, and now even small and midsized companies can acquire such technology. Vendors like SAP, Oracle, and Microsoft market these software packages as the overall business transaction solution for companies in different fields of business. While the first decade of use was disturbed by late and badly made implementations (Sumner, 2005) later research shows that companies implement these packages stepwise, with basic functions being put to action first (Lorenzo, Kawalek, & Ramdani, 2009; Davenport, Harris, & Cantrell, 2004). Thus, getting an enterprise system is an incremental process where internal functions seem to be prioritized. Enterprise systems have been described as the second most important information technology (IT) for companies after the Internet (Seddon, Shanks, & Willcocks 2003; Davenport & Prusak, 2003), which makes the effects and changes they have caused worth studying. Initially enterprise systems were described as the overall IT solution for companies (Davenport, 1998), but given that they have a heritage in material and resource planning (MRP) systems, their functionality is mainly production focused (Newell, Huang, Galliers, & Pan, 2003). Carlsson and Hedman (2004) also found that their logic is focused on everyday operations and is less useful for managers and thereby less valuable when it comes to strategic decisions. Thus, even if the enterprise system is a comprehensive, integrated, and company-spanning solution, its effect on companies can be questioned given its practical scope and functionality.

To understand the impact of an enterprise system on a company's business, an approach is proposed in which the company's business relationships are seen as a valuable resource that needs to be managed. Extensive studies of mainly industrial companies' business with each other carried out by researchers belonging to the IMP Group (see www.impgroup.org) have shown that the companies have a limited number of long-term business relationships with what are considered important customers and suppliers (Ford, Gadde, Håkansson, & Snehota, 2003; Håkansson & Snehota, 1995). These business relationships often involve several people with different business functions, given that the exchanged product or service might

be complex and that it is often adapted to the customer's requirements. This matching process between a buyer and a seller is sometimes discussed in terms of homogeneous markets (Alderson, 1965; Penrose, 1959) where the exchanged value needs to be scrutinized and negotiated by the partners involved. Thus, prior to a business exchange of the product and service for a negotiated price, there will be information exchanges as well as personal interactions between different employees from both the selling and buying companies. This chapter addresses the research question of *how do enterprise systems support the business activities that take place in a business relationship?* An underlying assumption is that the enterprise system can help the participating staff by supporting the execution of their business activities. The following chapter presents lessons from case studies of two large companies' business relationships with customer and partner companies. The aim of the chapter is to offer an insight in how enterprise systems are used in an interorganizational setting, with an emphasis on marketers and salesmen. It also shows the challenges that companies aiming for a fully integrated enterprise system are facing.

RESEARCH APPROACH

Since companies started to implemented different forms of IT as computer-based information systems in the early 1960s the research focus was initially the technology *per se*. However, over the decades the research approaches in the discipline of information systems also included the management of IT, how the organizational setting affected the use of IT, as well as an inclusion of how IT was used in an interorganizational setting (Myers & Avison, 2002). An early contribution that theorized about IT use was Markus' (1984) "system features," which held five concepts that could guide researchers studying computer-based information systems' functionality and use. According to Markus (1984) an information system can mainly be used for: *operational* purposes, i.e. support work rationalization and work routinization; *monitoring and control* by enforcing standards, measures, evaluation, feedback, and rewards; *planning and decision* based upon models, data analysis, and presentation; *communication* by supporting communication procedures and communication mediation; or *interorganizational* purposes by structuring interorganizational transactions. Thus, depending on the enterprise system's features, we can expect it to be used for certain activities. Another contribution that put forth IT use as context dependent was "the web of computing" by Kling and Scacchi (1982). The web of computing also incorporates more than just the IT functionality and was a reaction to what Kling and Scacchi described as the then prevailing "atomistic view" of IT. Basically they thought that earlier IT studies had an overly narrow scope and that they missed the incorporation of the impact of context. The recipe was to include the research setting,

and Kling and Scacchi (1982) proposed five concepts that could explain if and how IT was used. The web of computing concepts are: *the line of work*, which describes what people do and value in a given setting; *the going concerns*, which is the momentum of the situation, what is on the agenda now; *the infrastructure*, that covers the company's systems and network arrangement, and whether they support the user(s) needs; *the production lattices*, which is the division of labor; and *the macrostructure*, which holds the prevailing standards, the company's market, the distribution of critical resources, and so forth. By studying all these aspects the researcher can gain better insight into a company's use of IT.

A more recent contribution to this research field is offered by Walsham (1993, 2001), who has been involved in several studies of the wider impact of IT. By analyzing the results from several case studies, he has been able to present lessons of how standard information systems cause problems when they are implemented in companies due to different local contexts that might not fit the generic logic of the technology (Walsham, 1993, 2001). Given that each company has a different history and partly idiosyncratic practices, standardized information systems might create irreversible infrastructure, and this in turn means that local variances are jeopardized when the information system spans different cultural boundaries. Thus, with all these affecting factors it is hard to estimate *a priori* the effects an enterprise system will bring.

The previously-mentioned research contributions have a common theme. They urge researchers to avoid being too technology focused—and only consider technological effects such as speed or usability—given that such a stance delimits our understanding of the technology. Instead, researchers are better off if they study the IT in its business context, i.e. in a setting where both internal and external practices will affect the outcome. Company-wide IT, such as enterprise systems, brings multilevel effects (spanning individual users, groups, and even beyond organizational borders), and this means that it affects interaction patterns, group behaviors, and individuals' maneuverability. Basically this boils down to recognizing that an enterprise system affects the company's everyday businesses, both internally and externally, as well as the strategic choices that the company has (Schneider & Klein, 1994). Thus, to capture the utilization of enterprise systems in a business setting that involves multiple actors, a suitable approach is what Orlikowski and Iacono (2001) describe as an "ensemble view of computing," i.e. to see technology as integrated in a socio-economic activity. With such an approach the researcher takes into account that the users try to accomplish both personal goals and to fulfill their employer's performance expectations and financial targets—and that all of this takes place simultaneously. Enterprise system use is empirically found in a setting that also is colored by the needs and wishes from other actors, such as suppliers and customers, i.e. from those the user may consider as affiliates (Lamb & Kling, 2003). Thus, enterprise system use and its effects on

business must be analyzed by considering both organizationally internal and external aspects.

When summarizing the prior theoretical concepts (Walsham, 2001, 1993; Markus, 1984; Kling & Scacchi, 1982) enterprise systems can best be understood if we study (a) the technological resources and the enterprise system's features; (b) if the enterprise system is used or not (regardless of features); (c) the business activities that are affected by the enterprise system use and the business processes that are not; and finally (d) how this affects the company's overall business. By complementing our interest in the standardized enterprise system with a theoretical perspective on business, we may understand enterprise system use in its context. In this study, the applied IT perspective is integrated with theories on business relationships as a mean to understand the interorganizational business setting and the usability of enterprise systems for marketers and salesmen.

A company is dependent on its business relationships in that they are the means of getting resources as well as the means of providing a market for the company's offerings. Thus, any company in a market economy needs to establish bonds to other companies. Some of the company's business will be based upon arm's-length transactions, i.e. they may only occur with the same customer a few times and probably with standard commodities, while others will be ongoing and frequent, leading to both business and social bindings (Granovetter, 1995; Bagozzi, 1974). Early research on business relationships showed that companies often have a limited number of more important business partners on both the supplier and customer side and that this group of partners accounts for a major part of the company's sales and purchasing volume (Håkansson, 1982). Interaction with these partners is more intense, and they may also be more personal. Conceptually these ongoing exchanges are the fundament for the business relationships, and they mean that the involved companies will develop their businesses in parallel, affecting both the product development and the routines used when exchanging the products (Hallen, Johanson, & Seyedmohamed, 1991; Johanson & Mattsson, 1988). The coordination needed to carry out the business often involves multiple people from each company, and these professionals might also have a social connection to each other (Metcalf, Frear, & Krishnan, 1992; Dwyer, Schurr, & Oh, 1987; Turnbull, 1979). Thus, each business relationship will come with different forms of exchanges that can be described as *business* (product, services and financial), *information* (e.g. about the product or the order routines), and *social exchanges*. The business exchanges in the business relationship, whether it is with a customer or a supplier, will also comprise behavioral elements such as trust and commitment (Morgan & Hunt, 1994; Anderson & Weitz, 1992), and this is manifested as mutual *adaptations* to the product or service exchanged and even to the routines used for the exchanges (Hallén et al., 1991), following the logic of heterogeneous markets. The establishment,

development, and maintenance of a business relationship are thereby an important investment for the companies involved, and considering the time, effort, and resources each partner puts in to this business relationship, it can be regarded as a valuable resource in itself (Håkansson & Snehota, 1995; Cunningham & Homse, 1986).

To integrate the technology and business relationship aspects of enterprise system utilization this study has used the *business activities* as the bridging entity between what is IT and what is business as well as what are theoretical concepts and empirical action. From an IT perspective the use of a technology is connected to the activities, i.e. the business practices that are carried out when using the IT. Studying what has been done when using an enterprise system (e.g. placing an order) helps us understanding how it affects the user and the wider business. Activities can also be considered a theoretical concept in that they are a part of the theories on business relationships (Håkansson & Snehota, 1995) where activity chains in a business relationship are an entity that describes how businesses are carried out. Empirically, activities are also what people do in their everyday work.

To sum it up, the study has been supported by information systems theories that pinpoint the need to study a company's system features to grasp how and where it is used. It has also been supported by the web of computing concepts as a means to consider the wider context that affects the use within and beyond the organizational boundaries. These concepts have been used in parallel with management concepts that describe the

Table 6.1 The Theoretical Concepts, Their Theoretical Domain, and the Empirical Setting

Theoretical domain	*Information systems*	*Management of information systems*	*Management (marketing)*
Concepts	*System features*: —Operational —Monitor/control —Planning/decision —Communication —Inter-organizational *Web of computing*: —Line of work —Going concerns —Infrastructure —Production lattices —Macrostructure	*Standard systems* comes with a generic structure that might not fit the ongoing business interactions	*Exchanges*: —Business —Information —Social *Adaptations*: —Products —Routines
Empirical level	*Business activities*: Enterprise system use (or non use) in the business relationships		

company's interorganizational business as made up of different forms of exchanges. The character of these exchanges, and the mutual orientation business relationships bring, means that the involved companies will facilitate the ongoing exchanges with different forms of adaptations. Finally, the lessons offered by Walsham (2001, 1993) pools these two theoretical domains by theorizing standardized enterprise systems as a trade off, as they have a standard set of functions which might not be optimal for the users. Thus, the marketers and salesmen are theoretically described as being involved in ongoing exchanges, and this in turn means that they need to be prepared for different forms of adaptations. Whether this is doable is affected by the enterprise systems features as well as the setting (the web of computing) in which the enterprise system is used. In this study, the presented conceptual framework has been used to analyze the enterprise system use for interorganizational business activities as a means to understand the standardized enterprise system's effect on the company's business, with an emphasis on marketers and salesmen.

THE CASE STUDIES

To understand how enterprise systems are used in business relationships, case studies were carried out on two large companies, ABB Robotics and Volvo Wheel Loaders, and some of their customers and partners. Case studies are considered appropriate when studying contemporary phenomena in a real-life context when the researcher strives for a certain level of detail and when the questions are how or why (Yin, 2009; Galliers, 1991). The case study methodology encourages multiple sources of data as interviews, artifacts, and observations, as well as the use of *a priori* theories as a means to further develop knowledge of a phenomenon (Yin, 2009; Eisenhardt, 1989). The empirical illustrations in this chapter are drawn from two large case studies involving more than 80 interviews, several non-participatory observations, and the study of archival material during the years 2004–2006. The cases presented were selected on the grounds that both are large industrial companies—a category that has actively implemented enterprise systems—and that they both are involved in several business relationships (Ford et al., 2003; Davenport, 1998; Håkansson, 1982). Thus, the empirical data should be able to illustrate contemporary use of enterprise systems in business relationships. Many of the interviews were recorded and transcribed while others were written as comprehensive interview notes, complemented by sketches made jointly by the researcher and the respondent. After completion, the empirical drafts were also commented on by the respondents via member checking (Jonsen & Jehn, 2009)—a procedure that yielded even more empirical material and clarifications. The following sections are brief versions of the full research presentation (Ekman, 2006), and they provide insights into contemporary IT use in the business relationships of industrial companies.

Empirical Illustrations from the ABB Robotics Case

The first case presents ABB Robotics, which was a niche division within the ABB Group that had sold more than 140,000 robots globally at the start of the case study. ABB Robotics was one of 6–7 global players when it comes to producing robots on a large scale. The empirical descriptions in this chapter evolve around ABB Robotics' main office, sales office, and manufacturing plant in Sweden, which had approximately 1,400 employees at the time of the study. The ABB Robotics case also covers three of their main customers and partners: Volvo Cars, which bought a couple of hundreds robots for a Swedish manufacturing plant; Specma Automation, which was an engineering company and an ABB Partner; and SKF Seals, which had purchased 10 robots over the last decade.

During the study ABB Robotics had recently implemented a comprehensive enterprise system from SAP where the R & D, manufacturing, and logistic procedures had been prioritized but where more market-oriented functions were in line to be developed next. Basically, the robot had a digital representation in the SAP system in the form of a "material master." This representation was made by a group at the Order Department that structured various robot configurations in close collaboration with R & D and manufacturing planning. The digital representation—made as a set of selection rules—was used both for doing the manufacturing planning through regular material resource planning (MRP) calculations and for purchasers to acquire the needed parts from the suppliers. One of the persons at the Order Department that programmed the robot configurations in the SAP system explained that they created "rules" in the enterprise system, e.g. a rule that hindered a robot that would be exposed to splashing hot water from being equipped with sensitive components that would break down under such conditions. However, these rules were written with caution, given that the SAP system did not offer any good overview of how the rules were related to each other. One output from the robot configurations was "Robot Specification Forms" that the marketers and salesmen could use when creating offers for potential and present customers. These Robot Specification Forms were created as MS Excel spreadsheets based on data exported from the SAP system. The Robot Specification Forms had three levels of content and complexity: a standard offer for ABB Robotics' basic robots, an expanded offer with more options, and finally a customized offer that was used for customer with a need of a tailor-designed robot configuration. The standard and expanded offers could be sold to most customers, while the customized robot configurations were mainly made for larger customers. When customized versions of the robots were made, a large order was required, not seldom a hundred robots or more, so that the cost and resources required for manufacturing the custom robot could be spread. One of the salesmen also stated that a robot is a rather useless tool in itself. It needs to be "dressed," i.e. equipped with some peripherals, such

as welding, gripping, or painting tools, to be productive. Some of the equipment could be specified in the standard packages offered by ABB Robotics while others were highly customer specific.

ABB Robotics had three distinct sales channels. The single largest customer segment was the automotive industry, and these customers were handled through "capture teams," i.e. marketers, salesmen, and engineers that could act upon the customer's demands and that managed the negotiation process. When customers in the automotive industry ordered robots, it was usually the result of a long process. During the case study an ongoing robot delivery to a Volvo Cars plant in Sweden took place. The delivery involved approximately 200 robots to be used to produce the new Volvo S80 model that would be launched in 2006. Prior to the order the basic configuration of the robots had been described in general agreements between ABB Robotics and Ford Motor Company, which owned Volvo Cars at the time of the study. Ford had such an agreement with some of the major robot suppliers, including ABB, and these agreements delimited the competition when ABB Robotics formed their offer. However, the deal was initially still open given that any robot supplier who wanted to deliver robots to Volvo Cars also had to come up with 3D models for each robot. This requirement was based upon Volvo Cars' need to create virtual representations of the forthcoming plant so that they could test and optimize their production before they went live. Volvo Cars also required customized robots—e.g. when it came to the parts used for the robot communication—given that Volvo Cars also had contracts with another supplier that they could purchase spare parts from directly. Thus, Volvo Cars could specify that ABB Robotics must use a part that they normally did not use. The reason was that Volvo Cars wanted to have direct communication with what seemed to be important parts suppliers themselves, whether this was a financial or quality matter. When ABB Robotics won an order contract, as the one with Volvo Cars, it was declared a project and thereafter handed over to a group of ABB representatives, who focused on the design, manufacturing, and delivery of robots. A Marketing Manager at ABB Robotics' main office related that: "the car industry is drowned with engineers. Many of the purchasers are former engineers [. . .] so the sales personnel that go there have solid technical competence." Thus, the marketers and salesmen were often supported by engineers with the necessary experience both before and after a contract was signed. Many of the requirements Volvo Cars purchasers and engineers put forth were never handled in ABB Robotics' SAP system but instead registered in MS Excel spreadsheets or as paper documents in project binders. The documents produced during the negotiation process were also not stored in the SAP system. ABB Robotics had a Lotus Notes database for this information as well as other general information about the forthcoming product deliveries. A Senior Sales Specialist at ABB Robotics stated that the reason for the limited use of the enterprise system was that SAP did not support their way of doing business, and if they did use it they would administrate themselves to death. The order handling

of Volvo Cars' robots also involved only a limited use of the SAP system. To get an order involving hundreds of robots the project leader and the capture team must be sensitive to the customer's needs and wishes but, at the same time, not lose integrity and follow corporate guidelines. The rather rigidly structured SAP system didn't always comply with these needs. There were also situations when the customer required that ABB Robotics use another information system. An ABB Robotics Salesman related that when a new batch of robots was ordered, Volvo Cars did demand that ABB Robotics use Ford's web-based ordering system. Thus, the ABB Robotics sales and ordering personnel had to keep track of what Volvo Cars wanted next and then manually register it in the SAP system themselves.

Another way that ABB Robotics sold their robots was through one of their partners, Specma Automation. ABB Robotics classified their partners depending on their sales volumes and how closely they collaborated. By being an ABB Robotics Partner, these customers, which served as middlemen on a given market, were offered extra information, such as access to product information, on an ABB Extranet as well as ongoing education about the products through ABB University Seminars and so forth. The partner Specma declared that the relationship with ABB Robotics was well established but that it had its pros and cons. From their perspective, a robot is only one of several parts needed to design and create a manufacturing cell, and when a customer demanded a robot of another brand, Specma had to turn down that request due to their partnership with ABB Robotics. Specma had a staff of 20–40 persons, depending on the production level, i.e. a large proportion of their personnel were subcontractors hired for a limited time. However, Specma was also a part of the Investment AB Latour, which had 3,000 employees and good finances. Being part of the Latour group allowed Specma to handle rather large projects, with their connection to wider resources and competences even if Specma itself was rather small. The business with ABB Robotics was mainly handled by an ABB Robotics salesman who was assigned to deal with ABB Robotics Swedish partners. Specma's CEO said that they had been offered the Robot Specification Forms but they did not use them given (with a humorous tone) that it would eliminate their salesman's job. An ABB Robotics salesman verified that he was the one who used the Robot Specification Forms, since the people at Specma didn't use it themselves. From his perspective, this was a pity, as it left him less time to interact with the partners face-to-face and support them better when it came to market and technological issues. During the study ABB Robotics developed a Product Selection Software that would allow the salesmen and their partners to set up suitable robot configurations through a user-friendly graphical interface. This solution would result in robot configurations that could be re-used when the customers placed their orders. The new Production Selection Software would speed up the ordering process and ensure that a correct robot combination was ordered, i.e. the quotation and ordering process would be much more efficient in the future.

The final customer studied for the ABB Robotics case was SKF Mekan, a company that manufactures bearing carrying units. SKF Mekan had 180 employees at the time of the study and was a subdivision of the SKF Group, which is a multinational company with over 100 production plants around the world. The Production and Quality Manager at the SKF Mekan plant described that they considered robots for one or more of the following things: cost savings, ergonomics and safety, or quality. SKF Mekan had installed their first robot in the 1990s, and it was used for simple picking tasks. Through the years SKF Mekan had installed more than 10 robots, and the latest installation was a complex production line made up of two ABB Robots working in parallel supported by optical sensors and with one robot moving on a motion track platform. Observing the robots from when they were installed, one could discern a clear learning curve where more basic robots were followed by more complex and capable ones. From ABB Robotics' side SKF Mekan was supported by a salesman that dealt with ABB Robotics' smaller customers described as "general industry." Customers belonging to the "general industry" segment ordered one or two robots every other year, and they often required a bit more support during the selection and installation process. ABB Robotics' Salesman described that a purchasing process could go on for months, which he liked, as it meant that it became a stimulating sales process with a lot of personal interaction. He used ABB Robotics' Lotus Notes system for notes about customer requests so he could administrate ongoing projects. He also made personal notes to keep track of his main customers, who at the time of the study were limited to 10–15 companies that ordered robots yearly or every other year. The Salesman's notes were often unofficial and were mainly kept for his personal use. Other comments were written as memory notes regarding his personal evaluation of when the sale could take place, the probability that there would be a sale, as well as other information about the customer and their needs. The Robot Specification Forms in MS Excel was used by the salesman only when the robot was ordered, i.e. it had a rather limited use. The Salesman also mentioned that he didn't access the SAP system at all—this was handled by the Order Department instead. Once a robot was sold it lived its own life. SKF Mekan had, e.g., given their first robot new tasks due to changed needs, but this was not seen, nor captured, by ABB Robotics' SAP system. The only time ABB Robotics got information about a sold robot was when they performed service or installed new robot software on a customer's robot. However, this information was not stored in the SAP system but in another information system, and this legacy system was primary used by the after sales department.

Empirical Illustrations from the Volvo Wheel Loader Case

The second case study followed Volvo Wheel Loaders, which at the start of the study was Volvo Construction Equipment's largest business division,

with a sales volume of almost 8,000 wheel loaders in 2005. The study covered Volvo Wheel Loaders' Swedish market and its two major manufacturing plants in Sweden, with more than 1,300 employees. Within its segment, Volvo Wheel Loaders was a top-three player where the leading position was held by the American company Caterpillar. Volvo Wheel Loader had a diverse sales and distribution structure depending on country, and Swecon was their exclusive dealer on the Swedish market. Thus, Swecon was the only studied Volvo Wheel Loaders' customer, as they were the only buyer in Sweden. However, the gap left by not studying several customers was offset by the opportunity to study a formalized business relationship colored by intense interaction and large purchase volumes. This close business relationship was believed to offer a good insight in inter-organizational enterprise system use.

During the case study of Volvo Wheel Loaders they were in the middle of a shift from having a customized legacy system made up of multiple software applications to having a more integrated enterprise system from SAP. At the time of the study the financial functions had been migrated to an SAP system and this was be followed by even more business processes being migrated to and supported by the SAP system. Even though Volvo Wheel Loaders had a more fragmented information system than ABB Robotics at this time, they had similar functionalities where the manufacturing was supported by a MRP core designed for manufacturing and delivery planning. The R & D and Marketing Departments were supported by separate legacy systems that kept track of the product structures and prices. One of Volvo Wheel Loaders' IT Managers related that the current change of enterprise system had several driving forces, such as becoming more extended (i.e. being able to work more closely with their partners), integrated (that all data is handled by one system), and consolidated (that they all work in a similar way). In markets where Volvo Wheel Loaders didn't have their own salesmen, they preferred to use dealers, i.e. contracted external sales companies, for marketing and selling their products. These dealers had different levels of maturity when it came to utilizing IT, and this led to a situation where some dealers were digitally connected to Volvo Wheel Loaders through electronic data interchange (EDI) while other dealers had to be handled via telephone of fax. Volvo Wheel Loaders' considered the Swedish dealer Swecon a mature partner, and they said that they used EDI for all their orders to Volvo Wheel Loaders.

There are a number of management information systems that can be used by automotive companies. These go under the label Dealer Management System (DMS). Volvo Wheel Loaders supported and encouraged their dealers to use a preferred DMS that easily could be connected to Volvo Wheel Loaders' own enterprise system. During the study both Volvo Wheel Loaders and Swecon were in the middle of a migration process because both companies felt they had legacy systems that did not fully support their businesses. Swecon had a DMS that was made up of several legacy systems

partly integrated and developed in cooperation with Volvo Wheel Loaders. However, an engineer at Swecon pointed out that they refined their wheel loaders further, so that they had become Swecon specific products. Thus, Swecon's salesmen and marketers needed a DMS with functions that also allowed the use of parts and products from other companies and of other brands. With Swecon's position as the sole seller of Volvo Wheel Loaders in Sweden, from an end-customer perspective the Swecon brand is synonymous with a Volvo machine. These wheel loaders also have great value as used, and Swecon also sold used wheel loaders. Volvo Wheel Loaders were not involved in this used market business, but Swecon's DMS needed to have features that allowed Swecon's salesmen to store information about used wheel loaders. Swecon related that they tried to respond to Volvo Wheel Loaders' requests, but they had to select another information system, as Volvo Wheel Loaders' recommended DMS didn't fulfill all their needs.

A Swecon Salesman reported that the new wheel loaders use to be equipped with extra products, such as a weight device, fire extinguisher, and so forth. These accessories were administrated in MS Excel Spreadsheets created by Swecon's engineers. The spreadsheets was based on the data offered by Volvo Wheel Loaders enterprise system but they were complemented by Swecon's engineers, who decided which combinations that Swecon would offer besides the packages Volvo Wheel Loaders offered themselves. Many of these accessories were also bought from other companies than Volvo Wheel Loader. Thus, Swecon's salesmen used these MS Excel Spreadsheets when they created quotations, and once they made a sale it was recorded in Swecon's DMS by a market assistant and then transferred to Volvo Wheel Loaders via EDI. When this was done Volvo Wheel Loaders' ordering and production planning personnel could update their product schedules right away. A Material Supply Manager at Volvo Wheel Loaders mentioned that further development of their enterprise system was necessary given the demands on their factory. He used ocean travel as a metaphor—in the past it was enough with a sextant but nowadays the fast ships need GPS. He thought it was the same with modern factories and the delivery on time demands; it relied on real-time and accurate information. However, even if the information exchange between Swecon and Volvo Wheel Loaders was integrated, the information about the end-customer was rather aggregated and hence on a general level.

DISCUSSION AND CONCLUSION

The two cases presented reveal that the scope of the enterprise systems studied had mainly been internal and highly product- and manufacturing-focused, while market-focused functions have been inadequate or under development. This is in line with the study by Davenport et al. (2004). Following the systems features concept (Markus, 1984), the enterprise

systems studied can mainly be described as being *operational* as well as used for *monitoring and control*. Once an order was placed, the enterprise systems were also supporting the companies' need for *planning and decision*-making regarding manufacturing and delivery. However, the cases showed that the enterprise systems were of very limited use when it came to the *communication* between the marketers, salesmen, and their customers, and the Volvo Wheel Loaders–Swecon relationship was the only one that showed a well-developed *interorganizational* use. Thus, the system features (Markus, 1984) show that the enterprise system doesn't cover many of the exchanges that take place in the business relationships. This has led to a situation where the enterprise systems' use for the marketers and salesmen is limited.

When using the web of computing concepts (Kling & Scacchi, 1982) the marketers' and salesmen's lack of an enterprise system use can be understood even better. When analyzing the *line of work* it is clear that the marketers and salesmen want to respond to the customers' needs, and this might involve adaptations that are difficult or time-consuming to manifest in the enterprise system. An interesting deviation from this was ABB Robotics, which had defined a "Customized Robot Configuration" in the enterprise system, i.e. they sold customized robots on a continuous basis, and they had incorporated this into their SAP system. However, seen from the enterprise system's point of view, this had a limited impact on the marketers and salesmen that used MS Excel spreadsheets at the time of the study. When it comes to the *going concerns* the cases has clearly showed that the customer needs are prioritized, and the cases show that the marketers and salesmen see their customers and partners, what Lamb and Kling (2003) describe as affiliates, i.e. the business relationships that also involve social exchanges (Granovetter, 1985; Håkansson, 1982). Both cases have presented two companies in the middle of a migration process, entailing that the *infrastructure* has been in transition and that the support for business exchanges has been limited. The *production lattices* have shown how this type of businesses has a number of involved actors, but there is a rather clear division of labor, both internally and in the business relationship. Thus, the enterprise systems were used by those directly involved in the manufacturing, while the marketers and salesmen used other applications. Finally, we have also seen examples where the *macrostructure*, e.g. the requirement to use Ford's web-based order system for the Volvo Cars orders or for Swecon's need of a DMS that handled product beyond Volvo Wheel Loaders', limits the enterprise system use in the business relationships studied. The concepts of the web of computing thereby show that limited use might have multiple causes (Kling & Scacchi, 1982). Another interpretation is that enterprise systems are transaction focused, not relationship focused, since they only deal with data directly related to the exchange of the companies' products. The business exchanges that take place between industrial companies have involved a lot of people from both participating companies, and these exchanges

incorporate a lot of information that hasn't been related to the selling company's product, or, alternatively, the exchanges have required information that couldn't be offered by the enterprise system.

The study is in line with the lessons presented by Walsham (2001, 1993) where the enterprise systems' generic and production-focused functioning has supported the marketers and salesmen to a low degree. The cases have described different business activities carried out in the business relationships, and they have also displayed different forms of exchanges. The study has also displayed various forms of adaptations. The ABB Robotics' customer Volvo Cars, e.g., require digital 3D models and specific robot configurations containing specific parts—adaptations that ABB Robotics made based upon extensive information exchanges involving engineers from both firms. These adaptations clearly show a willingness to satisfy Volvo Cars' need for robots, and they exemplify the marketers and salesmen everyday situation. Another example is Specma Automation, which didn't use the Robot Specification Form due to what might have been considered its low usability but also because they were used to having a personal interaction—i.e. both information and social exchanges—with the ABB Robotics salesman. Then there was ABB Robotics' business with SKF Mekan, an interaction that was mainly recorded through personal notes due to the ABB Robotics' salesman's habit and convenience. When analyzing the SKF Mekan business relationship there was clear evidence of customer learning and increased customer expectations, but this could not be seen in any enterprise system; it was the salesman's personal knowledge. Finally Volvo Wheel Loaders' business relationship with Swecon showed that their partner needed functions beyond those that dealt with Volvo products. Thus, the business relationships not only involved a seller and a buyer that interacted when negotiating a product, there were several professionals, such as purchasers, salesmen and marketers, engineers and technicians, and so forth that throughout repeated meetings came to terms with what solution the customer needed and how the deal should be handled. These interactions comprised all forms of exchanges, and they also entailed that there were adaptations made, both to the products and the sales procedures, which seems to be common in business relationships (Hallén et al., 1991). The enterprise systems studied have not supported all of these distributed activities, nor all the exchanges or adaptations.

The cases have showed that the enterprise systems have been used for the ordering process, i.e. when products have been sold, but less for the other interaction that takes place before and after the order. Prior to the order, i.e. during the negotiation process, the enterprise system was only used for creating personalized MS Excel spreadsheets at ABB Robotics, and a similar use was seen at the Volvo Wheel Loaders' partner Swecon. The companies studied were both in a state of change—ABB Robotics' was developing a Product Selection Software, Volvo Wheel Loaders migrated to a new SAP environment, and Volvo Wheel Loaders was also discussing a

new Dealer Management System with Swecon. But to fully succeed, these software packages need to be able to include much more than the mere product, price, and order information, given that the marketers and sales men's description showed that there are much information exchanged prior to an order. The study also showed that the information about sold products wasn't integrated with the current enterprise system, i.e. detailed knowledge about the current customer base mainly resided with the salesmen (as at ABB Robotics that also had a separate database at the aftermarket department) or at a partner company (as Volvo Wheel Loaders' partner Swecon). The sales activities presented have also illustrated how the exchanged products have been complemented with other companies' products. Such information is also not handled by the enterprise systems, as they only had features to handle the company's products.

The cases have illustrated that marketers and salesmen are perceptive to the customers' and partners' needs, which leads to different forms of adaptations as a means to facilitate the business relationship and make a sale possible. The main argument behind company-wide and integrated enterprise systems is that they support most of a company's needs. However, the sale (which in turn leads to manufacturing and delivery) is only one of all the business activities that take place in a business relationship. The business relationships described have shown that there is a lot of information exchanged besides ordering products. The cases have also indicated that the customers learn about the products, and may alter them, once they have left the manufacturing plant. This is something that the marketers and salesmen gain knowledge about, but they do not register this information in any enterprise system. A special case was also the Volvo Wheel Loaders and Swecon partnership, where Swecon dealt with all the Swedish customers. Even though that must be considered a formalized business relationship with a high degree of trust, there was considerable information, about the used market or complementary products, for instance, that Volvo Wheel Loaders never received.

The answer to the research question of how enterprise systems support the business activities that take place in a business relationship must be, considering the previous discussion, to a low degree, at least when focusing on the needs of marketers and salesmen. The challenges for management are therefore finding ways to include functionalities that allow more information than mere product information to be captured in an integrated system. Whether this is described as e-commerce, CRM modules, or via a separate information system, such as a knowledge management system (KMS; Newell et al., 2003), is an open issue. Whatever solution is selected, the marketers' and salesmen's dynamic environment, their inclination to establish a personal approach, and their willingness to adapt to customer needs might be the greatest obstacles for the completely integrated enterprise system. With a history in MRP systems focusing on efficiency, enterprise systems need to change considerably to be more flexible and thereby more useful to frontline personnel. But even if there were no point in including

all information for the exchanges that take place in a business relationship, more functions can be in fact added. The selected cases, e.g. illustrated products that have long life spans—often with a strong aftermarket—and by collecting data about the customers throughout the product lifecycle, the enterprise system can also offer the company valuable knowledge about the current product portfolio that is useful when developing new products as well as when evaluating the current customer base. The marketers and salesmen are at the company forefront, and their knowledge about the company's business relationships can be better captured by considering more forms of exchanges when implementing an enterprise system.

DISCUSSION QUESTIONS

Based upon this chapter:

1. Do you think it is worth striving for a fully integrated enterprise system or is it better to use a portfolio of information system with limited integration? What are the main benefits and what are the downsides with the different solutions?
2. The study has tried to combine two theoretical domains, management and IT. Do you think the approach has been fruitful, and are there any other theoretical domains that might have helped us understand the business context better? In what way?
3. The findings of the study show the implications of having the enterprise systems set up around the company's product logic. Given that over the last few decades services have been put forward as a main competitive advantage, what changes needs to be made to the current enterprise systems to better support a business that follows a service logic?

RECOMMENDED FURTHER READING

Davenport, T. H., Harris, J. G., & Cantrell, S. (2004). Enterprise systems and ongoing process change. *Business Process Management Journal*, *10*(1), 16–26.

Ford, D., Gadde, L.-E., Håkansson, H., & Snehota, I. (2003). *Managing business relationship* (2nd ed.). Chichester, UK: John Wiley & Sons.

Lorenzo, O., Kawalek, P., & Ramdani, B. (2009). The long conversation: Learning how to master Enterprise systems. *California Management Review*, *52*(1), 140–166.

REFERENCES

Alderson, W. (1965). *Dynamic marketing behavior: A functionalist theory of marketing*. Homewood, IL: Richard D. Irwin.

Anderson, J., & Weitz, B. (1992). The use of pledges to build and sustain commitment in distribution channels. *Journal of Marketing Research*, *24*, 18–34.

Bagozzi, R. P. (1974). Marketing as an organized behavioral system of exchange. *Journal of Marketing*, *38*(4), 77–81.

Carlsson, S. A., & Hedman, J. (2004). From ERP systems to enterprise portals. In F. Adam (Ed.), *The enterprise resource planning decade: Lessons learned and issues for the future* (pp. 263–287). Hershey, PA: Idea Group Inc.

Cunningham, M. T., & Homse, E. (1986). Controlling the marketing–purchasing interface: Resource development and organisational implications. *Industrial Marketing and Purchasing*, *1*(2), 3–27.

Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review*, *77*(2), 106–116.

Davenport, T. H., Harris, J. G., & Cantrell, S. (2004). Enterprise systems and ongoing process change. *Business Process Management Journal*, *10*(1), 16–26.

Davenport, T. H., & Prusak, L. (2003). *What´s the big idea? Creating and capitalizing on the best management thinking*. Boston: Harvard Business School Press.

Dwyer, F. R., Schurr, P. H., & Oh, S. (1987). Developing buyer–seller relationships. *Journal of Marketing*, *51*, 11–27.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532–550.

Ekman, P. (2006). *Enterprise systems & business relationships—The utilization of IT in the business with customers and suppliers*. Doctoral thesis No. 29, Västerås: Mälardalen University.

Ford, D., Gadde, L.-E., Håkansson, H., & Snehota, I. (2003). *Managing business relationship* (2nd ed.) Chichester: John Wiley & Sons.

Galliers, R. D. (1991). Choosing appropriate information systems research approaches: A revised taxonomy. In K. H. Nissen, (Ed.), *Information systems research: Contemporary approaches and emergent traditions* (pp. 327–345). Amsterdam: North-Holland.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, *91*(3), 481–510.

Håkansson, H. (Ed.). (1982). *International marketing and purchasing of industrial goods: An interaction approach*. Chichester: John Wiley & Sons.

Håkansson, H., & Snehota, I. (Eds.). (1995). *Developing relationships in business networks*. London: Routledge.

Hallen, L., Johanson, J., & Seyedmohamed, N. (1991). Interfirm adaptation in business relationships. *Journal of Marketing*, *55*(2), 29–37.

Johanson, J., & Mattsson, L.-G. (1988). Internationalisation in industrial systems—A network approach. In N. Hood & J.-E. Vahlne (Eds.), *Strategies in a global competition* (pp. 287–314). New York: Croom Helm.

Jonsen, K., & Jehn, K. A. (2009). Using triangulation to validate themes in qualitative studies. *Qualitative Research in Organizations and Management*, *4*(2), 123–150.

Kling, R., & Scacchi, W. (1982). The web of computing: Computer technology as social organization. *Advances in Computers*, *21*, 2–90.

Lamb, R., & Kling, R. (2003). Reconceptualizing user as social actors in information systems research. *MIS Quarterly*, *27*(2), 197–235.

Lorenzo, O., Kawalek, P., & Ramdani, B. (2009). The long conversation: Learning how to master enterprise systems. *California Management Review*, *52*(1), 140–166.

Markus, L. M. (1984). *Systems in organizations*. Cambridge, MA: Ballinger Publishing Company.

Metcalf, L. E., Frear, C. R., & Krishnan, R. (1992). Buyer–seller relationships: An application of the IMP interaction model. *European Journal of Marketing*, *26*(2), 27–46.

Morgan, R. M., & Hunt, S. D. (1994). The commitment–trust theory of relationship marketing. *Journal of Marketing*, *58*(3), 20–38.

Myers, M. D., & Avison, D. (2002). *Qualitative research in information systems: A reader*. London: SAGE Publications.

Newell, S., Huang, J. C., Galliers, R. D., & Pan, S. L. (2003). Implementing enterprise resource planning and knowledge management systems in tandem: Fostering efficiency and innovation complementary. *Information and Organization*, *13*, 25–52.

Orlikowski, W. J., & Iacono, S. C. (2001). Research commentary: Desperately seeking the "IT" in IT research—A call to theorizing the IT artifact. *Information Systems Research*, *10*(2), 121–134.

Penrose, E. T. (1959). *The theory of the growth of the firm*. New York: John Wiley & Sons.

Schneider, B., & Klein, K. J. (1994). What is enough? A systems perspective on individual–organizational performance linkages. In D. H. Harris (Ed.), *Organizational linkages: Understanding the productivity paradox* (pp. 81–104). Washington, DC: National Academic Press.

Seddon, P., Shanks, G., & Willcocks, L. (2003). ERP—The quiet revolution. In G. Shanks, P. B. Seddon, & L. P. Willcocks (Eds.), *Second-wave enterprise resource planning systems—Implementing for effectiveness* (pp. 1–19). New York: Cambridge University Press.

Sumner, M. (2005). *Enterprise resource planning*. Upper Saddle River, NJ: Pearson Prentice Hall.

Turnbull, P. W. (1979). Roles of personal contacts in industrial export marketing. *Scandinavian Journal of Marketing*, *16*(5), 325–337.

Walsham, G. (1993). *Interpreting information systems in organizations*. Chichester: Wiley & Sons.

Walsham, G. (2001). *Making a world of difference—IT in a global context*. Chichester: John Wiley & Sons.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Thousand Oaks, CA: SAGE Publications.

7 Integration of Information Technology in Business Relationships
A Managerial Issue

Cecilia Lindh

The use of information technology in business is a challenging managerial issue; the technology is commonly employed to increase efficiency and find new ways of exchanging necessary information. However, the situation where this is achieved is not one that is reached instantly or easily maintained. Accomplishing this situation in a company is a cumbersome task but still within the range of control of a single management. The issue of information technology use in the business with customers and suppliers is even more complex and tedious as managers from not only one company, but two, need to have an understanding of the new technology in its actual business setting if they want to use it effectively. Several studies have provided valuable insights into how information technology is adopted by a single company's organization and what benefits can be achieved when the technology is part of the organization's activities. However, when information technology becomes part of actual business—i.e. used in the interaction between two companies' organizations instead of within the single one—the situation is very different and calls for alternative approaches. In this chapter the situation of information technology in the interaction of two companies is approached with a business relationship perspective. This perspective is argued to be more suitable for finding crucial knowledge necessary for managers given the focus on information technology use in the interaction between companies. The managers of companies need this knowledge and other input on the matter of how information technology is *integrated in business relationships* and, above all, what the *implications* of information technology are when it is integrated in the business with suppliers and customers in order to reach the desired increased efficiency.

This chapter discusses the integration of information technology in a perspective of business relationships. It draws on a prior study founded on a theoretical approach to business relationships and integration that was validated by means an extensive quantitative empirical study of 353 business relationships on the Swedish business-to-business market (see Lindh, 2006). In the study integration is employed as a frame of reasoning when approaching change in business relationships that can be related to responding to an issue initially exogenous to them but

eventually part of them. Specifically, the exogenous factor in the study is various forms of information technology that can be used in the interaction between two companies.

The aim of this chapter is thus to present some central findings from the study on how information technology used in business relationships can be studied and how the relationships change when information technology becomes integrated in them. The starting point chosen for this is the developed theoretical approach on integration in the study, which, in a single statement, can be formulated as:

> *Integration of information technology in business relationships is a collaborative state of purposeful use of the information technology.*

Now, how can this statement be used in a discussion on the change of information technology in business relationships that managers may learn from? The statement discloses some pivotal opinions on the phenomenon: (1) the *collaborative state*, which refers to the structure of integration in its particular setting, i.e. the business relationship, and; (2) the *purposeful use* referring to the direction of integration, i.e. that the information technology is there as the use of it improves specific business functions and involve specific behavior. A deeper understanding of behavior in business relationships relating to integration of information technology can provide managers with useful tools, tools that help the managers in understanding what integration of information technology in their business relationships entails, and what benefits and challenges that may await them.

The chapter starts with a brief background on information technology in business and business relationship theory followed by a discussion of the collaborative state of integration. This is followed by a presentation of selected findings on how the business relationships studied changed as the result integration of information technology and finally, some managerial implications are outlined.

INFORMATION TECHNOLOGY AND BUSINESS RELATIONSHIPS—A BACKGROUND

Business is fundamentally based on the buying and selling between two parties. It can be as simple as a person buying today's newspaper from a newsstand, a simple procedure involving many buyers. On the other hand, business can also involve highly sophisticated products that are not clearly defined and involve few customers or just one customer. It can be said that business varies in character, from simple to more complex. The varying complexity entails that the parties need different amounts of information from each other. This implies an effect on the possibilities and outcome of how information technology can be employed as well as how it impacts

business. Information technology has certain distinguishing characteristics in a business setting, mainly as it provides the ability to increase efficiency due to: (a) the reduction of time needed to get information; (b) the facilitation of rapid response and reaction; and (c) the ability to handle both simple and complex content (e.g. Müller & Seuring, 2007).

When business of lower complexity is carried out, information technology is mainly used to advertise information and to attract customers. Electronic marketplaces are expanding, and many consumers engage in home shopping, which means purchasing from websites on the Internet instead of in a store (Bonfield, 1993).

An example of higher complexity of business that is handled with the help of information technology is the customers of a bank, who need service and security since they trust the bank with their money (Alhudaithy & Kitchen, 2009; Johns & Perrott, 2008). That means the service level is high, so customers are handled efficiently with information technology since there are many of them, and each represents a relatively small share of the suppliers' turnover. Both the storing of information on customers in databases and communicating with them via the Internet are important.

For companies involved in business of higher complexity, information technology can provide many solutions that can be used to enhance the flow or management of data and information. This can involve anything from making orders on email to systems for order–delivery–payment or product development through shared databases (Berthon, Ewing, Pitt, & Naudé, 2003; Hill & Scudder, 2002). Information technology makes it possible for partners to share databases and messages to be copied and delivered instantly to a vast number of recipients (Deeter-Schmelz & Kennedy, 2002; Ortega, Martinez, & De Hoyos, 2008).

The companies can use Electronic Data Interchange (EDI) to transfer information (Elgarah et al., 2005). A special format is used to encrypt the messages, which is decrypted (electronically) upon arrival at its recipient. Order confirmation and invoices can be sent automatically with EDI, and in some business relationships it is used for payment. EDI in business between companies saves a great deal of time and work since some activities occur automatically. Companies that do business regularly have ongoing activities and can invest together in computer-based systems, like EDI, that automate their joint activities to some extent (Laage-Hellman & Gadde, 1996; Seyal, Rahman, & Muhammad, 2007). Their sharing or transfer of information is organized around the business, to carry out production and deliver products. For many companies, information technology is used to keep present customers, as the example of banking showed. Using information technology then means a higher level of service and makes complex business simpler and, inevitably, has an effect on the duration of business (Sanders, 2007).

The vast organizing of activities and the scope of business that is required for more extensive use of information technology in business are complex issues. Information technology may be technically complex, since it may

be especially developed for a specific purpose or require efforts of maintenance of computers or software. The complexity, however, also lies within its use as the degree of difficulty that places demands on the users. Also, one company may be using information technology for many different purposes, which adds to the complexity of use and communication between departments of employees. In the setting of a business relationship information is exchanged for a variety of purposes, which accounts for a rather high level of complexity in the use of the technology.

Continuing business between well-known business partners has been extensively studied from a business relationship perspective. Business relationships are based on exchanges—of products for money and of information exchange—but also encompass many aspects of behavior, such as trust or commitment between the parties or activities of adaptation that are made in order to carry out the business (cf. Hallén, Seyed-Mohamed, & Johanson, 1991; Johansson, 1989; Morgan & Hunt, 1994).

A central theme in the business relationship approach is that business is a joint activity between two companies. The focus is on the interaction between them instead of the business operations of one company. The activities between two companies are investigated and business activities are approached as bi-directional, i.e. business takes place in a dyad of exchange (Bagozzi, 1974). Exchange concerns more than buying and selling, as the law of exchange by Alderson and Martin (1965) defines: Exchange is when both parties give something in order to obtain something they need, but did not possess before, and thus exchange increases the value of each party (Alderson & Martin, 1965; Bagozzi, 1974). Exchanges have become established as the core of business relationships. They have been studied as exchanges with varying aspects: product exchange, information exchange, social exchange, technological exchange, and financial exchange (Cook & Emerson, 1978; Håkansson, 1982). Exchange of information is part of the exchanges of a business relationship, important both for executing the product exchange and the money transfer (Hallén et al., 1991; Johanson, 1989). In the case of information technology integration, the exchanges are very important for the discussion on what different functions the information technology is used for.

Over time, a content of behavior specific to the business relationship develops. The content of behavior in a business relationship is the imprinted results of interactions that have led to exchanges, and thereby it is decisive for future exchanges (Anderson & Weitz, 1992; Hallén et al., 1991; Johanson, 1989). In research on business relationships, several elements of behavior have been established. One of the fundamental elements of the content of behavior of a business relationship is trust. Trust is built as the parties get to know each other and interact (Morgan & Hunt, 1994). Another basic element that characterizes the content of behavior in business relationships is the parties' willingness to commit resources to the continuation of exchanges in the relationship. Commitment in business

relationships encompasses all the self-reported and perceived pledges of the parties (Anderson & Weitz, 1992). As time passes and the two parties develop a business relationship to fill their respective needs, their interdependence gradually increases (Brennan & Turnbull, 1999). Interdependence is the mutual recognition that each of the two companies depends in part on the other. One element of the content of behavior relating to increased interdependence is adaptation in business relationships. Adaptation refers to the degree to which parties adjust to match their operations so the exchanges can be carried out, involving, for example, the adapting of products or processes of production. (Hallén et al., 1991) The behavior of a business relationship decides the direction of business and is therefore important in the discussion of the integration of information technology in business relationships. The elements of exchanges and of behavior make up the structure of the business relationship. As neither exchanges nor behavior is static, the business relationships are dynamic and change over time, as in the context of integrating new technologies.

The Collaborative State of Integration in Business Relationships

The multifaceted and wide range of use of information technology in the exchanges of business relationships renders it a complex phenomenon. Integration of information technology is a way to describe the employment of information technology in business relationships, since it entails a profound role for the information technology. However, it is not an established concept in academic research on companies' behavior in the business relationship perspective. A more common context is supply chain management; integration in studies on information technology in business relationships, as well as supply chain management, is becoming increasingly common (e.g. Thun, 2010).

One of the most often quoted definitions of integration is by Lawrence and Lorsch (1967, p. 11): "the quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment." In their case it is integration between departments within one company that is studied, as opposed to this work, in which integration is between two companies doing business using information technology. The essence of integration still refers to collaboration between two distinct units. In the case of information technology, the concept integration encompasses the purposeful use of the technology between two companies in business, i.e. to the *state of collaboration* that Lawrence and Lorsch (1967) refer to.

Integration as a state of collaboration implies that the companies of the business relationship are collaborating and the consequence of that must also be that integration has an effect on the companies' respective operations. The line of argument on integration suggests that information technology, when employed in a business relationship, inevitably leads to a process of change.

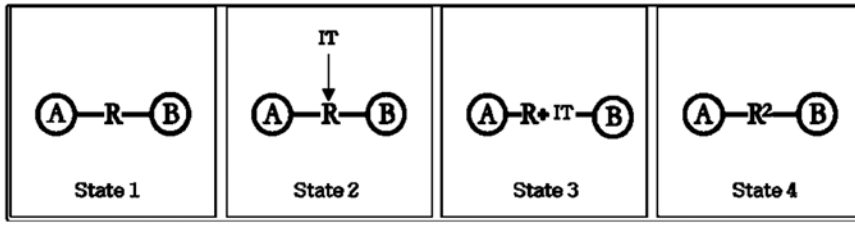

Figure 7.1 Integration of information technology and change.

Figure 7.1 describes how information technology can be integrated in business relationships showing how an exogenous factor enters a business relationship (in this case it is information technology, IT) and becomes integrated. Assume that company A and company B have developed a long-term business relationship, R (State 1). The two companies decide to include information technology, IT, in their business relationship R (State 2). This means that the information technology and what it comprises will be added to R and accordingly R changes (State 3). The companies' business relationship, now R2, is composed, first, of the functional and technological basis of R, but also of the content of information technology and what that brought into the R (State 4). State 4 also means that it is no longer possible to detach IT from R2; they are in fact inseparable. In this illustration the integration of information technology is seen by comparing the stages before and after, whereby the efficiency of the business relationship is increased; A and B can enhance their mutual benefit.

The process of implementing information into the business relationship occurs during a limited period of time and is certainly interesting to study for anyone who wishes to gain more profound knowledge about the first encounter a company has with information technology. An important implication of the business relationship perspective, however, is long-term orientation and thus also ongoing employment of information technology. The discussions in this chapter refer to State 4 in Figure 7.1, since business relationships in the collaborative state of integration of information technology are analyzed.

Integration of Information Technology

Regarding the content of information technology integration in business relationships the study showed clearly that the technology is part of exchanges as well as behavior in the business relationships (Lindh, 2006). Information technology is used for a number of functions and to some extent its use affects the exchanges as well as the behavior in business relationships. The companies involved in a business relationship continuously exchange information on the product itself, and for that purpose information technology is employed to a large extent. This is closely connected to

continuously agreeing on delivery as well as placing orders, and for those functions there is also vast employment of information technology. For these exchanges, information technology is used very frequently. This is evidence that the information technology is there as a joint decision and has specific purposes.

The purpose of using information technology in business relationships is to enhance the exchanges of information. The changes are connected to the behavior, so they are affected too. First of all, as there is use of information technology in the exchanges, they become increasingly important to both parties. The importance is linked to a general level of agreement on the use of the information technology and openness to further increase. This means that the integration of information technology is based on cooperative behavior and the reliance on the business relationship continuation. Trust and a long-term orientation are also parts of the information technology integration. The parties may have become increasingly interdependent as the information technology becomes more and more important to the business relationship, and the routines to use it become specific to some degree. The business relationships are adapted to the use of information technology, which implies that the parties of the business relationships are committed to the use of information technology.

Integration of Information Technology and change

Regarding the changes in a business relationship when there is integration of information technology, the analysis (Lindh, 2006) shows a number of interesting results. It seems that in general the level of integration of information technology is contingent on the content and purposes of the business relationship, but the reverse is also true, the development of the relationship is a result of the integration of the information technology.

In general, knowledge on information technology increases as it is used in business relationships, and the higher the integration of information technology, the stronger the relation is. This means that the more the technology is actually used and the more important it is for carrying out the business, the more the companies increase their knowledge of the technology they are using. Thus the knowledge about the use of information technology that companies need to carry out their business is acquired as the technology is being used. The implication is clear: Business relationships are important for companies regarding their learning processes of the information technology that is useful for them in their business. The result also highlights the importance of cooperation in the longer term.

Commitment contributes to the learning process and the effective use of information technology. This is also demonstrated by the efforts made to develop the business relationship with information technology. Companies set goals together regarding the information technology, which indicates a clear agenda of cooperative behavior. The analysis shows that many

business relationships with a higher integration of information technology are important to the companies for their development of information technology. They are engaged in joint activities regarding information technology, such as setting common goals or customizing the use of the technology to fit the business relationship.

The efficiency in managing information increases as the information technology is used in business relationships. One example is that the higher integration of information technology relates to a decrease in the need for personal meetings. Although planning and preparation for investment in information technology are essential, the increased efficiency is a result of ongoing use of the technology between the parties. Hence the integration of information technology is a process that can be expressed as "learning by doing." Experience is built into the business relationship and is decisive for the outcome of how effectively the technology is used. The implication is that the expected effect of the information technology and the future ability to use it effectively comes with practice. It is not just the technology as such that affects the outcome.

CONCLUSIONS

This chapter set out to present findings developed from an extensive empirical study on how company operations with suppliers and customers change due to information technology. The findings are based in the investigation of information technology in business relationship *between* companies, rather than restricting the study to include only the information technology used within a single company. Approaching business and the use of information technology as taking place in the ongoing interaction between parties showed that (1) the effective use of information technology in business relationships means cooperation; and (2) that it cannot be delimited to some specific activities in the relationship.

The use of the business relationship approach showed clearly that there is more to business between companies than just buying and selling; the content of behavior related to activities of exchanges contains a whole set of elements that increase the level of explanation of models of companies' behavior in business. Integration means adding not just the value of the investment of the counterparts to the business relationship but also the creation of new values from the increased efficiency, further increasing the mutual value of the relationship for the counterparts.

When there is integration of information technology in business relationships, changes follow. This is twofold: First there is the integration as such, which means that the technology is purposefully used. Second, the integration has implications for the business relationships and their content as a whole. Thus the integration of information technology in business relationships has two dimensions: one connected to the exchanges and another

connected to behavior. Information technology integration is analyzed with the elements of business relationships, which yields the benefit that it is possible to discuss the details of integration.

In summary, information technology is integrated when it is indispensable to the two companies' execution of activities necessary to perform business. Information technology is initially an exogenous factor influencing the business relationship by eventually becoming endogenous to it. When integration of information technology refers to the collaborative state and purposeful use of the information technology in the business relationship, the technology cannot be regarded as a commodity that has an effect solely by being purchased. It has to be integrated for its specific function in the exchanges. Thereby it becomes purposeful and part of exchanges and behavior. Only then, when the opportunities of the technology are embraced and are employed in a *collaborative state of purposeful use*, is the information technology integrated in the business relationship.

MANAGERIAL IMPLICATIONS

This chapter concerns the information technology used in the interaction *between* companies rather than the one used within their respective organizations. The study has by using a business relationship approach pointed out that (1) there are considerable amounts and varieties of activities taking place by means of information technology between companies; and (2) the activities are organized rather than ad hoc. To manage information technology use in this setting is perhaps even more complex than doing so within a company, but it is necessary and deserves attention, since the benefits of doing so are arguably substantial. In this chapter integration of information technology in business relationships is presented as being a collaborative state. This has a number of implications that managers may want to consider.

The effective and efficient use of information technology in business between companies is more about learning by doing than by planning. The knowledge of information technology that makes business efficient is acquired in a learning process in the business relationship, thereby being to a large extent experiential. Furthermore, the cooperative setting with a long-term orientation is necessary for the experiential knowledge to be obtained.

Knowledge that is of importance for a business relationship is developed within it, and it can be of importance for companies' operations in general, i.e. for their organization and other relationships. This is valid also in the case of information technology—much of the knowledge development on the technology that occurs in the business relationships is of benefit also outside that specific relationship in which it was developed. So, again the importance of cooperation and a long-term orientation are stressed—they are essential if the full benefits of information technology in the information exchanges are to be achieved.

A final issue to consider is the implication of the complex organized activities of business relationships. They are to some extent like vessels that carry information, products, and money between companies. Important business relationships often have a rich content and are thereby more than vessels—they are also complex settings for technological development and learning. This becomes even more evident when the case of information technology integration in business relationships is studied.

DISCUSSION QUESTIONS

Based upon this chapter:

1. Discuss the different activities that go on in business relationships and how information technology can be used to carry them out.
2. Discuss the differences between a young business relationship (of 6 months–1 year) and another that has been established for at least 10 years.—What knowledge about each other would there be in the older relationship that the younger has not developed yet?—Also discuss pros and cons: what advantages or disadvantages will the young and the older have (respectively) regarding their ability to or adapt to new technologies? Use the concepts presented in the chapter, i.e. cooperation, commitment, adaptation, learning, trust, interdependence to guide the discussion.

RECOMMENDED FURTHER READING

Anderson, E., & Weitz, B. (1992). The use of pledges to build and sustain commitment in distribution channels. *Journal of Marketing Research, 29*(1), 18–34.

Brennan, R., & Turnbull, P. W. (1999). Adaptive behavior in buyer–seller relationships. *Industrial Marketing Management, 28*(5), 481–495.

Hallén, L., Seyed-Mohamed, N., & Johanson, J. (1991). Interfirm adaptation in business relationships. *Journal of Marketing, 55*(2), 29–37.

Mukhopadhyay, T., & Kekre, S. (2002). Strategic and operational benefits of electronic integration in B2B procurement processes. *Management Science, 48*(10), 1301–1313.

Ortega, B. H., Martinez, J. J., & De Hoyos, J. M. (2008). The role of information technology knowledge in B2B development. *International Journal of E-business Research*, *4*(1), 40–54.

REFERENCES

Alderson, W., & Martin, W. M. (1965). Toward a formal theory of transactions and transvections. *Journal of Marketing Research, 2*(2), 117–127.

Alhudaithy, A. I., & Kitchen, P. J. (2009). Rethinking models of technology adoption for internet banking: The role of website features. *Journal of Financial Services Marketing, 14*(1), 56–69.

Anderson, E., & Weitz, B. (1992). The use of pledges to build and sustain commitment in distribution channels. *Journal of Marketing Research, 29*(1), 18–34.

Bagozzi, R. P. (1974). Marketing as an organized behavioural system of exchange. *Journal of Marketing, 38*(4), 77–81.

Berthon, P., Ewing, M., Pitt, L., & Naudé, P. (2003). Understanding b2b and the web: The acceleration of coordination and motivation. *Industrial Marketing Management*, *32*(7), 553–561.

Bonfield, P. (1993) Implications of developments in electronic trading: a cross-industry view. *Logistics Information Management*, *6*(5), 16–19.

Brennan, R., & Turnbull, P. W. (1999). Adaptive behavior in buyer–seller relationships. *Industrial Marketing Management*, *28*(5), 481–495.

Cook, K. S., & Emerson, R. M. (1978). Power, equity and commitment in exchange networks. *American Sociological Review*, *43*(5), 721–739.

Deeter-Schmelz, D. R., & Norman Kennedy, K. (2002). An exploratory study of the Internet as an industrial communication tool, examining buyers' perceptions. *Industrial Marketing Management*, *31*(2), 145–154.

Elgarah, W., Falaleeva, N., Saunders, C. S., Ilie, V., Shim, J. T., & Courtney, J. F. (2005). Data exchange in interorganizational relationships: Review through multiple conceptual lenses. *Advances in Information Systems*, *36*(1), 8–29.

Håkansson, H. (Ed.). (1982). *International marketing and purchasing of industrial goods: An interaction approach*. Chichester: John Wiley & Sons.

Hallén, L., Seyed-Mohamed, N., & Johanson, J. (1991). Interfirm adaptation in business relationships. *Journal of Marketing*, *55*(2), 29–37.

Hill, C. A., & Scudder, G. D. (2002). The use of electronic data interchange for supply chain coordination in the food industry. *Journal of Operations Management*, *204*, 375–387.

Johanson, J. (1989). Business relationships and industrial networks. Perspectives on the economics of prganisations. *Crawford Lectures 1*, Institute of Economic Research, Lund University Press.

Johns, R., & Perrott, B. (2008). The impact of internet banking on business–customer relationships (are you being self-served?). *International Journal of Bank Marketing, 26*(7) 465–482.

Laage-Hellman, J., & Gadde, L.-E. (1996). Information technology and the efficiency of materials supply: The implementation of EDI in the Swedish construction industry. *European Journal of Purchasing & Supply Management*, *2*(4) 221–228.

Lindh, C. (2006). *Business relationships and integration of information technology*. Doctoral Dissertation No 28, School of Business, Mälardalen University, Sweden.

Lawrence, P. R., & Lorsch, J. W. (1967). *Organization and environment—managing differentiation and integration*. Division of Research Graduate School of Business Administration, Harvard University. Boston, MA.

Morgan, R. M., & Hunt, S. D. (1994). The commitment–trust theory of relationship marketing. *Journal of Marketing*, *58*(3), 20–38.

Müller, M., & Seuring, S. (2007). Reducing information technology-based transaction costs in supply chains. *Industrial Management & Data Systems*, *107*(4), 484–500.

Ortega, B. H., Martinez, J. J., & De Hoyos, J. M. (2008). The role of information technology knowledge in B2B development. *International Journal of E-business Research*, *4*(1), 40–54.

Sanders, N. R. (2007). The benefits of using e-business technology: The supplier perspective. *Journal of Business Logistics*, *28*(2), 177–207.

Seyal, A. H., Rahman, M. N. A., & Muhammad, A. Y. A. (2007). A quantitative analysis of factors contributing electronic data interchange adoption among Bruneian SMEs—A pilot study. *Business Process Management Journal*, *13*(5), 728–746.

Thun, J.-H. (2010). Angles of integration: An empirical analysis of the alignment of internet-based information technology and global supply chain integration. *Journal of Supply Chain Management*, *46*(2), 30–44.

8 Internal Accounting Information Systems and Inter-Organizational Coordination

Episodes Involving Balanced Scorecard and Differential Customer Accounting

Lars Frimanson

Inter-organizational relations are of particular importance when firms collaborate. The networks of relations between firms, which are the main axes in the production of products and services (Håkansson & Snehota, 1995), are new domains for accounting-based coordination efforts. In contrast with some theories of coordination (e.g. Anthony & Govindarajan, 2003)—where accounting information is thought to facilitate or influence internal decision-making—inter-organizational relations involve not only the firm's own but also the external partners' activities as objects of coordination. Inter-organizational coordination—the qualitative and quantitative matching of plans (Håkansson & Lind, 2004)—is key for the competitiveness of collaborate production. This indicates that adoption of accounting information systems—the systems linking non-financial to financial information—for inter-organizational coordination is not merely an attempt to align partner firms' existing modes of production. It is also a question of influencing the external partners' wider coordination efforts in the network.

In the two case firms *OldTech* and *NewTech*—which are to be discussed hereafter—it was clear that the development of internal accounting information systems (AIS) for inter-organizational coordination were firm-internal initiatives. It was not a matter of these two firms crafting some strategy of control over partners, nor was it the other way around. They designed AIS to support internal decision-making to coordinate a web of different inter-organizational customer relations, including ad hoc transactions, so that the external, and not only the internal, coordination of activities changed. The effects of adopting AIS were particular forms of coordinating links between inter-organizational relations that impacted both inter-organizational and intra-organizational activities.

OldTech and *NewTech* put different AIS in place. *OldTech* implemented a Balanced scorecard (BSC) designed for customer orientation (Kaplan &

Norton, 1996), while *NewTech* took on forms of Differential customer accounting (DCA; Lind & Strömsten, 2006). Such information systems are thought to create more efficient decision-making processes as they provide differentiated information based on differences in customer needs. Others have studied the application of AIS—mostly in firms dominating their industry—and they tend to suggest that such AIS exist to facilitate the measurement of customer profitability (Lind & Strömsten, 2006). In contrast, the results from this study show how such AIS are part of wider coordination issues in the network, involving information needs, organization, and technology. Thus, there is a focus on effects, and this chapter studies the *coordination efforts* made following the introduction of AIS (Håkansson & Lind, 2004).

INTER-ORGANIZATIONAL COORDINATION: DIFFERENT INFORMATION FOR DIFFERENT RELATIONS

Inter-organizational relations are important because firms depend on matching their plans with the plans of suppliers and customers, which can be achieved through control or coordination (Håkansson & Lind, 2004). Since firms can only afford to control a few of their inter-organizational relations, they tend to control suppliers rather than customers since firms frequently have more power over suppliers. Therefore, customer relations are often crafted as objects of coordination. This requires information systems facilitating differentiated information sharing since firms have a mix of customer relations requiring different coordination and decision-making needs (Håkansson & Lind, 2004; Lind & Strömsten, 2006). Some relations are close and long-term with complex decision-making needs involving many units and competencies. Close relations provide access to external resources such as knowledge, technology, and equipment, and reap economic benefits beyond what is possible through ad hoc transactions. In ad hoc, market-like transactions of standardized products, coordination mainly concerns a price–quantity decision. However, they provide access to competitive market forces and opportunities to fill free capacity for economies of scale.

Differentiated information sharing creates close trust-based relations with some customers and distant opportunistic-based behavior with others (Lind & Strömsten, 2006). Not only in the literature, but also in the two cases *OldTech* and *NewTech*, certain differentiated AIS were prominent in coordinating customer relations. They were important in the two case firms as they contributed to decentralization of customer-related decision authority. This enabled more efficient coordination of the mix of close relations with different needs with certain distant, ad hoc transactions to fill free capacity. They were instrumental for rapid development of technology as the decision locus of innovation (Powell, Koput, & Smith-Doerr, 1996) was in the network and not in any specific partner firm or inter-organizational

relation. As a result, certain customers were hand picked for their ability to fit with existing modes of production, while other customers were rejected because they did not fit. Yet others—the customers with unique competence and long-term relations—had and provided access to resources and non-financial and financial information. They cooperated with *OldTech* and *NewTech* to develop activities so that the modes of production in the network changed—and not only in these specific customer relations. Consequently, the introduction of internal AIS impacted not only the firms' ability to influence intra-organizational activities; it also influenced—directly or indirectly—inter-organizational relations.

The main inter-organizational coordination issue for firms is to coordinate their total set of relations to increase the value of the firm (Håkansson & Snehota, 1995). This concerns the coordination of *specific links* and *general links* between relations. Specific links are social or technological interdependencies in a specific close relation that are dependent on interdependencies in other close relations, for example, when change in just one piece of equipment in the production of customer A products requires change in the equipment used to produce customer B's products. General links refer to common interdependencies to a collective of relations or transactions, whereby customers are coordinated by the same principles, applied generally to all customers in the collective.

For *OldTech*, the 50-year-old relation to *Electrosaler*—the relation in focus in this case—included profound social interdependencies such as close, but varied, personal bonds that relied on and produced commitment and trust, but also the lack of the same. One interviewee described the relation as "an institutionalized customer relation we can hardly escape from." Here social interdependence served as a template *and* an obstacle for coordination of technological interdependencies involving product portfolio, logistics, and distribution systems on both ends. *Electrosaler* was the largest customer (10% of turnover; 2.5 times more than the second largest), but it was only 1 out of 1,200, of which 9 other close customers contributed 40% of *OldTech*'s turnover. The remaining bulk of customers were small firms searching for cheap standardized component products, frequently swapping suppliers. In contrast to firms with only close relations, which can be trapped and run the risk of small-numbers bargaining and lock-in costs, *OldTech*—having over 99% of its relations coordinated as ad hoc transactions—ran the risk of having too few learning opportunities. Hence, they had experienced an excessively heavy focus on product standardization at the expense of development of logistics and related services, with customer dropouts as a result. Therefore, just as all firms must choose how and through which inter-organizational relations their activities and resources should be developed, *OldTech* implemented a BSC to "establish learning partnerships with selected customers."

For *NewTech*, every customer relation was, in varying ways, part of the links between relations. Close, long-term relations to publishing houses

such as the largest customer *MonthlyMagazines* (more than 20 years, 8% of turnover) and *WeeklyNews* (more than 50 years, 3% of turnover) included profound technological interdependencies. They were specifically linked to each other and to ad hoc transactions, while the latter were generally linked to each other and to close relations (Håkansson & Snehota, 1995). Thus, when *NewTech* developed digital computer-to-plate technology with *MonthlyMagazines* and *WeeklyNews*, other close customers had to change to digital prepress systems to reap the economic benefits of this technology. Similarly, ad hoc sales of brochure printing to some 900 non-magazine customers had to adapt in a general way to the technology, as the better such jobs fitted for digital production the lower was the risk they would disturb magazine production for close customers. General links were thus reflected by the non-existing possibility for a single non-magazine customer to influence operations, and by the way they were managed as a collective. Therefore, *NewTech* implemented forms of DCA to manage a web of different customer relations.

Different forms of links in network relations provide different opportunities for economic benefits (Lind & Strömsten, 2006). Specific links foster cost-efficient creation and allocation of resources for the development of new technology through close relations. Links between close relations provide access to opportunities circulating in the network, and to be effective it is important to supply *and* collect information. Specific links provide a better quantity and quality matching of producer levels with user needs than general links do. Thereby, a faster reconciliation between demand and supply can be attained as the quality and speed of information exchange is better than what is possible with only general links. In *OldTech* and *NewTech*, the introduction of AIS played a key role in managing different forms of links between inter-organizational relations. They provided information that impacted on decision-making not only within the firms, but also in their networks of customer relations.

METHOD: SEARCHING COORDINATION EFFORTS AND DECISION-MAKING EFFECTS

OldTech and *NewTech* (pseudonyms, like all other names) were two medium-sized technology-based firms in the power distribution and magazine printing industries, respectively, that implemented AIS. Both firms described themselves as customer-oriented with a leader position in a market characterized by keen competition, and they both feared that competitors would take market shares if they were not able to better coordinate their production activities. *OldTech* focused on coordinating service activities such as ordering, logistics, and after-sales, since they operated in a mature industry with highly standardized components constrained by legal norms (e.g. CE-marking within the European Union). *NewTech* sought to

coordinate prepress activities such as communication, setting, and proofing to improve print quality and lead times by continuously advancing the frontier of prepress technology. The introduction of AIS—a customer-oriented Balanced scorecard (BSC) in *OldTech* and Differential customer accounting (DCA) in *NewTech*—was done in both firms to provide better information for internal decision-making to achieve these coordination efforts.

This study was designed to follow the firms after the introduction of internal AIS. The purpose was to explore the effects of BSC and DCA on decision-making. Particular attention was paid to the firms' efforts to coordinate specific vis-à-vis general links between customer relations. This is a method that reveals differences in information needs for inter-organizational coordination because it highlights tensions between different relations (Håkansson & Snehota, 1995). *OldTech* had an annual turnover of SEK 600 million and employment of 400, while *NewTech* employed 370 and had a turnover of SEK 460 million. Interviews were conducted over a 2-year period with 15–25 people in each company about the linkages between interdependence in customer relations and information from AIS and from competing information systems. Some 50–70 documents were collected from each firm to corroborate interviewee statements. The issues probed were oriented to the interplay between AIS and production improvements, with particular attention to the role of AIS information in decisions related to the coordination of links between customer relations. The study followed the effects of adopting AIS such as BSC and DCA for coordination efforts of inter-organizational customer relations. In the study of these effects, one coordination aspect from the accounting literature was drawn upon: decision-making (Sprinkle, 2003).

Decision-making reflects that accounting information is used to coordinate business activities by changing action, and two main roles have been identified: a decision-facilitating role and a decision-influencing role (Sprinkle, 2003). The former role reflects that accounting provides information for analysis and planning of changes in action. It focuses on the issue of what information should be supplied to internal or external decision-makers. The latter role reflects that accounting motivates individuals to take action. It focuses on factors influencing the alignment of action through measuring, monitoring, evaluation, and rewarding when matching of plans is based on control (Håkansson & Lind, 2004). Related to decisions are diagnoses, which do not change action. Here accounting directs attention, reflecting that the information has some value even though it does not result in analysis action or alignment of action. A diagnosis refers to the assessment of outcomes with standards, which may be formal and frequent or informal and ad hoc. Regardless, the information reduces uncertainty to the extent that the decision-maker need not take any action.

By these principles, the study analyzes how two internal accounting information systems (AIS) entered decision-making processes related to the coordination efforts of certain customer relations at *OldTech* and *NewTech*.

THE INTERNAL AIS: BALANCED SCORECARD AND DIFFERENTIAL CUSTOMER ACCOUNTING

OldTech and *NewTech* embarked on a Balanced scorecard (BSC) and forms of Differential customer accounting (DCA) using rather opposite methods and justifications. The BSC is often legitimated by its potential positive consequences of increased alignment, i.e. control, of business units and external partners' activities with the strategy of the firm. Here sharing of information within the firm is seen as vital for the creation of learning. Thus, Kaplan and Norton (1996, p. 251) write:

> *Organizations need the capacity for double-loop learning, the learning that occurs when managers question their assumptions and reflect on whether the theory under which they were operating is still consistent with current evidence, observations, and experience.*

The BSC, therefore, is a system through which coordination is achieved through control by *similar customer information* (Frimanson & Lind, 2001). This may involve double-loop learning when superiors change performance standards, or single-loop learning when subordinates align action to comply with standards. Hence, the argument goes, interventions can be made by superiors to align internal operational actions and decisions with strategy to reap economic benefits. How this works—or not—is discussed via the case of *OldTech*.

DCA is an information system that focuses on the need to manage customers differently. DCA is legitimated by its potential positive effects of providing *different customer information* to support different internal decision-making needs. Lind and Strömsten (2006, pp. 1257–1258) describe the rationales for DCA as follows:

> *Variation in [resource] interfaces creates heterogeneous customer relationships and, just as heterogeneous customers must be managed by taking heterogeneity into account, accounting for the firm's customers should take into account the variety of customer interfaces. Thus, a company will apply different customer accounting techniques according to the customer interface.*

One argument is that some relations demand such high investment costs and yield much smaller revenue flows, but are strategically important for the firm because they provide access to knowledge and technology that can yield large revenues from other customers. Another argument is that if a firm requires its external partners to coordinate differently to its production activities, it must not only collect different information—it must also distribute different information to different customers (Håkansson & Lind, 2007). Here, coordination takes place within relations and not only within

firms. Depending on customer relation, this may require financial information for customer cost analysis (Strömsten & Lind, 2006), or sharing of non-financial information for quality analysis for technology development, or both, as it was in the case of *NewTech*.

OLDTECH: CUSTOMER-ORIENTED BSC AND INTER-ORGANIZATIONAL COORDINATION

OldTech was a medium-sized manufacturer that sold electricity distribution products to wholesalers and industry. It had been an actor in this market for more than 40 years. A main product was order-specific distribution boards that contained standardized components such as contactors and pilot devices. The study of *OldTech* began when competition in the market was said to be keen because firms were easily capable of copying competitors' products. Excelling in support services such as order-specific design, logistics, and after-sales support—rather than product quality *per se*—was seen as strategic. However, management at *OldTech* believed that its firm had neglected support services, which made it difficult to be an overall cost-efficient supplier. This was thought to be why some close customers had left, with shrinking profits as a result. So, before BSC implementation *OldTech* changed its strategy to a customer-oriented strategy, as explained by the managing director:

> *Our new strategy is customer-oriented and centers around four key processes. We must first improve the customer value process by establishing learning partnerships with selected close customers and by applying value-based selling methods. Then there is the order and logistics process; we really need to improve service quality and lead times. Then there is the product development process, which is about improving time-to-market, timing of product launching, and so on. And finally we have the employee process, which is mainly about developing product competence in the logistics unit because they are responsible for after-sales.*

Backed with top management support, training and a specific IT-platform, *OldTech* implemented a 'customer-oriented BSC' with perspectives based on these four strategic 'processes' and a financial perspective. Each unit was asked to identify its own 'critical success factors' for achieving orientation to close customers, so they could design unit-specific BSC's with unique performance indicators for each different unit.[1] The intention was to implement BSC facilitating decentralized, local decision-making *within* units, the BSC project manager explained: "We want to decouple the BSC from hierarchical control. This BSC allows units on all levels to examine their own activities." Therefore, indicators could not be aggregated up the

hierarchy—they were all different, as they were based on different views of what customer-oriented performance was about. For example, production units typically measured productivity and lead-time performance for different production activities, whereas the logistics unit—the unit in focus in the new strategy—measured services related to purchasing, ordering, delivery, and after-sales. Soon all units operated their own unit-specific BSC.

When *OldTech* was revisited 2 years after implementation, substantial changes in the close relation to *Electrosaler* had taken place, and none of the units used the BSC anymore, as was explained by the controller:

> *We are not interested in the BSC anymore. We have evaluations in other ways now. Really, we manage without the BSC, but it was good to go through the implementation process because it helped us decentralize decision-making, to get decisions closer customers.*

The reason behind this unexpected outcome concerned coordination uncertainties related to the *Electrosaler* relation. It was not only the largest customer; it was also a lead customer, since it dominated the wholesaler market where distribution board products were sold. Hence, the relation played a particular role for the new strategy. *OldTech* sought to transform the 'institutionalized' relation to a 'learning partnership' to better learn end-user needs.

The key coordination issue for *OldTech* concerned the interaction between the first-order relation to *Electrosaler* and second-order relations to installation firms (*Electrosaler's* customers) with their electricians installing distribution boards, as was described by the manager of the distribution board unit:

> *We want to be in the front seat together with Electrosaler and develop products [. . .]. Our joint contribution is order-based manufacturing and order-specific design [. . .]. It's Electrosaler's customers who have the technical competence regarding design applications, so they make the decisions.*

Being in the front seat, however, required information sharing of a kind not possible with the BSC. Fundamentally, it was designed to facilitate decision-making *within* units *within OldTech*. Moreover, oddly enough, the 'customer-oriented' BSC supplied overly aggregated information so that it could not inform decision-making regarding the specific management of the relation to *Electrosaler*:

> *Although the BSC's high level of aggregation does not make it possible to evaluate our performance with Electrosaler, it certainly affects our consciousness about some general aspects about customers, which in turn will indirectly affects our relation with Electrosaler.*

As this statement from the logistics manager shows, *OldTech* had designed a BSC providing information that was useless for the specific coordination of customer relations since customer-specific product designs, orders, lead times, and so on, could not be retrieved from the system. In fact, none of the interviewees stated that they had used the BSC system to direct attention to problem areas. Surprisingly, this was not an issue, simply because other information systems in place before the BSC provided what was needed for diagnostic and decision-making purposes regarding specific relations. For example, inventory and delivery decisions were facilitated by information from the 'Planning–Economy–Order' system, which also provided customer-specific information on buffer levels, lead times and confirmed/actual delivery date ratios. Also, this and other primary systems were real-time systems, whereas the BSC was updated monthly. In fact, the vast majority of BSC measures were fed with information from existing systems. So even if the BSC helped 'decentralize' decision-making, it was useless for customer-specific decisions and was perceived as costly and unnecessary. However, as emphasized by the managing director and the logistics manager, managers at *OldTech* had used the BSC to 'obtain a more thorough picture of the development of activities at the unit and firm level,' indicating that the BSC had served a diagnostic role in the management of the hierarchy—a sharp contrast to the original intention of a system facilitating decisions *within* local units. In fact, the managing director indicated that he had "considered displaying all units' BSC on TV-monitors throughout the plant to strengthen accountability for the agreed targets."

The inability of the 'customer-oriented' BSC to facilitate and support customer-specific decisions related to the *Electrosaler* relation became evident for *OldTech* when installation firms—the end-users—called for better inter-organizational information flows. These end-users worked closely with *Electrosaler*'s sales engineers in calculating design combinations for the rather complex distribution boards. *OldTech* depended on design decisions in these second-order relations: "We have no possibility to make these design calculations," the wholesaler key account manager explained. However, efficient design decisions required cost information. Each specific design needed to be linked to cost information from *OldTech*, which refused to disclose cost information to *Electrosaler* because they also worked closely with competing suppliers. Therefore, the two partners developed an integrated information system that linked designing at *Electrosaler* to costing at *OldTech* that only shared lump sum costs to *Electrosaler* and not component-specific costs. In effect, more decisions could be made directly by *Electrosaler* with end-users without the involvement of *OldTech*. As a result, decisions related to the designing and costing of distribution boards became faster and more reliable, as the distribution board manager summarized:

> *The joint development of the new ordering system really improved analysis and planning in the design end, just as it made our cost awareness*

> *and ordering management better. I think it has contributed substantially to the increase in distribution board sales the past few years.*

NEWTECH: DIFFERENTIAL CUSTOMER ACCOUNTING AND INTER-ORGANIZATIONAL COORDINATION

NewTech was a medium-sized, full-service offset printer in the magazine market, operating with prepress, web and sheet-fed printing, binding, and distribution services. *NewTech* served two groups of magazine customers: large, professional, and highly competent publishing houses producing several monthly or weekly magazines, and less professional membership organizations having just one or a few people producing a single magazine as an outlet to members. All were contracted on a 1-year to 3-year basis and together filled 70% of production capacity. Free capacity was sold to buyers of non-magazine printing, typically of brochures. These ad hoc customers were organizations having no printing competence that were offered on the spot through estimates made by cost accountants.

The study of *NewTech* began when its competitiveness was said to be threatened because of production problems that made it difficult to deliver print quality for monthlies, which relied on revenues from buyers of high-quality advertisements. They also jeopardized lead times for weeklies, which were news-driven, wanting to include the latest possible news in order to maintain subscriptions. Management at *NewTech* believed that these problems originated from two different issues. The first concerned coordination of paper quality with runability performance in printing presses, the managing director said:

> *We had runability problems with the paper so Pulp&Paper [a paper supplier] ran a project with us to test the impact of different pulp qualities on runability. A variety of factors were measured, such as web temperatures, paper tensions at different locations in the presses, ink and moisture quantity, press speed, and their associations to paper breaks, folding problems, and other runability deficiencies. Lots of things were discovered from it. We learned about how the paper works and they learned how the paper affected the printing process. [. . .] Then I realized that quality is a far more important for strategic decision-making than I had previously thought.*

As different customers used different paper qualities, and because monthlies emphasized printability and print quality over runability and lead times as weeklies did, *NewTech* implemented a quality control system to manage lead time *and* print quality. This system provided customer-specific runability information (e.g. running time and paper waste for different presses and folding machines) and printability information (e.g.

print dot expansion, ink drying, misfit, and smearing effects from binding and cutting machines). This information not only facilitated better paper purchasing decisions, it also influenced *NewTech* to differentiate decisions so certain customers were scheduled for certain presses to maximize runability and printability performance for weekly and monthly customers, respectively. Moreover, introducing differentiated quality information also had external coordination effects:

> *Because MonthlyMagazines has so many magazines with different demands for quality, their production coordinators more or less have to act like diplomats to get things done. You know, art directors and editors have a lot of imagination. [. . .] You might say they use the printability information to negotiate internally with the magazines to achieve solutions that are realistic.*

As this statement by the key account manager describes, information from *NewTech's* internal quality control system also aligned decisions within the *MonthlyMagazines* organization, making certain parts of their staff act like *NewTech's* spokespersons to maintain printability.

The second coordination issue concerned accepting non-magazine jobs not suitable for magazine production, also jeopardizing print quality and lead times for magazine customers. The managing director explained:

> *The important thing for us is to find the right non-magazine jobs. We have to make sure that we don't accept bad jobs that cause trouble for our important magazine customers. That's why the salespeople cannot run the firm! They are rewarded on gross sales regardless of type of job or customer. It's the cost accountants who understand the market, are more objective, and know what fits in with our production structure.*

Even if the right jobs were found, non-magazines' lack of prepress knowledge disturbed planning and jeopardized runability for magazine customers such as *WeeklyNews*. Some used ordinary office software insufficient for offset printing, which required software adapted for digital four-color separation, or demanded smearing ink, and jeopardized printability for customers seeking print quality, such as *MonthlyMagazines*. Others agreed to transmit digitally but delivered films since they did not know how reproduction was done. Or even worse: "Some don't even know what reproduction is," a cost accountant explained.

To improve screening of these ad hoc buyers, *NewTech* adopted a differential cost estimate system providing three lump sum cost estimates in each spot contract for non-magazines to 'help' these customers with their decision-making. The more potential jobs fitted for magazine production, the less was charged. In addition, to specify consequences, each estimate was linked to a description of cost consequences for failure to comply with

agreed specifications. In contrast, close customers such as *MonthlyMagazines* and *WeeklyNews* received detailed lists disclosing costs for every possible service and their likely effect on printability or runability performance, respectively. As a result, "a better coordination of partly incompatible customer demands was achieved," the cost accounting manager said.

Though *NewTech* saw the coordination effects of these differential customer accounting systems as successful, some were also unexpected. Such unexpected effects followed after *NewTech* had started with monthly 'technology meetings' with *MonthlyMagazines*—and soon with *WeeklyNews* too—in which detailed information from the quality control system and the costing system was shared and discussed by managers and engineers from both ends:

> *After the quality system was introduced it got much better, but we still felt we had trouble getting the information to the close customers. It was then we started with the technology meetings with MonthlyMagazines. They already had detailed cost information, so introducing quality information provided a new template for discussing technology with them and WeeklyNews. It sort of introduced cost consciousness to quality and lead time discussions, and to technology development, and it made them share cost information with us as well. I think that this rather unexpected information sharing played a key role in our joint development of computer-to-plate technology.*

As this statement by the quality manager reveals, coordination uncertainties involved strategic aspects influencing the entire customer network—the development of computer-to-plate (CTP) technology. The 'technology meetings,' informed by quality and cost information, served as a template for the development of CTP, but with two different goals guiding decisions—printability with *MonthlyMagazines* for print quality improvements and runability with *WeeklyNews* for lead time improvements. Here consequences and rewards were not something specified in advance as with ad hoc customers, the managing director testified:

> *We have very close relations with MonthlyMagazines and WeeklyNews. Remember, they have been with us for a long time. These are relations based on mutual respect and trust between many people. [. . .] They are very important for our technological development since they have frontier prepress competencies. And they know that CTP development need to be integrated with us for it to work for our other customers, so there are no specific issues with responsibility, no contracts, or anything. We just work and talk openly about problems that occur.*

The implementation of CTP resulted in a series of rationalizations. With CTP a digitalized original was exposed directly on the plate that was later

inserted in the press, whereas computer-to-film technology required reproduction of film. Thus, with CTP the printing of film, the manual paste-up of page-film, the exposing of ultraviolet light on film onto plates, and manual proofing became superfluous. This resulted in less risk for print quality problems and shorter lead times as it involved fewer prepress activities. Therefore, all magazine customers changed to digitalized originals, but not all were as competent as *MonthlyMagazines* and *WeeklyNews*. So, the knowledge gained by *NewTech* at 'technology meetings' with these two lead customers became critical for negotiations with the other magazine customers in the network, where quality and cost analysis could be utilized, and benchmarking against these lead customers deployed as a method for presenting convincing arguments. Therefore, the implementation of differential quality and cost information systems not only had internal impacts within *NewTech*—and first-order impacts on the relations to *MonthlyMagazines* and *WeeklyNews*—but also second-order impacts on relations to other magazines. *NewTech* hired a prepress engineer to manage the digital transition for these smaller and less competent customers. They also hired a key account manager, accountable to the managing director, and made him responsible for monitoring and management of close customers such as *MonthlyMagazines* and *WeeklyNews*. Finally, the differential cost estimate system was fine-tuned for screening of digital ad hoc jobs not suitable for *NewTech's* production.

CONCLUDING DISCUSSION

The two cases illustrate how internal accounting information systems (AIS) work for inter-organizational coordination. After problems in the modes of production, both firms experienced coordination uncertainties related to close customer relations. Hence, AISs were introduced: a customer-oriented Balanced scorecard (BSC) in *OldTech* and forms of Differential customer accounting (DCA) in *NewTech*. Information from both influenced decision-making processes related to the coordination of activities in each network. The point that information facilitates coordination decisions between suppliers and buyers is one observation that is highlighted in other studies of inter-organizational coordination (Håkansson & Snehota, 1995; Håkansson & Lind, 2004). However, in the two cases it was also observed that decisions based on BSC and DCA information were involved in detecting and developing further information needs, as well as changes of organization and technology. Table 8.1 summarizes how information needs, organization, and technology were related to the internal accounting information systems for inter-organizational coordination.

In *OldTech*, a BSC was introduced to decentralize decision-making internally to improve orientation to close customers, which required information to support local units. This succeeded in a general sense, but the BSC failed

Table 8.1 OldTech & NewTech: Information Needs, Organization, and Technology Effects After Introducing Accounting Information Systems for Inter-Organizational Coordination

	Coordination	*Information needs*	*Organization*	*Technology*
		Intra-organizational effects		
OldTech: Effects of customer-oriented BSC	Decisions generally closer to customer interaction No effect on customer-specific decision-making	Customer-specific information from other systems	Decentralization of decision authority Diagnostic tool for management Possibility to influence decisions by visualizing accountability	Inter-organizational accounting systems improved design, costing, and ordering
		Inter-organizational effects		
	No effect on customers' coordination decisions Relocate resources to a system facilitating better product design and cost decisions	Specific product design and cost information from end-users	Design and cost decisions moved from first-order relation to second-order relations	Inter-organizational accounting systems linked design competence from end-users to producer costs
		Intra-organizational effects		
NewTech: Effects of differential customer accounting	Quality information facilitated differentiated purchasing and job scheduling decisions	Specific key account information	Rationalization of prepress activities Engineer managed general digitalization in network Key account manager manage specific close customers	Digital computer-to-plate production technology
		Inter-organizational effects		
	Different quality and cost information for coordination within specific customers. No formal accountability. Cost consciousness to quality and lead time issues Ad hoc transactions: General screening of jobs not suitable for close customers via differential cost estimates.Formal accountability	Cost information from specific close customers Specific cost and quality information from magazine customers to transform them to digital production	Monthly decisions on technology meetings with specific close customers Specific benchmarking analysis on meetings with other magazine customers	Adoption of digital production technology in entire network

to facilitate customer-specific decisions because customer-specific information could only be retrieved from other systems. Rather, management saw the BSC as a means to control intra-organizational affairs through its diagnostic capacity and its ability to influence decisions by making accountability 'visual' via TV-monitors. When end-users in the network called for more efficient design and cost information transfer, it became clear that resources should not be spent on maintaining a 'useless' BSC. So, the BSC was discontinued and resources were directed to the development of an inter-organizational accounting information system integrating product design/cost information through second-order relations to end-users. This was possible since this was done in an institutionalized relation that was the only channel to end-market users of this product. As a result, design and cost decisions moved to second-order relations.

In *NewTech*, differential customer accounting was introduced to manage internal quality problems and to screen ad hoc jobs not suitable for magazine production. This required different quality and cost information for different customer relations as they had different performance criteria, print quality for monthlies and lead time for weeklies, which influenced internal purchasing and scheduling decisions. It also allowed inter-organizational sharing of detailed information, used by close customers internally to align internal decisions to achieve 'realistic solutions.' This made management realize that quality is 'important for strategic decision-making,' and a need for key account information was identified, whereby a key account manager was hired to be accountable for close customer relations. Quality and cost information informed monthly decisions on 'technology meetings' that became key for the development of new technology with the two lead customers. Further intra-organizational effects such as rationalization of prepress activities and hiring of an engineer were implemented to manage a necessary digitalization of production methods throughout the network. Hence, a need for cost and quality information from other, less competent customers was discovered, which facilitated benchmarking analysis. Screening of ad hoc jobs not suitable for magazine production was managed through differential lump sum cost estimates and accountability procedures specified in advance, which was not the case with close customers.

In the two cases internal AISs had both intra-organizational and inter-organizational effects, which were more direct for *NewTech* and more indirect for *OldTech*. However, what is striking with these two cases is that AISs influence not only what decisions are about. More importantly, they influence *where* they are carried out and *who* is implicated in coordination efforts. Introducing additional information systems to reduce coordination uncertainty moved decisions from first-order relations to second-order relations, paradoxically creating new uncertainty and information needs (cf. Håkansson & Lind, 2004). This resulted in unexpected technology such as inter-organizational accounting information systems for *OldTech* and development of digital computer-to-plate production for *NewTech* and its

network, which was organized through specific inter-organizational meetings where detailed information sharing took place.

These observations show that changes in information needs, organization, and technology—which are inseparable parts of inter-organizational coordination (Håkansson & Lind, 2004)—were inseparable from changes in accounting information systems, be they internal or inter-organizational systems. This implies that changes in internal accounting information systems cannot be brought about without being affected, in turn, by changes in information needs, organization, or technology. Therefore, what may look like a failure—as the BSC case in *OldTech*—may actually be a success when observed in a broader perspective. In networks, therefore, understanding how internal AISs work involves understanding how internal AISs change and how they relate to changes in the boundaries of uncertainty, simply because information needs for decision-making change. This is conditioned by the ability of internal AIS to collect and distribute information within and beyond inter-organizational relations. Therefore, in networks, internal AIS implementation reflects the need to circulate information about the opportunities in the network (Powell et al., 1996), whereby links between relations is affected when opportunities are reaped, as was the case with *NewTech*.

Specific and general links (Håkansson & Snehota, 1995) between relations were managed *within* the two case firms through information from the internal AIS, which set intra-organizational decision-making processes in motion. For example, specific links—the specific interdependence between close relations—were organized by rationalization and hiring of an engineer and a key account manager responsible for close customer relations. Inter-organizationally, specific links were managed by organizing technology and benchmarking meetings informed by quality and cost information. General links—the general interdependence between close relations and ad hoc transactions—were managed *outside* firm boundaries: for *OldTech* through inter-organizational AIS moving decisions closer to second-order ad hoc end-users (electricians) and for *NewTech* by making ad hoc buyers (non-magazines) choose through differential cost estimates aligned with desired production methods, choices for which accountability consequences were specified in advance.

In this chapter the adoption of internal accounting information systems for inter-organizational coordination has been discussed. It addresses how such systems support, or do not support, decision-making related to inter-organizational coordination efforts, and how they in turn affect intra-organizational activities. The analysis is based on a study of two firms that had experienced coordination uncertainties after problems in their modes of production. In both firms the internal accounting information systems impacted decision-making outside firm boundaries because these systems enabled collaborating partners to supply and collect information to achieve a quantitative and qualitative inter-organizational matching of plans. As a result, decisions were not only informed differently, they also moved to other decision-makers in the networks. Consequently, one important conclusion

from this chapter is that inter-organizational coordination need not require inter-organizational accounting information systems. Also, nothing that was observed in this study appears idiosyncratic to accounting-based systems. Hence, managers responsible for information systems at large should be aware of the potential for inter-organizational effects from adopting internal information systems.

DISCUSSION QUESTIONS

Based upon this chapter:

1. What are the main differences in coordinating specific and general links between inter-organizational relations?
2. How can managers know where inter-organizational coordination efforts are required?
3. Can any accounting information system be used for inter-organizational coordination, or do more 'modern' systems have characteristics that are more suitable than 'traditional' systems?

NOTES

1 The chapter presents a simplification of the implementation process. For instance, intermediate steps were taken to link business strategy to unit-specific success factors.

RECOMMENDED FURTHER READING

Håkansson, H., & Lind, J. (2004). Accounting and network coordination. *Accounting, Organizations & Society*, *29*, 51–72.

Håkansson, H., & Lind, J. (2007). Accounting in an inter-organisational setting. In C. S. Chapman, A. G. Hopwood, & M. D. Shields (Eds.), *Handbook of management accounting research* pp. 885–902 (Vol. 2). Oxford: Elsevier.

REFERENCES

Anthony, R. N., & Govindarajan, V. (2003). *Management control systems*. New York: McGraw-Hill/Irwin.

Frimanson, L., & Lind, J. (2001). The balanced scorecard and learning in business relationships. In J. Johanson & H. Håkansson (Eds.), *Business network learning*, pp. 32–52. Oxford: Elsevier.

Håkansson, H., & Lind, J. (2004). Accounting and network coordination. *Accounting, Organizations and Society*, *29*, 51–72.

Håkansson, H., & Lind, J. (2007). Accounting in an inter-organisational setting. In C. S. Chapman, A. G. Hopwood, & M. D. Shields (Eds.), *Handbook of management accounting research*, pp. 885–902 (Vol. 2). Oxford: Elsevier.

Håkansson, H., & Snehota, I. (1995). *Developing relationships in business networks*. London: Thomson.
Kaplan, R. S., & Norton, D. P. (1996). *The balanced scorecard: Translating strategy into action*. Boston: Harvard Business School Press.
Lind, J., & Strömsten, T. (2006). When do firms use different types of customer accounting? *Journal of Business Research*, *59*, 1257–1266.
Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, *41*, 116–145.
Sprinkle, G. B. (2003). Perspectives on experimental research in managerial accounting. *Accounting, Organizations and Society*, *28*, 287–318.

9 Expansion of IT Business Through Cross-Industry Mergers and Acquisitions

Peter Dahlin

Advances in information technology (IT) have been phenomenal for several decades, but no matter how exciting technological advances may be, IT would not play the role it does today if business had not formed around it. So the strong development of IT consists of two parallel tracks: strides in actual technology and an evolution of IT-related businesses. In a mutual dependence, IT business relies on technological development, but its value-adding applications are also what brings the technology into use and motivates further development. In this chapter, the focus is on the business context that is required in order for a sustainable business to be established, rather than technological developments per se.

Information Technology is in many respects an enabling technology, meaning that it enables different ways of doing things (David, 1990). The applications that make use of IT vary greatly, and it certainly has become a huge sector in consumer as well as industrial markets; almost all people and companies use information technology today, and many are very much dependent on it for their everyday life or business. Technological development is complexly related to business development, i.e. the creation of business around the technology. New applications become possible as the technology itself advances, but can also be the result of innovative perspectives on existing technology. Businesses based on IT have thus formed through both technology- and market-driven fields of application, which require abilities to both incorporate new knowledge and establish new market relations in order to achieve long-term growth.

Whereas some parts of the IT industry may be in an intermediate developmental stage, or perhaps even a mature stage, many parts of it were and are still very much in the early exploratory stage (cf. Jovanovic & MacDonald, 1994; Williamson, 1975). However, industry development is often contingent on the development of technology and knowledge, and the acquisition of know-how is an important factor in innovative sectors (Audretsch & Feldman, 1996). Companies in the IT business face tough requirements to be on par with, or preferably ahead of, the development not only of the information technology, but also in the field of the application. In the naissance of a field in the IT business, a company must quickly

gain the knowledge and competence necessary to master the particular combination of technology and application. One way to accomplish this is to acquire a company that holds the missing parts, be they knowledge, resources, patents, or a market position, and corporate acquisitions are thus of great relevance in understanding the dynamics of a business area. Although combining these competences and resources is one of the keys to success in the IT business, it is hard and demanding to achieve.

From a 'firm' perspective, business growth is basically an increase in the available resources within the administrative framework of the firm (Penrose, 1959). However, companies cannot grow by their own means alone; there simply is no business without a market. Customers valuing the output and suppliers providing necessary input are necessities for most companies. This study sees the market as inter-organizational interactions forming business networks. In those terms, business growth means increased market exchanges, i.e. an increase in existing volumes or the establishment of new exchanges. As the scope of a business area expands to new fields, this will show through business interactions crossing boundaries of industries and domains.

The setting of this study is the Swedish IT industry during the turbulent era in late 1990s and early 2000s, when it underwent booming development (Dahlin, 2007; Eriksson, 2008). In this period of time, often referred to as the "IT boom", "IT crash" or "IT bubble", a large number of companies were started owing to technological developments, the availability of seed-money, and the general IT hype. Over the years, as the industry formed, bankruptcies as well as mergers and acquisitions changed the contents and structure of the IT sector. This chapter aims to describe the development and expansion of the "IT business" through mergers and acquisitions, and to discuss it from both an M & A and a business network perspective.

THE STUDY

This chapter is based on a retrospective study of mergers and acquisitions in the Swedish IT industry. An absence of public records of mergers and acquisitions has necessitated the use of various ways of identifying acquisitions. Several studies have used the mass media to identify acquisitions, and this has shown to be a relatively manageable and effective way of mapping them (Dahlin, 2007; Rydén, 1971). In this study, data on acquisitions and the companies involved have been collected and compiled from news items in three Swedish newspapers between 1994 and 2003: one focused on the IT industry, one national newspaper, and one regional newspaper. Through a combination of computer-aided and manual processing, a dataset was compiled from the total of 125,546 articles (for a more thorough description, see Dahlin, 2007). Only M & As that took place 1994–2003 and involved at least one Swedish IT company were included in the dataset. Through the

counterparts, the data has international coverage in the many cross-nation acquisitions, and includes companies in various lines of business.

Data regarding M & As and the companies involved were recorded from the texts. The dataset also includes information on the companies' customers, suppliers, owners, and partners, naturally limited to the information in the news items. One bias is that press releases of the companies involved are often used as a basis for the article, thereby giving the company's own view of the situation. Another is the biased coverage, assumed to favor M & As and companies considered interesting to the public.

The data was coded and systematized to form a representation of the dynamic situation where mergers and acquisitions are seen in the context of connected companies and other mergers and acquisitions. However, this study will use the dataset as a pool in which interesting cases can be identified.

THE SWEDISH IT SECTOR'S M & A ACTIVITY AT LARGE

The data covers 814 mergers and acquisitions, which involved 1,283 different companies. The annual number of M & As range from low levels in the early years, with only 16 in 1995, to much higher levels around the turn of the millennium, with a peak at 148 in 2000. To some extent the low numbers for 1994 and 1995 can be a result of less accessible data for those years, and should thus be interpreted with caution.

As a comparison, the number of IT companies in Sweden was 8,869 in 1994, and had steadily increased to 27,372 in 2003, so far from all established companies were involved in M & As. Although many of the companies were very small (as many as 75% of the companies in 2003 had no employees), the number of employees in these companies had increased from 33,011 to 84,111 during the same period (numbers from Statistics Sweden, www.scb.se).

The companies in the dataset have been categorized with a rather simple product typology distinguishing four "sectors" of companies: *IT hardware*, *IT software and services*, *miscellaneous IT,* and *non-IT*. The categorization was based on their main product focus as described in the media texts, i.e. roughly at the time of the M & A. Some companies are very hard to place in a category, not least because of the topic of this chapter: the moving boundaries of the IT industry. The category "miscellaneous IT" is used for companies which are clearly in the IT sector, but either combine "hard" and "soft" IT, or are very difficult to characterize. A rather rigid division has been made between IT and "non-IT" companies, although some cases can be discussed, such as telecom companies.

Of the M & As found, 420 (52%) are cases where the two consolidating companies belong to the same of the four sectors, for example where an IT software company buys another IT software company. The remaining 394 (48%) are consolidations of companies from different sectors. Among these

are a wide variety of cases, and some M & As face wider gaps than others. Quite a number of these are cases where the buying party is an investment company, a holding company, or the like. Such takeovers may imply important effects for the acquired company, for example through added financial resources that can secure future development, or through the association to the group of companies within the realm of the investment company. The bulk of the 394 cross-sector M & As are still within the IT industry, for example an IT software company buying an IT hardware company. Their potential effect on the expansion of the IT business is less groundbreaking, so these deals will not be considered further.

Instead, the cases spanning the boundary of the IT industry are potentially more effective examples of how IT business formed through innovative combinations of resources, technology, and knowledge. As many as 73 M & As are deals involving an IT company and a non-IT company, thereby crossing the IT industry boundary. Some of these deals involve several companies, so the data cover 81 cases of combination between two companies of quite different focus. Sixteen (20%) of these are presented as mergers, indicating a somewhat mutual basis for the consolidation. In 35 (43%) of the cases, an IT company has been bought by a company from another sector, and the remaining 30 (37%) are IT companies acquiring non-IT companies. There is thus a relatively even balance between cases where the actual technology approaches the applications of it, and vice versa.

ILLUSTRATIONS OF THE EXPANSION OF THE SWEDISH IT BUSINESS

The companies consolidating with the IT companies represent different industries: industrial, finance, media, trade and commerce, services, and telecom. The distribution of the 81 inter-industry M & As is illustrated in Figure 9.1, which clearly shows that the two notably largest shares are telecom (30%) and industrial (27%). Mergers are shown as lines in the figure, whereas arrows represent acquisitions, made either from another industry into the IT industry, or vice versa. The frequency of the deals is reflected in the width of the lines and arrows.

A number of interesting cases that illustrate the widening of the IT sector can be found among these inter-industry M & As. **Telecom** companies, to start with, are today very closely associated to IT, but this study treats them as a separate industry. A strong connection between IT and telecom is shown not only by the large number of M & As joining the two industries, but also that the type of deals is quite balanced. There are slightly more telecom companies buying into IT (42%) compared to the other way around (29%) and to mergers (29%), but the interest in combining products and knowledge from these two fields appears to be quite mutual.

The acquiring telecom companies were primarily telephone operators such as Swedish *Telia* and Finnish *Sonera* (who merged in 2002 to form

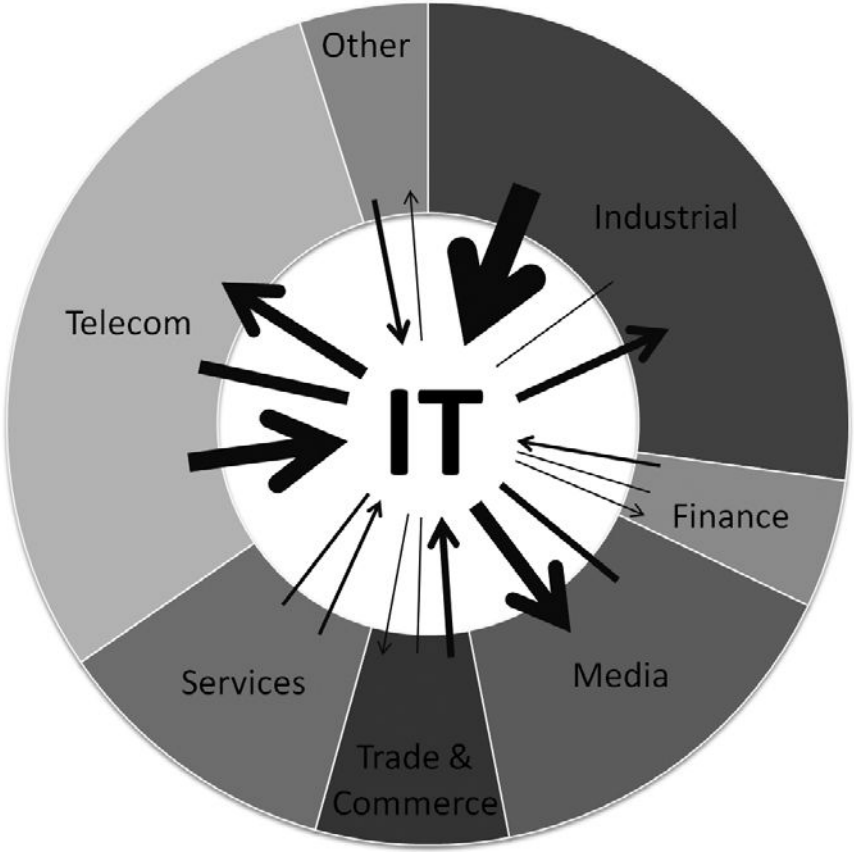

Figure 9.1 Movements between different industries represented by the arrows (acquisitions from or to the IT industry) and lines (mergers), where a wider line means more inter-industry deals. The size of each sector in the circle is representative to that industry's share of the inter-industry M & As.

TeliaSonera). These large corporations were in the midst of expanding the scope of mobile phone services, and made various acquisitions in this quest. One example is *Sonera's* SEK 7 Bn (≈€700M) acquisition in 2000 of *Across Wireless*, a Swedish company specialized in systems for mobile e-commerce. Another is *Telia's* acquisition of the mobile web portal *Halebop* in 2001, which Telia was a minority owner of. This was in a time when "portals", i.e. content-rich start pages, were a hot topic on the web and on the rise for mobile phones. In fact, Halebop was one of three (sic!) mobile portals in Telia's portfolio, but whereas the other two (*MyDOF* and *Speedy Tomato*) have been closed down, Halebop lives on as Telia's youth-oriented mobile network brand.

Continuing to the **industrial** domain, we find a very strong dominance of industrial companies buying IT companies. In almost three quarters of the deals, the industrial company is the acquiring party. One frequent acquirer

is the defense industry company *Celsius*, which is a company formed by a history of M & As, for example with the weapons manufacturer *Bofors*. As early as 1994, Celsius bought a number of IT companies: the electronics and communications company *Telub*, the communications company *Dotcom*, and the IT service company *Dialog*. Celsius itself was later acquired by the aerospace and defense corporation *Saab* in 2000.

Another example is from the traditional printing press industry, with *Tryckindustri* as the company in focus. In year 2000, Tryckindustri made a series of acquisitions of IT companies. They bought *Computer Publishing Systems* and *Triple Sense*, both focused on systems for managing information on web pages. During the same year, they also bought *Intellecta*, a company focused on electronic communication platforms for business information, and changed their name to Intellecta. The traditional printing press company Tryckindustri had thereby realized their strategy to become a "communications management" company (Tryckindustri's press release, June 27, 2000).

Continuing into the **media** context, another direction of the expansion is dominant, namely that IT companies buy into the media industry. An illustrative example of this is the IT consultant and systems company *Mandator's* 2003 acquisition of *Journalistgruppen*, specialized in making customer magazines. Mandator said it enabled them to deliver contents to the information systems they supply, and that it is a direct effect of the increasingly close relation between traditional IT and traditional communication services (Mandator's press release, December 7, 1999). Another example is how the software distributor *Nocom* in 2000 complemented their role as a supplier of IT solutions for e-commerce by buying *Hera*, an established agency for market communication. That way, Nocom became a supplier for all needs related to e-commerce (Nocom's press release, January 12, 2000). A third example is the internet company *Linné Data*, which bought TV and video production companies: *Propello* in 1998 and *TELETV* in 1999. These acquisitions were made to strengthen Linné Data in providing video media as a part of their "communication solutions" (Linné Data's press release, February 16, 1999). Yet another example is the web agency *Drax*'s acquisition of the advertising agency *Heart Reklambyrå* in 2000. All three examples from the meeting between IT and the media shows how IT companies have made acquisitions in order to expand their capability to deliver contents to the IT systems their business was based on.

The combination of IT and **services** is even more dominated by IT companies acquiring to expand their businesses. A representative example for this group is the IT systems provider *Softronic*, which in 1999 bought an established management consultancy firm, *Consultus*, to be part of a development where IT was becoming an increasingly important strategic issue for business. As a result of the acquisition, Softronic promised to launch a number of new business concepts and challenges for the Swedish market (Softronic's press release, July 6, 1999). Very similar was the acquisition of

Adaptive Performance by *Entra Data* in 1999, which was part of Entra's "strategy to strengthen its position in business development based on internet-related technology" (Entra Data's report for the 1st quarter, 1999). These types of M & As directly address the critical role IT plays for business, and are combinations of two knowledge-intensive fields: business management and information systems.

In **trade and commerce**, the main trend seems to have been that traditional trade companies acquire companies that have taken their business online, and thus established a platform for e-commerce in a certain area. Among these are *BIG*, a retail chain in construction equipment, who in 2003 bought an online retailer of similar products, *verktygshuset.se*. Another is the clothes manufacturer *New Wave*, who bought an almost bankrupt online clothing store, *Dressmart.com,* in 2000 for the purpose of using its e-commerce system to take their business online. Continuing on the same theme, the consumer cooperative *KF* owns a traditional bookstore *Akademibokhandeln*, and complemented this with the online bookstore *Bokus* in 1998. And in the **finance** sector, the insurance company *Länsförsäkringar* bought a closed down Internet-based insurance broker, *Jahaya,* in 2002. In these deals, the acquired companies had knowledge and experience of running a business online. Some of them had succeeded, whereas others had failed, but what remained after the failures was an e-commerce system, and that alone could be a motive for the acquisition. Implementing such a system had in fact proven to be a surprisingly demanding venture in terms of time and money. For example, the clothing and sports accessories online store boo.com spent around SEK 2.4 Bn (≈€250M) on their system before going bankrupt (see Malmsten, Portanger, & Drazin, 2001).

Among the remaining **other** cross industry M & As in the data set, one is particularly mind-blowing. In 2000, the real estate company *Columna* changed its focus to investments in IT and Internet businesses. In what seems like managerial hubris, Columna bought a part of an online film distributor, *Filmvianet.com*, and then aimed at taking over *Drax Holding*, an IT investment company listed on the stock market. After buying a large share of the company during 2000, Columna placed a bid for the rest of the shares, but soon thereafter the stock market, and the IT shares in particular, plummeted in value. As a consequence, the deal had to be cancelled abruptly, followed by legal disputes and negative publicity, somewhat in line with the past of the company, which is remembered in Swedish business history through the "Fermenta scandal". After the failure, Columna returned to real estate through other acquisitions, and was in turn acquired by another real estate company later on.

The examples given here are just a few of the many intriguing mergers and acquisitions that took place in the Swedish IT sector, and affected its development. To further understand what these types of M & As mean for the expansion of IT as a field of business, two different perspectives on M & As will be discussed next.

COMPANY GROWTH THROUGH MERGERS AND ACQUISITIONS

Quite fundamental to the reasoning about growth as an increase of the resources in a company is the dichotomy between internal and external growth (e.g. Harrison, 2003; Penrose, 1959; Wilson, 1980). Internal growth is accomplished by using the company's own resources to expand its business, which is generally slower but less risky, whereas external growth builds on cooperation with or acquisition of other companies (Harrison, 2003). One way for companies to grow is thus through mergers and acquisitions, in which growth can be accomplished through the internalization of another company's resources to expand the capabilities, gain control over critical resources, and overcome growth barriers (Andersson, Johanson, & Vahlne, 1997; Wilson, 1980; Yip, 1982).

The possibility of combining resources through mergers and acquisitions enables expansion at a more rapid rate and in larger steps (Penrose, 1959, p. 195). This can be a key factor in fast-changing industries, such as the IT sector, where organic growth simply is too slow to keep up with the competition. What is gained in momentum, however, is lost in control. The integration of two businesses entails a wide variety of difficulties, and many consider acquisitions to have a very low success rate (e.g. Datta, 1991; Perry & Herd, 2004).

Different types of mergers and acquisitions can be distinguished, and a commonly used categorization is a typology accredited to the FTC (Federal Trade Commission), based on similarities in the product, technology, or market of the consolidating companies and delineated between vertical, horizontal, and conglomerate M & As (Federal Trade Commission, 1968).

A *horizontal* M & A takes place between two similar companies in the same industry, often described as 'competitors', primarily to reduce competition or to coordinate product development (Larsson, 1990; Vaara, 1992). A *vertical* merger involves two companies within the same "value chain", in the sense that the output of one is the input of the other. This basically means that a customer buys its supplier, or vice versa, and this applies to production as well as distribution lines. A vertical merger implies an internalization of the market exchanges that preceded the merger; thereby securing access to resources and distribution channels. This could be especially important in situations of stiff competition or rapid technological development (Thompson, 1967).

The third type, *conglomerate* M & As, emphasizes the difference between the companies. Acquiring into an unrelated market, called 'market extension', means that the two companies are in the same general line of business, but are operating in different markets, which extends the business possibilities and lowers the risk. In contrast, 'product extensions' are acquisitions into another line of products, although somehow related in terms of market, marketing, or distribution. Finally, the 'unrelated conglomerate' is a situation where the similarities between the acquiring and the acquired firms are few or non-existent (Federal Trade Commission, 1968).

All types of M & As can doubtlessly have a great impact on the industry and market in which they occur. Theoretically defining the types of M & As is one thing, but using the typology empirically to categorize actual M & As is more problematic, and the conglomerate category has been criticized for being a container for all deals that could not be labeled vertical or horizontal. The dataset in this study does not allow the explicit distinction of vertical M & As, as neither the companies' position in the value chain nor their pre-M & A relations are adequately covered. However, a rough distinction can be made between intra- and inter-industry M & As, through the described distinction of four sectors, and this theoretically separates horizontal/vertical from conglomerate consolidations.

Both horizontal and vertical can be found among the 420 M & As that took place within a sector, as mentioned but not described in detail earlier. The other 394 cross-sector consolidations in the data are hypothetically conglomerates. Especially the consolidations spanning the IT boundary are likely to be product-wise expansions, but could potentially also be market-wise expansions. Seventy-three such deals were found, and among these were the cases used as illustrations of industry-crossing combinations of companies. Following this terminology, the chapter is about conglomerate M & As as remarkable indicators of a business's development through combinations of resources, technologies, and knowledge.

A conglomerate M & A with a large "diversifying scope", i.e. the two companies are very different in terms of technology, production, knowledge, and market, is a tremendous challenge. Anything from selecting the target to realizing the synergies is increasingly difficult as the difference increases. However, very few M & As are in fact completely diversifying in nature; there is often some kind of link through production or skills (Penrose, 1959). This can be seen in many of the cases, where the acquisition was made to enhance an established platform, for example, IT companies buying media companies to help customers manage the contents of the systems, and the meeting between IT companies and telecommunication companies that laid the groundwork for more advanced mobile units, constantly enabling new ways of consuming IT.

The way printing presses can be combined with interactive media to form a new way of information management, or management consultants' business understanding can be added to the technical competence of IT-systems suppliers is to a greater extent a matter of forming new domains of business. Altogether, the M & As called conglomerates here have to a varying extent led to applications that change the way we use information technology, and there will most likely be many more interesting M & As of this type.

A NETWORK PERSPECTIVE ON BUSINESS EXPANSION

Focusing on business exchanges is another way of looking at expansion. Business interactions and exchanges between customers, suppliers, and

other actors can be described as inter-organizational business relationships. Adaptations and interlinked activities form dependencies and render the relationships interconnected in the sense that what happens in one relationship affects other relationships (Blankenburg Holm & Johanson, 1997; Forsgren & Olsson, 1992). As most companies have more than one customer or supplier, a typical company is involved in numerous business relationships, all connected to each other in what can be described as a business network. A business network is a structure of connected business relationships, and this structural dimension makes the actions of a company dependent not only on the business relationships it is involved in, but also on the relationships connected in the second line or even further away (Anderson, Håkansson, & Johanson, 1994; Håkansson & Snehota, 1989).

Business relationships are the result of past interaction and the frame for future interaction of the involved companies. Strategies and choices take place within the constraints of, and uncertainty in, the context. Managerial control over business relationships is not unilateral, so although some effects in the context can be intended and calculated, many consequences are hard to comprehend and control (Anderson, Havila, & Salmi, 2001). The business network constitutes inertia as well as dynamics for growth and business development. As established business exchanges are not likely to be abandoned, the network implies a kind of stability where the company's position in the network limits the possible strategies for the company. At the same time, the current commitments give rise to business opportunities in the current network context (Ghauri, Hadjikhani, & Johanson, 2005; Johanson & Vahlne, 2006).

From this perspective, growth in the form of increased sales to existing customers, for example, would appear to be a smaller change than the launch of completely new types of products on new markets, since the former is a change within the current business network whereas the latter aims to establishing new business relationships, causing changes of the business network. The greater the difference is in relation to current business interactions, the more radical the changes of the business network can be expected.

Mergers and acquisitions are potentially radical changes not just for the companies involved but also from a business network perspective. When two actors in the business network consolidate, which is what happens in M & As, customers and suppliers can both be affected by, and affect, the outcome (Havila & Salmi, 2000; Holtström, 2009; Öberg, 2008). A merger or acquisition is likely to affect not only the companies directly involved, but also other actors that are related to the consolidating parties, and the change can thus spread through the network (Havila & Salmi, 2002).

The effect of mergers and acquisitions on business networks can be seen both in the form of structural and relational changes. From a structural point of view, an acquisition creates a restructuration of the business network as the joining of two actors through a merger or acquisition joins

the actors' network positions and the business relationships of the actors. The effects of that first-hand structural change may be limited to relational changes, e.g. adjustments within the established business relationships, but may also lead to additional structural alterations, e.g. the termination or development of business relationships, new structural formations or isolations. Besides the target company itself, all its business relationships should be regarded as part of the target; "you marry the family", as Dooley and Zimmerman (2003) put it, suggesting that considerations of network effects are key to M & A success. Substantially larger changes can be expected during the years following an acquisition, compared to the periods before and after it, and a significant share of the acquired company's main business relationships can be ended or replaced (Bocconcelli, Snehota, & Tunisini, 2006). This raises the question of whether the acquirers are really buying the businesses they think they are.

The business network perspective adds another dimension to the earlier reasoning on business and market development. The described FTC typology of different types of M & A, i.e. horizontal, vertical, or conglomerate, is based on an industry perspective regarding the relations between the acquiring and the acquired firm, but these types are also interesting from a business network perspective. A *vertical* acquisition, for example, could mean that a company buys one of its customers. Such consolidations alter the immediate network structure, but can also have further effects. For example, competitor companies that are also buying from the customer may not appreciate the new situation where it buys from its competitor's subsidiary, and may therefore end the business relationship.

Being competitors implies competing for the same resources, primarily in the form of suppliers' products or customers' money. To reach synergies in a *horizontal* merger of two competitors, the companies can coordinate their purchases, which, if the two companies are buying similar goods from different suppliers, means that one relationship to a supplier is terminated (Anderson et al., 2001). Similarly, if the two merging companies provide similar products, the customers will have their options reduced.

Vertical and *horizontal* M & A thus takes place within the network context, and joins two related companies. The companies in *product or market expansion conglomerate* M & As are instead indirectly linked prior to the consolidation, for example, through common partners and suppliers (based on product relatedness) or customers (based on market relatedness), but are still within the established network structure. These are thus examples of companies acting on opportunities in the current network context. *Unrelated conglomerate* M & As, on the other hand, join two businesses in heterogeneous network contexts, and are thereby likely to bring together previously separated parts of the structure. They are based on opportunities in combinations of network contexts, and entail greater changes for the network context as well as the field of business.

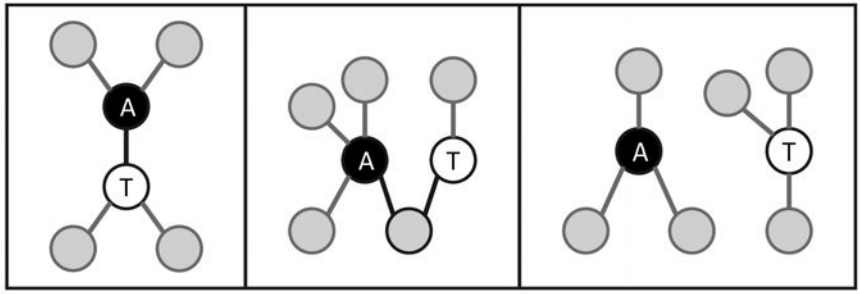

Figure 9.2 Illustrations of M & As between two related companies (left) where the Target is a customer of the Acquirer, two indirectly linked companies (middle) where the Acquirer and Target have a customer in common, and two unrelated companies (right) where no link exist between the Acquirer and Target in the immediate context.

To empirically study market expansion in the form of structural changes of business networks is a tremendous challenge, but M & As do, based on this line of reasoning, offer a window to approach business network dynamics. Although the business network dimension was not explicitly part of the described cases, they indicate a few different situations. One recurring observation, primarily in the meeting between IT and trade and commerce, is how traditional companies turn to Internet companies to get a web-based retail channel. In these cases, the acquiring company has an established network of suppliers within the field, whereas the acquired company has a desired network of customers combined with an established supply chain. As the buyer obtained an Internet-based retail channel, the way that company approached the market changed, and, in all likelihood, so did how it interacts with existing customers. These deals are in one way market extension conglomerates, but some of the web shops might in fact have been more interested in developing and selling the e-commerce platform than the actual products.

Many of the acquirers in the cases emphasize the customers, not least the current customers. It seems that quite a few of the M & As were made to complement the core competence and products to meet customers' needs. These consolidations thus aim to build on and preserve the current network context, somewhat in line with the frequent emphasis on the incremental dimension of business expansion (cf. Johanson & Vahlne, 1977). Larger changes are however likely on the supplier side of the network context. In many cases, the customer oriented product development meant that the involved suppliers were replaced by or complemented with 'IT-competent' competitors. The network was thus expanded on the supplier side in order to offer more and better products and services to the customers. This alone can imply quite revolving changes to the established business structures.

CONCLUDING DISCUSSION

During the IT industry's expansive era during the late 1990s and early 2000s, it was reformed through combinations of (what was then considered) traditional IT companies and many different types of other companies. The many cases described in this chapter to illustrate the expansion of IT as a business domain are similar in some aspects, but very different in others. They show that the IT industry has crossed paths with a number of different other industries, and illustrate the great variety in the directions of the IT business' expansion. The mergers and acquisitions appear to be made with a wide variety of intentions, and ideas of what the effects will be. In all, it does appear to be a very complex parallel to the technological development of the field.

Without defining causes and effects, it is interesting to see how the technology takes different paths as it diversifies business through conglomerate M & As. Although this study had a particular focus on mergers and acquisitions involving companies from different industries, most of the cases described appear not to be as unrelated as was hypothesized, but rather quite understandable developments of the companies' product portfolios and business networks. Some more daring exceptions could be seen though.

The market's, i.e. customers' and suppliers', role in bridging the distance between two seemingly unrelated companies or sectors was acknowledged through the business network approach. This adds to the understanding of the complex relation between growth of companies, on one hand, and expansion of the market, on the other. It was argued that business expansion is achieved through combinations of business network contexts, with changes of rather than in the network structure. Business expansion thus emphasizes business network growth in scope over volume.

Being an abstract theoretical construction, business network dynamics is very difficult to study empirically, and since this dimension was not included in depth in the illustrative cases, it was not possible to explicitly see if and how business network structures were combined through the M & As. However, a note was made regarding the potential (im)balance between changing network structures on the customer versus supplier side.

Broadly speaking, an acquisition is a way to buy into a network of knowledge, applications, customers, and suppliers, and in conglomerate M & As the leap is relatively big. An alternative M & A typology could perhaps be based on what kind of relationship, if any, the two companies had before the merger (cf. Andersson et al., 1997). M & As where the companies are directly related (e.g. customer and supplier) could be distinguished from indirect relations (e.g. competitors) and no relations. It is reasonable to assume that greater business development and market expansion can be achieved if greater opportunities are seized. This is difficult to distinguish, but it could be argued that a strong pre-merger relation between the consolidating companies means a smaller change than if there is no relation whatsoever

between the companies. Combining companies with as much difference as possible in their resources, knowledge, business relationships, and network position is, from a market expansion perspective, the most innovative move with great possibilities to create business not previously imagined. M & As, and particularly between seemingly unrelated companies, could therefore be used as an indicator of the expansion of an industry.

Looking at current trends within the world of information technology, a focus on content is evident. In many domains, content has been separated from technology, thereby enabling the user to concentrate on using, not maintaining, the systems. This can be seen in an increased use of the "cloud" (or "cloud computing"), a dynamic grid of several (thousands of) computers acting as a virtual machine taking care of storage and processing with capacity far beyond any individual setup (Harvard Business Review, 2010; Mell & Grance, 2011). Running applications in the cloud makes installation, bug fixes, and incompatibility non-issues for the user. Centralized solutions are not new; mainframe computers and Software-as-a-Service (SaaS) have been around for decades, but the Internet now allows for a stable distributed architecture. There have already been a number of M & As of relevance to the cloud era, for example the Swedish "traditional systems" supplier Visma's takeover of the Finnish "cloud systems" supplier Severa in 2010, the global database giant Oracle's $7Bn acquisition of mainframe computer manufacturer Sun Microsystems in 2009, and the hardware company HP's $2.35Bn takeover of the virtual-storage company 3PAR in 2010.

Although many of the services are free or funded with ads, the cloud has brought new spot-market-like use-based models for payment, for example charging per second/month/gigabyte. The online advertising industry is perhaps the primary economic engine of the Internet today, and the large Internet companies do not hesitate to acquire companies with innovative data-mining models for advertisement profiling. In this quest, the increasingly interactive web is a core component. The more the users contribute content, the more the advertisers know about the users, which enables them to show just the right ads to the right people, and besides, it means that the users do (almost) all the work in adding valuable content to the product. These are some areas with high probability for interesting mergers and acquisitions, and they illustrate the continued intertwined technological and business development. However, these speculations will be hopelessly outdated very soon as the information technology and IT business advances.

KEY INSIGHTS

- Technology and business development go hand in hand.
- "IT industry," "IT sector," and "IT business" are not distinct labels but instead very diversified and volatile. What we think of as "traditional companies" today may very well be seen as "IT companies"

tomorrow, and "IT companies" of today may very well be the "traditional companies" of tomorrow.
- M & As takes place in a context of other companies and relations.
- A firm-focused view is not necessarily the best way to understand the expansion of a business area.

DISCUSSION QUESTIONS

Based upon this chapter:

1. Can you see similar development in other sectors?
2. What might be the key strategic success factors for a company in a rapidly developing sector?
3. In terms of knowledge, how do mergers and acquisitions (M & A) compare to internal research and development (R & D)?
4. When it comes to mergers and acquisitions, how can a company handle the business network dimension?

ACKNOWLEDGMENTS

The research has been funded by the Swedish Research Council, the Swedish Research School of Management & Information Technology, and Jan Wallander & Tom Hedelius Foundation, together with Tore Browaldh Foundation.

RECOMMENDED FURTHER READING

Anderson, J. C., Håkansson, H., & Johanson, J. (1994). Dyadic business relationships within a business network context. *Journal of Marketing, 58*(4), 1–15.

Datta, D. K. (1991). Organizational fit and acquisition performance: Effects of post-acquisition integration. *Strategic Management Journal, 12*(4), 281–298.

Forsgren, M., & Olsson, U. (1992). Power balancing in an international business network. In M. Forsgren & J. Johanson (Eds.), *Managing networks in international business* (pp. 178–193). Philadelphia: Gordon & Breach.

Havila, V., & Salmi, A. (2000). Spread of change in business networks: An empirical study of mergers and acquisitions in the graphic industry. *Journal of Strategic Marketing, 8*(2), 105–119.

Penrose, E. T. (1959). *The theory of the growth of the firm.* Oxford: Basil Blackwell.

Yip, G. S. (1982). Diversification entry: Internal development versus acquisition. *Strategic Management Journal, 3*(4), 331–345.

REFERENCES

Anderson, H., Havila, V., & Salmi, A. (2001). Can you buy a business relationship? On the importance of customer and supplier relationships in acquisitions. *Industrial Marketing Management, 30*(7), 575–586.

Anderson, J. C., Håkansson, H., & Johanson, J. (1994). Dyadic business relationships within a business network context. *Journal of Marketing, 58*(4), 1–15.

Andersson, U., Johanson, J., & Vahlne, J.-E. (1997). Organic acquisitions in the internationalization process of the business firm. *Management International Review, 37*(2), 67–84.

Audretsch, D. B., & Feldman, M. P. (1996). Innovative clusters and the industry life cycle. *Review of Industrial Organization, 11*(2), 253–273.

Blankenburg Holm, D., & Johanson, J. (1997). Business networks connections and the atmosphere of international business relationships. In I. Björkman & M. Forsgren (Eds.), *The nature of the international firm: Nordic contributions to international business research*, pp. 411–432. Copenhagen: Handelshøjskolens forlag.

Bocconcelli, R., Snehota, I., & Tunisini, A. (2006). Network relationships and corporate acquisitions outcomes. *The IMP Journal, 1*(2), 4–28.

Dahlin, P. (2007). *Turbulence in business networks—A longitudinal study of mergers, acquisitions and bankruptcies involving Swedish IT-companies*. Doctoral thesis No. 53, Mälardalen University, Västerås, Sweden.

Datta, D. K. (1991). Organizational fit and acquisition performance: Effects of post-acquisition integration. *Strategic Management Journal, 12*(4), 281–298.

David, P. A. (1990). The dynamo and the computer: An historical perspective on the modern productivity paradox. *The American Economic Review, 80*(2), 355–362.

Dooley, K., & Zimmerman, B. (2003). Merger as marriage: Communication issues in postmerger integration. *Health Care Management Review, 28*(1), 55–67.

Eriksson, C. M. (2008). *Industrial dynamics: A multilevel study of the Swedish IT industry*. Doctoral thesis, Chalmers University of Technology, Göteborg, Sweden.

Federal Trade Commission. (1968). *Annual report of the Federal Trade Commission*. Washington, DC: U.S. Government Printing Office.

Forsgren, M., & Olsson, U. (1992). Power balancing in an international business network. In M. Forsgren & J. Johanson (Eds.), *Managing networks in international business* (pp. 178–193). Philadelphia: Gordon & Breach.

Ghauri, P. N., Hadjikhani, A., & Johanson, J. (2005). *Managing opportunity development in business networks*. Basingstoke: Palgrave Macmillan.

Håkansson, H., & Snehota, I. (1989). No business is an island: The network concept of business strategy. *Scandinavian Journal of Management, 5*(3), 187–200.

Harrison, J. S. (2003). *Strategic management: Of resources and relationships: Concepts*. New York, Chichester: Wiley.

Harvard Business Review. (2010). What we're watching in . . . cloud computing. *Harvard Business Review, 88*(6), 24–30.

Havila, V., & Salmi, A. (2000). Spread of change in business networks: An empirical study of mergers and acquisitions in the graphic industry. *Journal of Strategic Marketing, 8*(2), 105–119.

Havila, V., & Salmi, A. (2002). Network perspective on international mergers and acquisitions: What more do we see? In V. Havila, M. Forsgren, & H. Håkansson (Eds.), *Critical perspectives on internationalisation*, pp. 457–472. Oxford: Pergamon.

Holtström, J. (2009). *Synergi? en studie av några industriföretag (eng. Synergy? A study of industrial companies)*. Doctoral thesis, Linköping: Department of Management and Engineering, Linköping University, Sweden.

Johanson, J., & Vahlne, J.-E. (1977). The internationalization process of the firm—A model of knowledge development and increasing foreign market commitments. *Journal of International Business Studies, 8*(1), 23–32.

Johanson, J., & Vahlne, J.-E. (2006). Commitment and opportunity development in the internationalization process: A note on the Uppsala internationalization process model. *Management International Review, 46*(2), 165–178.

Jovanovic, B., & MacDonald, G. M. (1994). The life cycle of a competitive industry. *The Journal of Political Economy, 102*(2), 322–347.

Larsson, R. (1990). *Coordination of action in mergers and acquisitions: Interpretive and systems approaches towards synergy.* Lund/Bromley: Lund Univ. Press/Chartwell-Bratt.

Malmsten, E., Portanger, E., & Drazin, C. (2001). *Boo hoo: A dot-com story from concept to catastrophe.* London: Random House Business Books.

Mell, P., & Grance, T. (2011). *The NIST definition of cloud computing* (draft). National Institute of Standards and Technology, U.S. Department of Commerce. Special Publication 800–145. Accessed 16 May 2011 from http://www.nist.gov/itl/cloud/index.cfm

Penrose, E. T. (1959). *The theory of the growth of the firm.* Oxford: Basil Blackwell.

Perry, J. S., & Herd, T. J. (2004). Reducing M & A risk through improved due diligence. *Strategy and Leadership, 32*(2), 12–19.

Rydén, B. (1971). *Fusioner i svensk industri : en kartläggning och orsaksanalys av svenska industriföretags fusionsverksamhet 1946-69 [Mergers in Swedish industry: an empirical analysis of corporate mergers in Swedish industry 1946-69].* Stockholm: Industriens utredningsinstitut, Almqvist & Wiksell

Thompson, J. D. (1967). *Organizations in action: Social science bases of administrative theory.* New York: Mc Graw-Hill.

Vaara, E. (1992). *Mergers and aquisitions between Finland and Sweden: 1981–1991: An analysis of success in four cases.* Helsinki: Helsinki School of Economics.

Williamson, O. E. (1975). *Markets and hierarchies, analysis and antitrust implications: A study in the economics of internal organization.* New York: Free Press.

Wilson, B. D. (1980). The propensity of multinational companies to expand through acquisitions. *Journal of International Business Studies, 11*(1), 59–65.

Yip, G. S. (1982). Diversification entry: Internal development versus acquisition. *Strategic Management Journal,* 3(4), 331–345.

Öberg, C. (2008). *The importance of customers in mergers and acquistions.* Doctoral thesis, Linköping: Department of Management and Engineering, Linköping University, Sweden.

10 Measuring the Impact of IT in the Swedish Logging Industry

Maria Kollberg Thomassen

Estimating the economic impact of the information revolution is a complex task. In this study, empirical observations are used to show how information flows in key processes in an industry have been digitized and how this digitization has led to a wide range of effects. Researchers have studied the impact of information technology (IT) on productivity growth for several decades, reaching disparate conclusions regarding the contribution of IT investments to productivity (see literature reviews by Brynjolfsson & Yang, 1996; Dedrick, Gurbaxani, & Kraemer, 2003). Productivity is often expressed in measures such as labor productivity, total factor productivity (TFP), or multi-factor productivity (MFP) (Schreyer & Pilat, 2001). Even though productivity is an important measure for evaluating financial performance of individual firms and economic growth on an industry or national level, it is questionable whether conventional productivity measures are appropriate for evaluating the role of IT in financial and economic development (Brynjolfsson, 1993; Statistics Sweden, SCB, 2004).

An important milestone in this debate was the following statement by Robert Solow (1987, p. 36): "You can see the computer age everywhere but in the productivity statistics." Research on the so-called "productivity paradox" or "IT and productivity paradox" constitutes a starting point for this study. Early studies in the late 1980s, which were mainly based on aggregated data from macroeconomic statistics and company databases, indicated that IT investments did not show up in aggregate productivity statistics and contributed to the development of a critical view regarding the impact of IT (see for instance Strassmann, 1990). However, according to more recent studies on an aggregate level based on official statistics, both the use and the production of IT have made a positive contribution to productivity (see for instance Jorgenson & Stiroh, 2000; Oliner & Sichel, 2000; Whelan, 2000; Council of Economic Advisers, 2001; Jorgenson, 2001; Stiroh, 2001). In addition, studies with a firm-level focus (see for instance Brynjolfsson & Hitt, 1996) demonstrate that IT has had a significant positive impact on productivity growth on average, but also that the relationship between IT investments and financial performance varies considerably among companies and industries (reviewed in Dedrick et al.,

2003). The issue of returns on IT investments therefore seems more complex than the original formulation of the productivity paradox (Brynjolfsson & Yang, 1996; Dedrick et al., 2003).

Even though the impact of IT on productivity statistics has not been solely positive, organizations in many countries have still shown a strong willingness to invest in IT over the last few decades (OECD, 2004). This may indicate that there are several other potential forces driving organizations to invest in IT, besides increased productivity.

Of course, IT could be expected to have some positive impact in this regard, but there are also benefits that are difficult to express in financial terms. For example, Brynjolfsson (1993) cites increased variety, improved timeliness of delivery, and personalized customer service as additional benefits that are poorly represented in productivity statistics. Moreover, Lucas (1999) identifies a number of ways in which IT generates value: One is that investments could create vital infrastructure or required systems while also serving strategic purposes or transforming organizations. The wide spectrum of possible uses and potential benefits of IT implies that managers also struggle to find adequate ways of measuring the business value of IT investments (Mahmood, Kohli, & Devaraj, 2004).

The basic assumption of the research presented here is that IT has a major impact on economic activity through its significant role in industry development. Even though its value may fail to show up in productivity measures, it is still of major importance and must therefore be better recognized in technology investment evaluations. This research investigates the impact of IT in a broad industry perspective, and the purpose is to explore effects of IT by studying digitized information flows in key processes in the Swedish logging industry. The focus is on outlining major IT effects that have contributed to the transformation of the logging industry and presenting some examples of measurement indicators that can be used to capture such effects.

The chapter is organized as follows: First, the applied research approach is introduced. Second, main empirical findings are reported from the Swedish logging industry, including IT development in logging over 40 years and effects of this development. Examples of indicators are also proposed that may be used to estimate the impact. In the conclusions, results are further explained and some implications for business managers are outlined.

RESEARCH APPROACH

This chapter reports on key findings regarding the transformational impact of IT in a case study of the Swedish logging industry that was conducted in the period of 2003–2005. Empirical evidence is based on data collected during several field visits, about 30 in-depth interviews with forest industry representatives and researchers, and complementary written documentation

in the form of both published materials, such as brochures, company magazines, and annual reports, and unpublished materials, such as presentations, punch cards, timber-measurement receipts, printouts of information from internal systems, and copies of internal reports.

This study was conducted within the ITOP (Impact of IT On Productivity) research program that was launched in 2003 to further explore the issue of IT and productivity. Besides the logging industry (Kollberg, 2005), the ITOP studies include the graphic industry (Cöster, 2005, 2007), grocery distribution (Horzella, 2005) and the healthcare sector (Fryk, 2007, 2009) in Sweden.

As mentioned earlier, many of the previous studies aiming at understanding the role of IT are based on aggregated data and narrow definitions of IT, and have a strong focus on productivity statistics. An alternative approach was adopted in the ITOP program in order to capture an extensive picture of the impact of IT in economic activities with an emphasis on the microeconomic level and information flows related to processes in specific industry segments. Basically, the alternative approach that was adopted was based upon:

- An industry perspective rather than a single organization;
- A broad perspective on IT effects rather than on one-sided productivity-related measures;
- IT development over 40 years, rather than a single IT investment; and
- An emphasis on the use of information in key processes by adopting the concept of digitization of information, the conversion of information to digital form that can be processed by computers (Collin, 2001; Online Dictionary, 2005), as a complement to IT investments.

ABOUT THE SWEDISH LOGGING INDUSTRY

The Swedish logging industry occupies an important position on both the national and international level. The industry provides raw materials to the wood and the pulp and paper industries (Hailu & Veeman, 2003). Logging operations involve four key processes including planning of logging activities and preparations of the logging stand (planning and preparation), harvesting or felling and reprocessing of logs (harvesting), forwarding or transportation of logs in forest terrain and transportation of timber from the forest to the sawmill (forwarding and transportation), timber measurement at the measurement station by the sawmill, and follow-up on timber production (measurement and follow-up).

During the last few decades, technological advancements and mechanization in logging operations have led to a rapid increase in productivity. Rationalization has been important for remaining competitive in the face of

intensified global competition. The total number of employees in the industry decreased by almost 60 percent over about 30 years—from 224,400 to 89,800 between 1970 and 2003 (National Board of Forestry, 2004).

A condition for this development has been technological enhancement mainly regarding forestry machines. Logging operations are not traditionally regarded as being in the forefront of IT development. Yet, digitization of information flows in logging operations started back in the 1960s, and today numerous IT applications can be found in a wide range of logging-related activities (Höglund, 2000).

In the production process of saw timber, the harvester and bucking of logs are central. A harvester is a logging machine that is used for felling and reprocessing of logs, including limbing and crosscutting (cut in lengths). Before the trunk is cut into desired lengths, it is measured and divided into assortments for optimal utilization of the tree (bucking). Bucking means "the division of a tree trunk into assortments" (Sillerström, 1985), and the purpose is to make the division that will provide the maximum financial yield.

IT DEVELOPMENT MILESTONES

Since the 1960s, the logging industry has experienced major IT advances. The key developments are presented in an overview (see Table 10.1) structured according to the four key processes and a timeline of decades spanning from the 1960s to the 2000s. In the table, each milestone is grouped in relation to a major process and a decade. The milestones are primarily

Table 10.1 IT Development Milestones in Key Logging Processes

	1960s	*1970s*	*1980s*	*1990s*	*2000s*
Planning and preparation					GIS and GPS
Harvesting			Harvester computers and mobile communication	Bucking support and harvester reporting	GIS and GPS
Forwarding and transportation			Mobile communication		GIS, GPS, and vehicle computers
Measurement and follow-up	Computer-based timber accounting and SDC foundation	Automatic timber measurement stations	Online timber measurement (VIOL)		

placed so that the decade reflects the time period of when different technologies were introduced. Even though focus in the table is on showing the timing of technology introduction, it is important to note that most technologies entail major developments also during later decades.

The introduction of IT began primarily in the phase of measurement and follow-up, where it was used to facilitate administration in timber accounting and registration of timber measurement results. Radio communication in forestry machines was followed by mobile phones. Harvester computers, introduced in the late 1980s, have primarily been used for advanced bucking support. More recent development concerns vehicle computers in forwarders and trucks and geographical and positioning systems (GIS and GPS).

The development in planning and preparation activities is concentrated in the use of applications for geographical information. For example, GIS (Geographic Information Systems) is a computer-based information system with functions for collection, treatment, storing, searching, analysis, and presentation of geographical data. GPS (Global Positioning System) is a satellite-based positioning system that can be used in forestry for defining coordinates of test areas and for updating digital forest maps.

In harvesting, IT development has been concentrated to harvester computers, mobile communication, and geographical information support. Computers in harvesters were introduced in the mid 1980s and are today primarily used for support in bucking and to provide production data. Basically, with a bucking computer, the harvester is used to divide each tree into different assortments, cutting the tree into various lengths depending on tree species, quality, and diameter. Advanced bucking calculations based on price lists and bucking to order, which is the most customer-oriented bucking method, were introduced in the 1990s, as the computer capacity had improved. Mobile communication in harvesters has been used since the 1980s for communication. And today, mobile phones are also used for digital transfer of data to the Forestry Computing Center (SDC). The development of applications for geographical information, such as GIS and GPS, also provide opportunities for advanced navigation support in the field.

Development in forwarding and transportation is concentrated to computers, mobile communication, and geographical information support. In contrast with the rapid development of the harvester computer, the introduction of computers in forwarders did not begin until the 2000s, and installation of computer systems in trucks has been rather slow. Radio communication has been used in forest machines since the 1970s. Both GIS and GPS are also used for navigation support in the field.

In measurement and follow-up, digitization primarily involves computer-based timber accounting, automatic timber measurement stations, and the development of VIOL ("Virkesmätning Online" or online timber measurement). SDC, founded in 1961, serves as "the IT company of the forest industry," and most buyers and sellers of timber in Sweden are SDC members. Its original purpose was to coordinate and rationalize timber measurement

reporting through computerization. Punch cards were first used to transfer measurement information from the landing to the SDC central system. Digital management of measurement data based on optical registration of measurement results at the SDC was introduced in the 1970s, and in the 1980s automatic measurement stations for saw timber were installed in sawmills, enabling data transmission over the telephone network. Since the early 1980s a nationwide system for timber measurement, the VIOL system has been used for registration of timber transactions. VIOL serves as an information center and has enabled centralized reporting for measurement at sawmills and in harvesters. Members also have their own interfaces with the SDC database, from which they transfer important information to their internal systems.

EFFECTS OF IT

This research shows how digitization of key processes in the logging industry has led to a wide range of effects in various areas (see Table 10.2). A tool for categorization of effects developed by Mooney, Gurbaxani, and Kraemer (1996) is applied here to distinguish between different types of effects. The tool is based on three categories that reflect effects of IT on business value. Briefly, automational effects refer to the efficiency perspective of IT as a capital asset substituted for labor. Informational effects concern the use of IT to collect, store, process, and distribute information. Transformational effects refer to facilitating and supporting process innovation and transformation through IT. The division of effects into different impact areas further helps the reader to get a better overview of how these various types of effects are distributed.

Seen in the light of the process-oriented framework, the majority of effects belong in the informational category. These effects are mainly related to the use of information and to the information itself: They include increased flexibility and availability, optimized use of resources, follow-up and control, quality, adaptation to customer requirements, integration, skills and creativity, and general understanding. Only a few effects fall into the automational category. These include reduced costs and labor savings in timber accounting, especially in administrative work, and through quicker access to information. Some effects are also considered transformational. These are related to IT as support for innovation and transformation and include for instance a more open timber market, increased adaptation to customer needs, and development of new services.

Findings regarding examples of indicators for different impact areas are presented here to highlight the various measures that may be used to quantify effects.

Labor and cost savings. The impact of IT in terms of labor savings can be measured in the number of employees involved in timber measurement

Table 10.2 Effects Identified in Key Logging Processes and their Impact Areas

Effect category	*Impact area*	*Effects*
Automational	Labor and costs savings	Timber accounting costs Access to information Review and surveillance Efficiency in measurement registration
Informational	Decision support and control	Bucking support Support for decision-making and evaluation Control in forestry planning Production follow-up and process control
	Information access	Flexibility in price management Availability of updated information Bucking support flexibility and availability Availability of updated information Quality of information Spread and use of information Opportunities to refine information
	Resource use	Optimization of timber transactions and stand utilization Utilization of harvester Stability in harvesting system
	Skill levels	Employee skills requirements Complexity in work routines Employee creativity Transparency and understanding of timber flow
Transformational	Innovation	Opportunities for integration of computer applications Opportunities to utilize measurement results Service opportunities
	Market	Market opportunities More open Swedish timber market
	Product value	Adaptation to customer needs Value of customized timber

registration, which has been significantly reduced by digitization both centrally at the SDC and at the forestry companies. Another indicator is the number of measurement stations connected to the SDC, which has steadily grown over time.

The impact of other cost savings is seen in indicators of price of timber accounting combined with registered timber volumes. The price of timber accounting that each member of the SDC pays per registered cubic meter in VIOL has slightly decreased over the years. While price levels have been more or less stable in recent years, there has been an increase in the amount

of information collected and available. More importantly, the timber volumes registered in VIOL have steadily increased. The timber accounting cost per cubic meter is considered to be small, but since large volumes are handled through the VIOL system, even very small changes in price levels can have quite a substantial impact on the members.

Decision support and control. With the increased control and decision support in many parts of the process, it is likely that better decision quality has been achieved. This kind of impact seems difficult to quantify. One indication of the importance of bucking support may be a comparison between harvester measurement results and results from sawmill measurement stations. The importance of production follow-up in terms of improved decision support may be illustrated with indicators related to selection of contractors. Indicators showing mistakes, failures, and misunderstandings in the process may also be used.

Information access. The importance of flexibility, quality, availability, access, refinement, spreading, etc., related to information seems difficult to quantify. Given the widespread use of information throughout the logging process, access to information is assumed to be important in this process. For example, lead-time indicators can demonstrate the importance of information. How long it takes to handle timber from the forest to sawmill can be shown by the time required per timber transaction in VIOL, from registration of the wood order to reporting of measurement results. However, the inflow of timber from the forest is uneven, with large seasonal variations, and the capacity of measurement stations and sawmills is limited. So far, lead times are of minor importance to the stakeholders involved, but several SDC members have recently requested further services for follow-up on lead time.

Resource use. The impact of improved use of resources is primarily seen in the utilization of the harvester. With remote troubleshooting and failure repair made possible with the bucking computer systems, the level of utilization has raised. A typical indicator for evaluating harvester performance is operational time, which also measures how much time is lost in the event of failure. In general, modern harvesters can be used 24 hours a day and harvesters with bucking computers have a higher utilization degree compared to times before computers were introduced due to the improved operational time and efficient troubleshooting. The increased utilization of harvesters is considered to have improved productivity significantly. However, compared to hydraulics and mechanics, the bucking computer is considered to have had only a limited positive effect on harvester performance. Improved optimization of stand utilization and timber transactions has further implied fewer miscalculations in stand evaluation and a better fit between delivered timber and customer expectations. With greater support in site evaluation and a better fit of resources to market demands, it is assumed that overall efficiency in utilization of forest resources has improved.

Skill levels. The development of computer skills seems to have been especially important for involved stakeholders. The SDC has assumed the role

of developing expert skills in digital timber accounting, thus stimulating members to develop internal computer skills. Contractors have also developed skills to manage the bucking computer. During bucking, for example, the harvester operator takes the final bucking decisions even though the computer suggests how to cut the logs into lengths. The reason is the risk of severe losses in timber value in the event of mistakes in bucking support. With manual control of the support, mistakes can be detected. Indicators of increased operator skills may include education and training, perceived motivation, and variation in tasks. Another example is reduction of somewhat monotonous tasks involving manual information processing, such as registration of measurement results, which have been replaced by more qualified tasks. With digital information present in daily tasks, users may also start to consider new applications for information.

Innovation. Some effects also have an impact in terms of innovation. In parallel with the development of core functionality in bucking computer systems and timber accounting, for instance, additional services have been developed such as harvester and forwarder reporting functions. There has been a steady increase in both the number of installations for production reporting in harvesters and forwarders and the production volumes reported. The increasing integration of applications in bucking computers and the growing demand from SDC members for additional information services further indicate that innovation is likely to be even more important in the future.

Market. Digitization of timber accounting is considered to have significantly affected market structure in terms of network synergies. The network synergies are related to the standardization aspect of the timber accounting system developed at the SDC. The more buyers and sellers of timber that join the SDC, the more value derives from the system, and this increased value is assumed to be the primary benefit to members. The network synergies may be quantified by the number of SDC members and the timber volumes managed through the SDC systems. Since it can be assumed that most buyers and sellers of timber in Sweden are members of the SDC, in view of the timber measurement laws and regulations in Sweden, a more open timber market is considered to have been important for buyers and sellers of timber as well as society at large.

The development of more assortments and increased diversification of timber products can be regarded as consequences of a growing market for specific timber assortments and customized timber. Greater demand for specific fiber characteristics of pulpwood is also seen in pulp and paper production. In addition, further applications for timber have developed, such as biofuel. Enhanced customer service and customization of timber have gone hand in hand with increasing competitiveness and the emergence of new markets with specific requirements, such as the Japanese construction industry. In view of the growing international competition, it can be assumed that the international timber market will become

increasingly important for many Swedish companies, especially in customized timber production. In addition, with widespread implementation of bucking computers, most large forest companies in Sweden will likely have an interest in further increasing their international competitiveness through customization.

Product value. Regarding value to customers, it is assumed that buyers of specialized timber initially pay a higher price compared to buyers of timber in general. Hence, producing companies such as forestry operators, sawmills, and contractors benefit from customized timber at the start. However, with the growing importance of customization and increasing price pressure, the higher prices of customized products are likely to drop, favoring customers. It is thus assumed that the initial benefits to producing companies will be transferred to customers in the longer term. With intensified competition and price pressure on the timber market, increased product variety and customization are likely to have a significant impact in terms of value to customers, or customer surplus.

FINAL REMARKS ON THE IMPACT OF IT INVESTMENTS

Developments in timber accounting and bucking are considered to have contributed the most to the transformation of the logging process. The SDC infrastructure has contributed to efficiency gains in the administration of timber transactions and to standardization in the timber accounting systems used by buyers and sellers on the Swedish timber market. The bucking computer has further permitted increased customization of timber and a wider variety of assortments.

Results show that only a minor part of effects identified have a direct impact on productivity and thus that a large number of significant effects do not. This both confirms the productivity paradox and explains why it exists. Those effects with a major direct impact include increased efficiency in measurement registration, lower costs of timber accounting, and increased utilization of harvesters and forest resources. Other significant effects with no direct impact are related to a more open timber market, increased timber customization, control, decision-making, and access to information, as well as skill levels and innovation.

This means that the logging industry has not only experienced major productivity enhancements from IT development, but that IT primarily has implied major transformational benefits, only a few of which are seen in traditional measures of the IT impact. There is little doubt that IT has had a significant contribution to the development of the logging industry, even though it does not show in conventional productivity measures. It is difficult to imagine what the logging industry would have looked like if information flows had not been digitized and there had been no investments in IT.

Information is considered to have had an important role in the logging industry since the very first timber transactions in Sweden. Information is necessary to conduct timber transactions and to ensure reliability for buyers and sellers. While information has long played a central role in the process, IT is a more recent phenomenon. Even though some steps still remain before IT is fully integrated into all logging operations, the study indicates that IT is becoming more and more prevalent in procedures and daily routines. The development of IT in the logging industry may also affect other processes and industries, with an impact on the entire economy and society.

Furthermore, there are synergies between different types of IT as well as interaction with other types of technologies. Since IT is integrated with its surroundings and also interacts with other technologies and organizational contexts, the development of IT is dependent on other technological and organizational advances. In general, this development evolves primarily in small steps and at a varied pace in different areas where IT is applied. This interactive development may be said to have ratchet effects, implying that progress depends on consolidation of previous advances involving contextual factors and that the evolution moves forward and cannot be reversed.

Other phenomena that make it difficult to estimate effects of IT development are consumer surplus and network synergies. The contribution of IT in terms of, for instance, increased variety of products and a higher level of service, is primarily in the form of benefits to consumers. Since these benefits are often intangible, they are also difficult to estimate. In addition, the benefits of IT may increase with the number of users. The time factor is important for network effects, with the principal benefits occurring primarily in the longer term. Another time-related aspect is that information captured for one purpose may be utilized for other purposes in the future. As new applications can arise over time, the benefits of information depend not only on its current use, but also on its possible future applications.

In view of the high degree of integration and interaction in IT, it seems difficult to isolate the IT component from its surrounding context when estimating the benefits of IT development. The more IT is integrated into our daily lives, the more difficult it will be to isolate and estimate its contribution alone. With further integration and interaction of IT with its context, trying to isolate its impact seems less and less important, despite its relevance today. In other words, it may well be of little interest to determine the impact of IT and digitization in the future. More likely, the future focus will be on estimating the influence of other new emerging technologies on economic development.

In the logging industry case, there are some particular circumstances in the context that have had an important role for the transformation of the industry through IT. One important feature in the logging case is the joint initiative to establish the SDC in the 1960s. Hereby, IT development

of timber accounting services was centralized, and a joint industry initiative was taken for collaboration on these applications that would favor the entire industry. Since the foundation of the SDC, the forestry industry has experienced long-term and coherent development of IT applications and services that are both standardized and available to all members.

PRACTICAL IMPLICATIONS

The results presented here also have practical relevance for business managers. Practitioners concerned with the impact of IT on a firm level, especially within the logging industry, might find these results interesting. Results indicate that there is a need for high creativity when measuring the impact of IT in organizations including alternative measurement methods and innovative indicators. This research provides examples of indicators that may be used as a starting point in such process. It further suggests that adopting an industry perspective on the IT impact as well as an interorganizational perspective involving several parts in the supply chain might be useful to capture broad industry effects. During an IT investment evaluation process, managers may find it useful to reflect upon some appropriate aspects representing the broad level and long term perspective as a complement to the more short-term payoff and immediate labor savings and costs. Some suggestions of topics that can be evaluated include:

- May this investment influence other actors in my industry or in other industries?
- What are the opportunities to collaborate with other industry partners regarding this investment?
- How will this investment influence our value chain business partners, i.e. suppliers and customers?
- How will our end-customers or consumers be affected?
- How will this system be integrated in the existing infrastructure in our organization?
- What is the role of this investment in a long-term perspective, for example 10–20 years from now?

This research shows how IT has transformed the Swedish logging industry. Due to the fact that operational and administrative industry processes are automated, more informed, and transformed, this research calls for the development of more comprehensive and innovative ways of measuring IT performance in organizations. It is also suggested that managers should pay more attention to effects with a long-term perspective, to changes related to the end-customer, to future technology development potential, to relationships with partners in the supply chain and across industries, and so on, in IT investments evaluations.

DISCUSSION QUESTIONS

Based upon this chapter:

1. Which measures do you think are appropriate for evaluating the impact of IT in business organizations? What are the benefits of including alternative measures? Are there any disadvantages?
2. This study has a rather broad scope with an explorative approach including all types of IT effects on an industry level. Do you think it is important to capture all types of effects when evaluating IT investments? Why/why not?
3. Do you think industry collaboration on IT investments can provide further competitive advantages for individual companies? What do you think are major conditions for successful industry collaboration on IT investments?

ACKNOWLEDGMENTS

I am grateful to the foundations of Jan Wallander, Tom Hedenius, and Tore Browaldh for funding this study.

RECOMMENDED FURTHER READING

Brynjolfsson, E., & Hitt, L. M. (2000). Beyond computation: Information technology, organizational transformation and business performance. *Journal of Economic Perspectives, 14*(4), 23–48.

Carlsson, B. (2004). The digital economy: What is new and what is not? *Structural Change and Economic Dynamics, 15*(4), 245–264.

Kohli, R., & Hoadley, E. (2006). Towards developing a framework for measuring organizational impact of IT-enabled BPR: case studies of three firms. *ACM SIGMIS Database, 37*(1), 40–58.

Litan, R. E., & Rivlin, A. M. (2001). *Beyond the dot.coms: The economic promise of the Internet*. Washington, DC: Brookings Institution.

REFERENCES

Brynjolfsson, E. (1993). The productivity paradox of information technology. *Communications of the ACM, 36*(12), 67–77.

Brynjolfsson, E., & Hitt, L. (1996). Paradox lost? Firm-level evidence on high returns to information systems spending. *Management Science, 42*(4), 541–558.

Brynjolfsson, E., & Yang, S. (1996). Information technology and productivity: A review of the literature. *Advances in Computers, Academic Press, 43*, 179–214.

Collin, S. M. H. (2001). *Dictionary of information technology* (3rd ed.). Oak Park, IL: Peter Collin Publishing.

Cöster, M. (2005). *Beyond IT and productivity—How digitization transformed the graphic industry*. Linköping Studies in Science and Technology, Thesis No. 1183, Linköping University.

Cöster, M. (2007). *The digital transformation of the Swedish graphic industry*. Linköping Studies in Science and Technology, Dissertation No. 1126, Linköping University.

Council of Economic Advisers. (2001). The annual report of the council of economic advisers. In *Economic report of the president*. Washington, DC: United States Government Printing Office.

Dedrick, J., Gurbaxani, V., & Kraemer, K. L. (2003). Information technology and economic Performance: A critical review of the empirical evidence. *ACM Surveys Computing, 35*(1), 1–28.

Fryk, P. (2007). *Beyond IT and productivity—Effects of digitized information flows in health care*. Linköping Studies in Science and Technology, Thesis No. 1328, Linköping University.

Fryk, P. (2009). *Modern perspectives on the digital economy: With insights from the health care sector*. Doctoral thesis, Uppsala University.

Hailu, A., & Veeman, T. S. (2003). Comparative analysis of efficiency and productivity growth in Canadian regional boreal logging industries. *Canadian Journal of Forest Research, 33*(9), 1653–1660.

Höglund, A. (2000). *IT växer (även) i skogen*. Telematik 2004. TELDOK and KFB Kommunikationsforskningsberedningen, Stockholm. [In Swedish.]

Horzella, Å. (2005). *Beyond IT and productivity—Effects of digitized information flows in grocery distribution*. Linköping Studies in Science and Technology, Thesis No. 1184, Linköping University.

Jorgenson, D. W. (2001). Information technology and the U.S. economy. *American Economic Review, 91*(1), 1–32.

Jorgenson, D. W., & Stiroh, K. J. (2000). Raising the speed limit: U.S. economic growth in the information age. *OECD, Economics Department, Working Papers*, no. 261.

Kollberg, M. (2005). *Beyond IT and productivity—Effects of digitized information flows in the logging industry*. Linköping Studies in Science and Technology, Thesis No. 1185, Linköping University.

Lucas Jr., H. C. (1999). *Information technology and the productivity paradox: Assessing the value of investing in IT*. Oxford, NY: Oxford University Press.

Mahmood, M. A., Kohli, R., & Devaraj, S. (2004). Special section: Measuring business value of information technology in e-business environments. *Journal of Management Information Systems, 21*(1), 11–16.

Mooney, J. G., Gurbaxani, V., & Kraemer, K. L. (1996). A process oriented framework for assessing the business value of information technology. *The DATA BASE for Advances in Information Systems, 27*(2), 68–81.

National Board of Forestry. (NBF; Skogsstyrelsen). (2004). Forest statistics. Accessed February 18, 2011, from http://www.svo.se/

OECD. (2004). *The economic impact of ICT: Measurement, evidence and implications*. OECD Science & Information Technology, No. 5, 1–298.

Oliner, S. D., & Sichel, D. E. (2000). The resurgence of growth in the late 1990s: Is information technology the story? *Federal Reserve Board, Working Paper, Finance and Economic Discussion Series*, 2000:20.

Online Dictionary. (2005). Accessed February 15, 2011, from http://onlinedictionary.datasegment.com.

Schreyer, P., & Pilat, D. (2001). Measuring productivity. In *OECD Economic Studies* No. 33, 2001/2.

Sillerström, E. (1985). *Grundbok för skogsbrukare*. Jönköping, Skogsstyrelsen. [In Swedish.]

Solow, R. M. (1987, July 12 p. 36). We'd better watch out. *New York Times Book Review*.
Statistics Sweden, SCB. (2004). *Further ways of reflecting what is new in the economy, final report from the project Statistics on the new economy*. Stockholm: SCB.
Stiroh, K. J. (2001). Information technology and the U.S. productivity revival: What do the industry data say? *Federal Reserve Bank of New York Staff Reports*, No. 115, January.
Strassmann, P. A. (1990). *The business value of computers*. New Canaan, CT: The Information Economic Press.
Whelan, K. (2000). Computers, obsolescence and productivity. *Federal Reserve Board, Finance and Economics Discussion Series*, 2000–6.

11 IT Innovation Influence and Industrial Transformation

The Case of the Swedish Graphic Industry

Mathias Cöster

Societies are constantly in a state of transformation, and today this transformation is largely driven by the ongoing digitization of information. The way we are able to access and use information through devices such as cell phones, the Internet, databases, GPS, etc., was not so long ago more or less treated as mere science fiction. But nowadays such devices have become almost everyone's tool.

In this context IT might be defined as the single most important technology for the development of societies and industries. Not only through the use of desktop computers connected to a world wide web of information, but also through embedded IT applications that enable digitized information flows to integrate. One example of an industry greatly influenced by IT is the graphic industry, where for centuries the creation and distribution of information has been the main business.

The history of printing is commonly acknowledged to start with Gutenberg in the 15th century. He introduced the letterpress with movable types, an innovation that was further developed in the 19th century with the introduction of the automatic cylinder press (Kipphan, 2001). Later on in the century the gravure printing technology was invented, which later evolved into the rotation press. Together with the use of Linotype, an automatic typesetter, it became possible to print and distribute newspapers and books in growing quantities. Partly because of these and other communication technology landmarks that were invented during this time, printing gradually developed into an industry[1] (Hadenius & Weibull, 1997; Kipphan, 2001).

If Gutenberg had been able to step into the graphic production processes during the 1960s, he would probably have been impressed at the speed and accuracy with which printed matter was produced. Nevertheless, he would also have been able to trace the way in which the production was arranged to the letterpress with the movable types that he invented. If he made the same visit today he would be totally confused. Over a period of only 30 years IT innovations have totally transformed the graphic industry into a high speed, high quality digital industry.

In this chapter the transformation of the Swedish graphic industry processes and its markets will be presented as an example of the influence IT

innovations may have on an industry. First, concepts on the importance of innovations in economic development are presented. Thereafter follows a description of the methods used for collecting and analyzing the material that the content of the chapter is based on. Then critical production processes in the Swedish graphic industry and examples of IT innovations that have been implemented in these processes are presented. Finally the chapter is summarized by a discussion on the influence these IT innovations have had and what it may imply for other industries and businesses. Important concepts in this chapter are IT, IT innovations, and digitization. Here IT is defined as a technology consisting of software and hardware. An IT innovation is the application of the technology in a specific context, for example an activity in a process. When the technology is applied the information that is generated in the activity is transformed from an analog form to a digital, i.e. it is digitized.

THE ROLE OF INNOVATIONS IN THE ECONOMY

An innovation can be defined as a new product, production method, service, organization, or market. It is important to note, though, that an innovation seldom comes fully developed, and it therefore tends to undergo numerous changes during its life cycle (see e.g. Dahmén, 1950; Carlsson, 1995; Christensen, 2000).

When an innovation is successfully introduced in an industry, it tends to influence the environment where it is implemented, resulting in transformation of organizations and processes. Here transformation is defined as a state that is the sum of several changes (Cöster, 2007). A single change, for example the introduction of an IT innovation or the development of a new product, does not represent a transformation. But when changes that have occurred during a certain period of time are added together, a state of transformation might emerge. In some economics research innovations, transformation, and development are of specific interest. Schumpeter (1934) defines economic development as a state of new combinations, and in a competitive economy new combinations mean the competitive elimination of the old. The means of production for these new combinations should, in Schumpeter's view, be drawn from some old combinations, in a process of creative destruction. More recently Arthur (1994) writes that the economic world is one of constant transformation and change. It is a messy, organic, complicated world in which transformation, change, and messiness are natural.

According to Dahmén (1950, 1989), Carlsson (1995, 1997), and Carlsson and Eliasson (2003), economic growth is a result of an industrial transformation that is characterized by start-up, expansion, contraction, and liquidation of different enterprises. Carlsson (1995) views the creation and exploitation of new business opportunities that are sprung from new

combinations of existing or emerging technological possibilities, i.e. innovations, as the main reason for economic development. Dahmén (1980) characterizes industrial transformation as a struggle between the old and new that in the end will result in a change. He also emphasizes that the process of innovations is of focal importance in industrial transformation.

But how do innovations actually influence industries? One possible way to come up with conclusions on effects from innovations is to divide such an analysis into both an internal process perspective and an external market perspective.

INNOVATION EFFECTS ON PROCESSES

The influence on critical production processes can be studied through the identification of different effects. Examples of effects that may occur when IT innovations are implemented in industrial processes are automational, informational, and transformational effects (see e.g. Mooney, Gurbaxani, & Kraemer, 1995). Automational effects refer to the role that IT has as a substitution for labor and the way it contributes to more efficient processes. Values derived from these types of effects are, among others, productivity improvements and cost reductions. Informational effects are possible to achieve if the opportunities that IT offers in collecting, storing, processing, and disseminating information are properly utilized. Value from informational effects can be gained through for example enhanced decision quality and employee empowerment. Transformational effects refers to IT's ability to facilitate and support innovation and transformation of processes. The business values that may come up from transformational effects are reduced cycle times, improved responsiveness, downsizing, service, and product enhancement.

It is also important to consider that the effects mentioned previously may not occur at the same time or as soon as a new innovation is introduced. For example, Lucas (1999) writes that effects from IT investments can be divided into direct and 2nd order impacts. This may be seen as consistent with Dahmén's (1980) view that innovations may have direct as well as indirect effects on its surroundings, i.e. the industry or market in which the innovation is used.

INNOVATION EFFECTS ON MARKETS

Introduction of IT innovations also tends to have external effects on industry markets. In a marketplace both buyers and sellers can receive information concerning the product and in the end do business with each other (for example, Parkin, 2003; Pindyck & Rubenfield, 2001). Introduction of an innovation enables companies to develop new products and services

that reach customers through new or existing markets. The effects on these markets can be described as market push, pull, or contraction (Dahmén, 1980). Market push is an endogenous effect, i.e. it is primarily a result of initiatives from inside the industry. For example, the introduction of the iPad is an example of an innovation derived by an industry that may develop existing or generate new markets for publishers. Besides market push, the industry may also experience increasing and decreasing exogenous demands on products that are not directly connected to the introduction of innovations. A market pull represents an increasing demand for a certain product, i.e. expansion pressures from the market, while market contraction in turn is a concept for a decreasing demand. Both these concepts may occur because of parallel competition, i.e. when competitors have introduced similar products in similar markets. A result from these market effects is that actors in an industry may experience transformation pressures. In order to meet changes and stay competitive, the actors in the industry have to change their processes, their products, etc.

METHODOLOGY

When IT innovations are implemented in an industry, they tend to produce not only tangible values, but also intangible ones. These values are often lost when quantitative methods are prejudicially used in research on IT innovation effects. Studies based on aggregate data concerning, for example, the connection between IT investment and productivity, have tended to present diverse results over the years (Brynjolfsson & Hitt, 2000; Jorgensen & Stirho, 2000; Whelan, 2000; Yao, Liu, & Chan, 2010). Here the business and organization of the graphic industry instead have been studied from a process perspective, with a focus on when and how IT innovations have been implemented as well as the results that have emerged from these implementations.

Information on process development was gathered mainly from interviews with 26 individuals that are related to the newspaper and commercial graphics industries (for details concerning the interviewees, see Cöster, 2007). The majority of the individuals have much experience, 20–45 years, from working within the industries. Besides the interviews industry statistics were also gathered from Statistics Sweden. Through this procedure, generic process descriptions gradually evolved as similarities, and differences in the responses from the interviewees were identified. Furthermore, the focus has mainly been on identifying cause–effect relationships in order to explain effects that have occurred in the processes and to determine which effects can be traced to IT innovations. Hereby the processes do not represent specific firms within the industry; instead the aim has been to reflect a general picture of the graphic industry processes in Sweden.

A DEFINITION OF THE GRAPHIC INDUSTRY AND ITS CRITICAL PRODUCTION PROCESSES

The graphic industry's main business is about communication of information in visual form on paper. The industry can be divided into three different segments: commercial products, newsprint, and industrial products. The commercial product segment constitutes the industry's core business as it generally has a broader segment of services to offer with a high quality of the printed matter produced. The newsprint segment, on the other hand, can offer greater volumes with acceptable quality, depending on the type of printing presses used. The industrial product segment is mainly represented in the packaging industry, where the role of the graphic product is complementary. The starting point for the industries critical production processes is a customer's particular need for communication. To handle the various activities in the processes several actors are involved, such as advertising agencies and newspaper offices together with pre-press, printing, and post-press departments at printing and publishing companies (Cöster, 2007).

Because of digitization the classification of the industry has gradually become less rigid. For example, newsprint companies produce not only newspapers but also other printed matter such as advertising brochures and periodical magazines. Also, digitized information produced by the industry can today be presented in any medium, not only printed. Hereby the graphic industry, as, for example, Kipphan (2001) points out, has drifted towards becoming a multimedia industry where printing itself might no longer be the dominant activity. The traditional output from the production process is though printed materials that can come in different shapes and forms such as books, newspapers, or magazines. The critical processes necessary to produce printed matter using offset printing technology consists of the creation of original, pre-press, printing, and post-press processes. Examples of important IT innovations that have been introduced in these processes since the mid 1970s are storing and processing of digitized pictures, desktop technologies, embedded IT in printing presses, new printing plate systems, and color management systems. In the next section, some examples of the influence of these innovations are presented.

THE DIGITIZATION OF THE CREATION OF ORIGINAL PROCESS

Creating an original in the mid-1970s consisted of a series of activities including producing a first sketch, writing a text manuscript, and photographing. The manuscript was inscribed on cassette tapes and put into a

printer that printed the text on paper strips. These strips together with the original sketch were then handed over to the composing process. The photos that were developed were in turn handed over to the reproduction process. Involved in these activities were operators such as editors, overseers, journalists, photographers, typists, typesetters, and photo developers. Along with the text inscription activity, the process was totally analog.

In the mid-1980s as desktop computers, postscript software, laser printers, magnetic tapes, and floppy disks became available, digitization of the processes accelerated. This made it possible to digitize the interfaces between individuals involved in the process. The unique skills and tacit knowledge of composers and typographers were put into the software of desktop computers and made explicit to anyone with interest in creating and processing originals. Hereby desktop publishing made it possible for a single person to manage the whole process of creating an original. A negative side of this development, however, was that the typographic quality of originals was initially often reduced and the process of updating software and hardware was expensive due to the number of application programs used.

As a result of an ongoing introduction of new software and hardware, the information flows between the actors involved in this process have become totally digitized and automated during the last decade. A significant influencing factor has been the development of the Internet. For example, today it is quite common for customers to be able to access material stored on the publishing company's servers. At the same time, publishers have greater control of the material they produce during a longer time of the production process.

THE DIGITIZATION OF THE PRE-PRESS PROCESS

In the mid-1970s the pre-press process consisted of two separate processes, composing and reproduction. In the composing department, a compositor arranged the text received from the creation of the original process, using a background paper put on a light board. Wax was put on the back of the text strips, which made them stick onto the paper temporarily, comparable to Post-it notes. The original was then, together with written instructions, sent to the reproduction process. Here the graphic material was photographed with a repro camera, and the film was developed and assembled with the pictures that also had been scanned in the process. In order to check if the produced repro film was correct, a blueprint was developed. If no errors were discovered, the sheets, together with instructions of color adjustments, were transported to the printing process. In these processes, IT was embedded in photo scanners. Apart from that, they were analog and heavily dependent of the competencies of compositors, scanner operators, and typographers.

During the late-1980s and early-1990s, as the digitization of the industry accelerated, composing and reproduction merged into the pre-press process. One IT innovation that transformed the process was computer

to plate technology (CTP), which was introduced in the late-1990s. CTP uses a digitally controlled laser to transfer information onto printing plates, whereby the original information does not have to be transferred on repro film before being exposed on printing plates. Effects of the CTP technology were that the quality of the printed matter was improved and the number of individuals employed in the pre-press departments was reduced. CTP technology also dramatically reduced the time for processing the printing plates. The handling of printing plates, which previously was a part of the printing process, now became a part of the pre-press process.

THE DIGITIZATION OF THE PRINTING PROCESS

In the printing process plates received from the pre-press process are mounted in the printing press. Before digitization the printing supervisor manually made the necessary adjustments concerning the amounts of ink and colors to be used, before the printing activity started and the information was transferred to paper. In the early-1990s, IT gradually became embedded in printing presses as individual control systems that made the adjustments of the printing press more automated and centralized. Hereby the printing supervisor could control and manage the complete printing process via a screen in the control room and in the newspaper printing process. This led, among other things, to an increased use of color.

As the printing process became digitized, the cooperation between suppliers and graphic companies became more integrated. Cooperation is today quite common in projects where industry partners jointly identify both different areas for improvement and new niches. For example, representatives of different actors such as printing press, paper, and ink developers work together with printing and publishing companies in order to develop innovations that increase the printing and publishing companies' production capacity, lower the weight of newspaper supplements, and lower costs of printing paper. Another example of increased cooperation due to digitization of the printing process is between suppliers such as ink producers and developers of printing presses. If a printing press is developed, there is also a need to develop ink that will function properly in the specific press, a requirement that has contributed to increased quality control.

IT INNOVATION'S INFLUENCE ON CRITICAL PRODUCTION PROCESSES

The IT innovations that have been introduced in the graphic industry's processes have had several automational, informational, and transformational effects, for example, productivity improvements, increased capacity to handle and produce information, increased integration of customers in

the production process, increased physical quality, and options for management improvement.

Productivity, an automational effect, has increased as IT innovations have reduced the need for certain professions and operators and also made it possible to merge processes. Furthermore, production time has decreased, and in parallel with this production capacity has increased. In some cases it has tripled, while the costs in the most cost-intensive process, the printing process, have decreased because of more centralized control.

The capacity to handle and produce information has not only increased, but more or less exploded. For example, the physical storage capacity of digitized information is much greater than any analog-based archive. From the perspective that more information helps individuals to make better and more informed decisions, this is a positive informational effect. Not only does the amount of information increase, but the way it is packaged is also enriched when traditional text-based information is mixed with more colors and pictures. However, too much information can also be negative if the individual does not know how to relate to it; information overload is a familiar concept that may occur in this context. For the graphic industry, however, this is only positive, as increased capacity to handle and produce information means that the companies involved in the processes can handle an increasing demand from customers with different needs and requirements.

The integration of customers in the production processes may have several positive implications, as it brings opportunities to establish a continual dialogue during the production of the printed matter. This is a combined informational and transformational effect that in the end increases the chances that an external customer will find the quality of the printed matter delivered congruent to or even higher than expectations. For actors in the graphic industry process this may result in more satisfied customers, which in the end could increase the likelihood that customers will return when they have a need for additional printed matter. By keeping a continual dialogue it is also more likely that the actors in the process will gain continuous knowledge of the customer's wants and needs, information that is of fundamental importance when developing a business.

Increased physical quality of printed matter is an informational effect of IT innovations that has enabled higher resolution of text and pictures. Increasing the physical quality means that a customer will gain more information for the money spent, as it is easier to communicate the information to the human eye if the resolution of printed matter is higher. It also offers possibilities for the customer to adjust the level of quality, as the number of quality levels may be multiple. The highest quality is often the most expensive, and by choosing a lower physical quality the customer may still achieve printed matter that will communicate the information, but at a lower cost. For graphic companies the possibility of offering higher quality, sometimes combined with constant or lower prices, is a way to gain a competitive advantage. However, the negative side may be that the IT

innovation used to gain this advantage is often available to others in the business, which limits the competitive advantage in time and space.

Management and control of the activities in the processes in which a dominating part of the information is digitized requires some form of supportive information system. As the information gradually has been digitized, it has become easier for managers and those responsible to follow the production from idea to printed matter. For example, time-consuming activities like developing of film and plates have vanished, and for the actors involved this correlates to the profit of the business. A higher production tempo means a larger amount of printed matter produced. More printed matter produced means lower marginal costs, which in the end also may have positive influence on the total profit. With a more intense production tempo, there is a need for balance between time and acceptable quality levels, a balance that may be maintained if adequate management and control are practiced. To achieve this, an important tool is a supportive information system, based on relevant IT innovations and organizational adjustments.

The process changes and effects, such as increased capacity to handle and produce information, increased integration of customers in the production process, increased physical quality, and options for management improvement effects, which have been presented previously, can all be seen as internal evidence of transformation. But as IT innovations were introduced in the production processes, effects also occurred in the markets of the graphic industry.

IT INNOVATION'S INFLUENCE ON GRAPHIC INDUSTRY MARKETS

IT innovations have influenced the graphic industry's markets in numerous ways. This has resulted in several market push initiatives, such as increased differentiation of products, greater variety in quality, additional book stores, audio and e-books, digital print, print-on-demand, and information services. Digitization has enabled the burgeoning production of paperback books in different sizes and qualities. Paperback books are a relatively low-cost product that is easy to deliver and store and has been a way for publishers to gain entry into new market places such as gas stations and supermarkets. Digitization has also enabled production of information in other media. Audio books and e-books are examples of products that have opened up new markets for publishing companies. In the short run these types of products are an addition to traditional printed matter, but in the long run, as digitization develops, the markets for these products may exceed those for traditional printed books. Further market push initiatives are digital personalized print and print-on-demand services, additional technologies to complement offset printing. By adopting these technologies the graphic companies have broadened their product output. Digitization of information flows has also made

it possible for graphic companies to expand their offerings. Instead of solely delivering printed matter, they can today offer their customers information logistical solutions. Such services may include storing, processing, and publishing customer information in media other than printed matter.

The majority of market pull initiatives, such as online bookstores, niche magazines, and additional newspaper products, have only partly been influenced by IT innovations developed by the graphic industry. Of greater importance has been the increasing level of digitization of society at large. For example, e-commerce market places are a result of influence from general digitization. Online bookshops have made it possible for publishers to gain access to a market with greater geographical distribution than is offered by traditional bookshops. They have also contributed to increasing demand by offering customers low prices and a wide range of book titles. The Internet and the digitization of society have also increased the possibilities of obtaining information concerning an individual's specific interest. This has had a positive influence on the demand for magazines with specialized content. Newspaper companies have also been able to explore new markets. Digitization has made it possible to publish information produced at editorial offices in additional media, such as TV and the Internet.

The development and use of desktop innovations in society, combined with the development of the Internet, have also resulted in several market contractions. Today there is, for example, a very limited market for printed matter like envelopes, catalogues, manuals, and advertising papers, because consumers commonly print these types of products themselves. The encyclopedia market has also more or less vanished as search engines on the Internet have evolved. Within the graphic industry, desktop technology has also reduced the market for smaller printing presses.

IT INNOVATIONS AND INDUSTRIAL TRANSFORMATION

The influence from IT innovations on the graphic industry might finally be described as a development cycle (see Figure 11.1) that causes transformation pressure. New IT innovations (1) enable the development of new products and markets. (2) The products and markets that are successfully commercialized by existing actors also attract new actors to enter the market. Thus competition gradually increases, which results in an ongoing development of transformation pressure. (3) One way to handle this pressure has been to increase production capacity, an effort that accentuates the need for interconnected digitized information flows in the production processes. Graphic companies and their cooperating suppliers are thus encouraged to engage in continued innovation development, which (4) results in an ongoing introduction of new IT innovations (1) in all the activities in the production processes.

The gradually increasing transformation pressure, as described in Figure 11.1 is experienced by many companies in the industry as an increasingly competitive environment. In order to succeed in this environment,

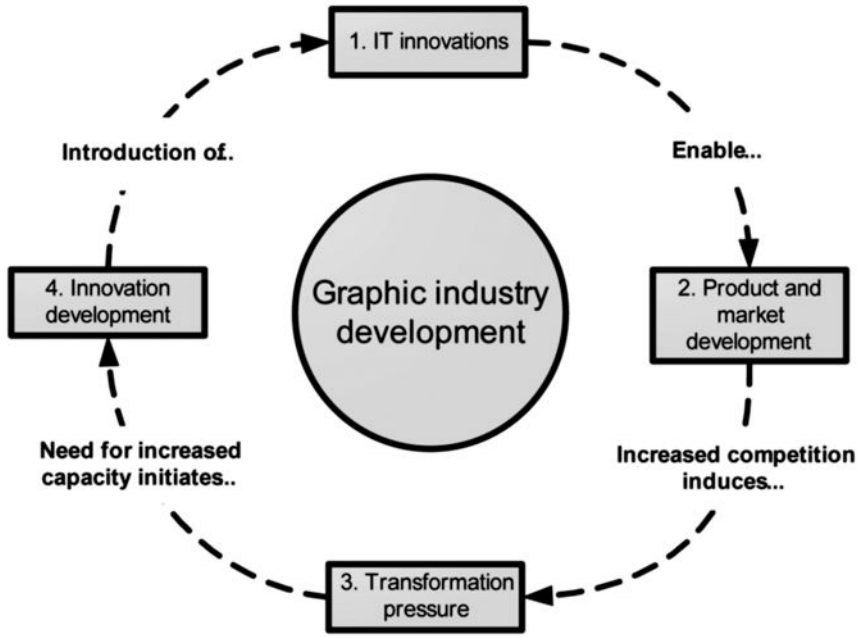

Figure 11.1 Influence from IT innovations described as a development cycle.

a dominating strategy among graphic companies has been low price/high quality offerings to their customers. Low price means less income per unit of printed matter sold, and companies have therefore been forced to adjust their production processes in order to balance their costs and revenues. One way to succeed in doing so is, as mentioned previously, to introduce IT innovations. These innovations enable companies, among other things, to increase their production speed and produce larger quantities during a shorter period of time and with fewer employees involved. Or, in other words, it enables them to increase their productivity in the production processes. However, this transformation pressure has culled victims, as graphic companies that did not have the financial resources necessary to take part of the innovation development have gone out of business. This has resulted in the existence of fewer and larger graphic companies compared to the period before digitization. Consequently, this has also affected the vendor business, which consists of fewer but larger companies today.

CONCLUSION

In the beginning of this chapter it was stated that IT might be defined as the single most important technology for the development of societies and industries. In the graphic industry IT innovations have enabled the transformation of critical production processes, which has resulted in productivity achievements

and quality improvements. In addition, integration of customers in the production processes is of great importance to any company that wants to develop its goods and/or services. Increased physical quality is something that may help a company to gain a competitive advantage over their competitors, no matter what type of business the company is engaged in. Improvements of management and control in the processes may also be of great importance, since these tend to influence the cost development of the business. Altogether these effects are of importance when developing existing and new markets.

Thus, it is possible to conclude that the graphic industry markets have also gone through numerous transformations. Traditionally, the output from the production process is printed matter. Printed matter can come in many shapes and forms, such as, for example, books, newspapers, or magazines. IT innovations and digitization of information flows have changed the graphic industry's markets by enabling the further development of these products. Digitization has made it possible to increase differentiation and also to offer customers a greater variety in quality. But digitization has also made it possible to develop new additional markets and distribution channels such as online bookstores. Gradually the industry also has come to develop alternatives to printed matter. The information that customers previously had access to only in printed form has become available via digital channels such as sound books, e-books, and newspaper sites on the Internet.

But digitization has not solely been an easy road to success. Over the years it has initiated several difficult challenges for the industry, for example when tacit knowledge was to be transformed into explicit knowledge. In the early days of digitization the skills in professions such as composers were to a high degree tacit, i.e. it was a competence that was not easily learned and it was transferred from one generation of composers to another in the social context of daily work. This made the position of this profession unique in the industry. A journalist was easy to replace, but the loss of a skilled composer could have severe effects on the quality of the printed matter produced. When desktop technology was introduced, the tacit knowledge of composers gradually became more and more explicit in just a couple of years. For example, it became quite convenient for the user of the desktop system to choose between different fonts and layouts. In the end this resulted in the evaporation of a corps of professionals that had had a dominating role in the graphic processes for centuries.

Altogether, the transformation of the industry has been characterized by what Schumpeter (1934) defines as creative destruction. Innovations enabling the creation of new markets have simultaneously contributed to the contraction of old ones, for example in the graphic industry through public access to desktop technology and the Internet. In the words of Schumpeter (1934) it has enabled new combinations and the competitive elimination of the old. Furthermore, it has also facilitated development of new goods or new quality of existing goods, new methods for production, opening of new markets, and reorganization of the industry.

But the transformation of the industry would not have been possible if it were not for the increasing overall digitization of society. The graphic industry has been dependent on the emerging digital environment that today is present in the developed parts of the world. Being digital is not enough, however. Increased standardization of IT innovations has, as shown in this chapter, led to intensified competition. These results point in the same direction as the findings of, for example, McAfee and Brynjolfsson (2007), who emphasize that the use of IT innovations has increased the competition in the U.S. economy.

So what is next? Is it possible for actors in the graphic industry, or other industries that are heavily influenced by IT, to sit back and enjoy the benefits that the IT innovations have delivered? The answer is no. Increasing competition, nourished by an ongoing development of IT innovations, means that the actors have to be even more creative when it comes to business development. Also, the pace in which transformation caused by digitization has occurred has been extraordinary compared to previous developments. Still, the digital journey of the graphic industry and society has probably only just begun. In the following decades the transformation will continue as new IT innovations are introduced. It is a journey that we all have to take part in, because whether we like it or not, the digital society is here to stay.

DISCUSSION QUESTIONS

Based upon this chapter:

1. What strategic values do you think the digitization of the graphic industry has generated?
2. Implementing an IT innovation in an organization is not an easy task. Several actors, internal as well as external, have to cooperate in order to succeed. What do you believe are the greatest challenges when implementing new IT innovations?
3. The outcome of digitization of businesses and organizations is often presented as positive, but, as in the case of the graphic industry, negative effects may also occur. What kind of negative effects do you think digitization of organizations can lead to?

NOTES

1. In some cases the graphic industry may be considered synonymous with the printing and publishing industry. There is, however, a difference here between these two expressions, as printing and publishing includes only some of the processes and activities necessary for transforming an idea into printed matter.

RECOMMENDED FURTHER READING

Chandler, A. D., & Cortada, J. W. (Eds.). (2000). *A nation transformed by information: How information has shaped the United States from colonial times to the present*. New York: Oxford university press.
Shapiro, C., & Varian, H. R. (1999). *Information rules*. Boston: Harvard Business School Press.
Standage, T. (1999). *The Victorian Internet*. New York: Berkley Publishing Group.

REFERENCES

Arthur, B. W. (1994). *Increasing returns and path dependence in the economy*. Ann Arbor: The University of Michigan Press.
Brynjolfsson, E., & Hitt, L. (2000). Beyond computation: Information technology, organizational transformation and business performance. *Journal of Economic Perspectives, 14*(4), 23–48.
Carlsson, B. (1995). *Technological systems and economic performance: The case of factory automation*. Dordrecht: Kluwer Academic Publishers.
Carlsson, B. (1997). *Technological systems and industrial dynamics*. Dordrecht: Kluwer Academic Publishers.
Carlsson, B., & Eliasson, G. (2003). Industrial dynamics and endogenous growth. *Industry and Innovation*, *10*(4), 435–455.
Christensen, C. M. (2000). *The innovators dilemma: When new technology causes great firms to fail*. New York: Harper Business.
Cöster, M. (2007). *The digital transformation of the Swedish graphic industry*. Linköping Studies in Science and Technology, Dissertation No. 1126, Linköping University, Sweden.
Dahmén, E. (1950). *Entreprenurial activity in Swedish industry in the period 1919–1939 Volume I and II (Svensk industriell företagarverksamhet-Kausalanalys av den industriella avvecklingen 1919–1939, band I och II)*. Stockholm: IUI.
Dahmén, E. (1980). *How to study industrial development (Hur studera industriell utveckling?)*. In E. Dahmén & G. Eliasson (Eds.), *Industrial development in Sweden—Theory and practice during a century* (*Industriell utveckling i Sverige—Teori och verklighet under ett sekel)*, pp. 8–33. Stockholm: IUI.
Dahmén, E. (1989). *Development blocks in industrial economics*. In B. Carlsson (Ed.), *Industrial dynamics, technological organizational, and structural changes in industries and firms* (pp. 109–122). Norwell, MA: Kluwer academic publishers.
Hadenius, S., & Weibull, L. (1997). *Mass media—press, radio & television in transformation* (*Massmedier—press radio & TV i förvandling)*. Stockholm: Bonnier Alba.
Jorgenson, D. W., & Stiroh, K. J. (2000). Raising the speed limit: U.S. economic growth in the information age. *OECD Economics Department*, Working Papers, 261.
Kipphan, H. (2001). *Handbook of printed media*. New York: Springer-Verlag.
Lucas, H. (1999). *Information technology and the productivity paradox*. New York: Oxford University Press.
McAffe, A., & Brynjolfsson, E. (2007). Dog eat dog. *MIT Sloan Management Review*. Accessed February 14, 2011, from http: //sloanreview.mit.edu
Mooney, G., Gurbaxani, V., & Kraemer, K. (1995). A process oriented framework for assessing the business value of information technology. *Center for Research*

on Information Technology and Organizations, Paper 161, University of California, Irvine.
Parkin, M. (2003). *Economics* (6th ed.). New York: Addison Wesley, Pearson Education.
Pindyck, R., & Rubinfeld, D. (2001). *Microeconomics* (5th ed.). Upper Saddle River, New Jersey: Prentice Hall.
Schumpeter, J. A. (1934). *The theory of economic development*. London: New Brunswick Transaction Publishers. (Work reprinted 1983)
Whelan, K. (2000). *Computers, obsolescence, and productivity*. Federal Reserve Board, Finance and Economics Discussion Series, 2000–6.
Yao, L. J., Liu C., & Chan, S. H. (2010). The influence of firm specific context on realizing information technology business value in manufacturing industry. *International Journal of Accounting Information Systems, 11*(4), 353–362.

12 The Do's and Don'ts of Digitization
IT and Organization in Health Care

Pontus Fryk

In the spring of 2004, the Stockholm County Council initiated a project called "Gemensam Vårddokumentation,"[1] abbreviated GVD. The goal was to limit the huge number of various information technology (IT) systems in the Stockholm area and to organize around common solutions regarding IT and health care. Among other things, this was expected to increase communication and collaboration between health care organizations, decrease costs, improve efficiency, and enhance quality and patient satisfaction. The project's budget was SEK 200 million (approximately $28 million), and it was to be completed in no more than 4 years.

Three years later, in 2007, the project was terminated due to poor results and increasing costs. According to the Swedish magazine *IT i vården*,[2] the project had reached a cost of over SEK 400 million (approximately $55 million), and the final cost and time for finishing the project according to the initial specifications was forecast to be SEK 1.6 billion (approximately $222 million) and 3 additional years (*IT i vården*, November 2, 2007).

Various reasons for this failure have been put forth. The overarching problem, however, is the very complex health care organization. First of all there are many key actors—e.g. economic forces, political entities, review institutions, patient interest groups—with assorted impact and agendas. On top of this there are difficulties such as the limited health care budget, legacy systems, and unwillingness to change among bureaucrats and practitioners. Moreover, the lack of standards and poor communication systems obscure matters further.

The Swedish situation is not unique. A special report on health care and technology in *The Economist* states that the US spends 16% of its GDP on health care, but huge problems still continue to haunt practitioners, academics, and society (*The Economist*, 2009). In the same article, it is concluded that if 90% of hospitals and physicians in the US would adopt digital health ITs—i.e. IT in health care processes—over the next 15 years, almost $80 billion could be saved per year due to increased efficiency.

This chapter is a synthesis of comprehensive case study work carried out over 5 years between 2005 and 2009. The research highlights a few aspects of digitization related to the issues mentioned previously. The arguments, reflections, and findings presented here are based on the comprehensive research put forth by Fryk (2009).

The present work tries to answer questions regarding possible benefits (do's) and disadvantages (don'ts) in connection to health care digitization: why digitization projects often fail, and critical conditions for positive digitization. Additionally the issues of different stages of IT maturity and various types of IT are scrutinized. And finally some reflections about the need for differentiated IT strategies depending on diverse development stages and organizational levels are presented.

HEALTH CARE IN THE DIGITAL ECONOMY

The modern world of business is often referred to as the "New Economy" or the "Digital Economy" (see e.g. Carlsson, 2004; Tapscott, 1996; Illing & Peitz, 2006). Here it is believed that organizations indeed exist in this digital economy and that it affects the organizational conditions. In health care, both the organizational and clinical prerequisites for delivering care are thought to be shaped by this development.

In the digital economy, digital data can be put together, processed, and stored in an almost unlimited number of new combinations. And because of the Internet, data can be communicated fast and to an almost unlimited number of people. These combinations together with the increased connectivity result in completely new conditions for economic activity (Carlsson, 2004).

Here it is assumed that innovation possibilities enabled by connectivity and new combinations are important reasons for the continuing strategic value of IT to organizations (Bannister & Remenyi, 2005; Raghupathi & Tan, 2002). Examples of this in health care are new forms of internal and external communication (e.g. video conferencing and e-mail); collaboration (e.g. geographically independent specialty consultation); trust networks (e.g. Internet based expert groups and health care at home); and many new products and services (e.g. IT based diagnosis and treatment, such as artificial intelligence [AI] decision support systems, and digital laparoscopy).

Consequently IT can result in improved, or entirely novel, products and services as well as increased productivity, enhanced quality, shorter patient waiting times, and improved cost efficiency. It is fundamental, though, to acknowledge that IT and organization are intertwined phenomena and that IT investments without the proper organizational adaptations and investments (both material and social) will most likely end up causing more pain than pleasure (see e.g. Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007).

RESEARCH APPROACH AND METHODOLOGY

The investigation presented here is carried out through examining the digitization of delimited processes in health care. After the definition and demarcation of the processes, they are studied through interviews, observations,

an expert group, shadowing, various documentation, data from information systems, secondary sources, and related research literature.

The view of process based research present in this work is well described by Pettigrew (1997) and Van de Ven and Poole (2005). The definition of a process used here can be summarized as "a sequence of individual and collective events, actions and activities unfolding over time in context" (Pettigrew, 1997, p. 338). A personal addition is that the "context" in this case includes both the internal and external contexts in the shape of, e.g., technology, political forces, professional cultures, identities and roles, and laws and regulations.

The processes are studied to enable a discussion about the research questions mentioned in the introduction. Therefore the digitization of the processes is of primary interest—by looking at the process transformations related to digitization, conclusions can be drawn about plausible do's and don'ts pertaining to both academics and practitioners.

The Case Study

The investigation consists of a qualitative case study primarily based on interviews and observations conducted at several health care organizations in the Stockholm metropolitan area between the years 2005–2009. The study is longitudinal and the process investigations starts at the genesis of digitization, some 30 years ago, and maps the key process transformations, and the affiliated digitization effects, until today.

In order to get a comprehensive description of health care digitization, three process categories are considered necessary: one *diagnostic*, one *administrative*, and one *clinical*. Whereas the diagnostic processes involve examination procedures, the administrative processes deal with things like patient information handling, and the clinical processes entail surgery and treatment. In choosing these key categories, most core areas within health care are covered.

The following three specific processes are suitable examples of this: *diagnostic projection radiography* (DPR), the *prescription* process, and *laparoscopic surgery of cysts on the ovaries* (LSCO). DPR is a diagnostic procedure, prescription handling is an administrative process, and LSCO is a clinical endeavor. These processes are generic in the sense that they exist at most medium- or large-sized hospitals in Sweden. Thus, they can be compared at several institutions in order to obtain generic process descriptions.

The case study is in line with recommendations presented by Yin (2003, 1999). He suggests that "case study methods are being rediscovered in health services research. Much of the contemporary need for case studies is driven by developments in managed care systems that link their multiple components in new ways, producing 'mega-systems' of great complexity" (1999, p. 1209). This type of "mega-system" is certainly recognized in the

present investigation of health care: The county councils strive towards unifying health care entities, with regard to both organization and IT, and try to stimulate various forms of collaboration. This results in a multitude of actors, IT systems, and cultures that have to be brought together, organized, and managed.

The Research Object(s)

The primary interests in this chapter are IT, organization, and organizational change. Health care costs amounts to just below 10% of the Swedish GDP, and this parameter is chosen as the empirical foundation because its organization and IT usage is believed to include most issues related to these phenomena. The sector is becoming increasingly digitized and, consequently, before-and-after studies are feasible.

The main empirical research object is Danderyd University Hospital (DUH). The hospital can be considered modern and fairly digitized—i.e. they have a comprehensive IT infrastructure consisting of digital systems for administration, clinical activities, and internal and external communication. DUH is large, at least by Swedish measures, and in 2009 they had approximately 3,150 employees, about 357,000 patient visits, roughly 42,000 treatment events, and a SEK 2.6 billion (approx. $364 million) net turnover. Although DUH has the organization of a corporation, all the shares are owned by the county council and the health care is ordered by the council's ordering authorities. Therefore, the patients do not experience any differences compared to ordinary public health care.

To be able to compare the results, and make generalizations, similar supplementary studies are also carried out at Gynekologkliniken[3] in cooperation with Capio S:t Görans Hospital, Löwenströmska Hospital, Märsta Närvård,[4] Stockholm County Council, and Apoteket Ormen (a pharmacy in Stockholm).

THE THREE PROCESSES

The studies paint a picture of the process of digitization from the first signs of digitization through today. By looking at the most important digitization milestones, and the fluctuating inputs and outputs to and from the processes during this time period, it is possible to draw conclusions about how digitization affects certain processes and the actors involved.

These highly simplified descriptions of the three processes, and their digitization, are put forth foremost so that the reader can get an idea of how the processes work and also of the course of events regarding digitization. The actual digitization-based process transformations are not portrayed in great detail per se. Instead the effects from the transformations are contemplated in the forthcoming sections.

Diagnostic Projection Radiography

Traditional radiology—e.g. the examination after breaking a leg while skiing—is habitually called diagnostic projection radiography (or x-ray examination), and it involves the use of x-rays that consist of electromagnetic radiation that enables the viewing of soft or hard tissues within the human body. The DPR process starts when a patient arrives at the DPR reception following referral by a physician, through "drop-in" services, or immediately from the emergency room. Patient information arrives through several channels at this point. The patient is directed to a waiting area or brought directly to the x-ray room. After the x-ray examination has been conducted the responsible physician inspects the images with regard to the coming treatment. Subsequently a preliminary answer is given to the patient and the images, along with the physician's opinion, are sent to another physician for a second opinion. Finally the concluding answer is sent to the referring entity.

Through the years the DPR process has become increasingly digitized. A large part of the patient information now enters the process by means of different administrative IT systems. In fact, throughout the process the information is almost entirely digitally handled. Both the photographic equipment and its affiliated machinery are digitized. In addition, the pictures, with the accompanying information, are stored in IT systems. The imaging methods have transformed radically because of the digitized images and the sophisticated viewing and editing software. As a result, fewer x-rays are taken today because of the increased image manipulation possibilities. Also, due to digitized imaging together with digital information and communication systems, second opinions are no longer dependent on time and geographical location.

The Prescription Process

The prescription process includes the activities from when a physician concludes that a patient needs some medicine to when the patient picks up the medicine at a pharmacy. The key actors are the prescribing physicians and nurses, the pharmacists/pharmacies, and the patients. The process usually starts when a patient arrives at the surgery as a result of a perceived medical problem. The physician examines the patient and considers possible diagnoses and treatments. When a suitable medicine is decided upon, the physician (or a nurse) writes a prescription. The patient goes to a pharmacy where the medicine is prepared and the proper instructions are given. Finally the medicine is dispensed.

Nowadays the reception staff can obtain digital patient information and give it to the physician in advance. The patient is also registered in the administrative IT system upon arrival. When the digital information and communication systems work, the patients' medical history, along

with various statistics, can be obtained. This recently adopted feature can increase health care quality due to better information and, in turn, treatment. In former times, a paper prescription was handed to the patient. Now prescriptions can be sent to a central electronic "mailbox" (server) that is reached by all pharmacies in Sweden. Thus, this part of the information handling process is totally digitized. Also, the actual dispensing of medicine at the pharmacy is significantly faster due to digitization and automation.

Laparoscopic Surgery of Cysts on the Ovaries

Laparoscopic surgery is part of the field called endoscopy, which entails looking inside the human body in a medical context. The procedure is also called keyhole surgery and it is primarily focused on surgical treatment within the abdomen and pelvic cavity. Laparoscopic surgery of cysts on the ovaries is an important and widespread treatment that removes cysts on the ovaries or renders them harmless. The LSCO process usually starts at a surgery when a physician suspects that there is something wrong and refers the patient to a suitable specialist (in this case at a gynecology department). During the first visit, the patient is examined, and if an unhealthy cyst is detected, the patient is scheduled for surgery at a later date. After some time the patient gets called back to the hospital or clinic for scheduled surgery. The surgery is performed, and the patient is rolled in to post-op.

The LSCO process has gone from totally analog to highly digitized during the last three decades. Patient information, and internal and external communication, is handled through administrative IT systems. Also, due to digital tools and machinery—such as advanced fiber optics and digital imaging techniques—this surgical operation procedure has changed radically. Today, patients usually do not need to stay at the department for more than a couple of hours. Then they are discharged and sent home. The ensuing time spent on sick leave has been shortened from around 4 weeks to 1, or 2 weeks at the most. The whole recovery process is faster because of the small incisions needed today, compared to large open wounds a few years back. This is possible as a result of the development of digitized surgical operation procedures. Moreover the general surgical precision has increased significantly, and the field of application has expanded.

DIGITIZATION AND CHANGE

Theory acknowledges that modern health care increasingly uses digital solutions that are changing the conditions for health care production with regard to, e.g. productivity, quality, and cost efficiency (see e.g. McNulty & Ferlie, 2002, 2004; Porter & Teisberg, 2006; Hatcher & Heetebry, 2004). The background is technological development, awareness of IT-related possibilities, and health care organizations' increasing IT maturity. This

investigation shows that IT can indeed help solve many problems in health care. It can facilitate enhanced productivity and cost efficiency, and it can also lead to better diagnoses and treatments.

Nevertheless many practitioners and researchers emphasize the need for an increased understanding of why many IT-related benefits have not yet materialized in health care. In fact, it is believed that health care has reached a degree of digitization where a number of organizational changes and improvements that do not yet exist could be expected. For instance, the involved actors talk about "paperless hospitals," "process orientation," and other IT-related benefits. Specifically, they underline the possibilities of, e.g. better access and shorter waiting times for patients, individually customized health care, increased number of qualitative treatment and diagnosis methods, increased productivity and quality, enhanced cost efficiency, improved information security and ensured patient integrity, better internal and external communication, and more collaboration opportunities among health care organizations. All this was supposed to happen as a result of IT implementations. Today, however, it is fairly obvious that hospitals are far from paperless, and many of the anticipated benefits have failed to be realized.

IT alone cannot be blamed for this situation. All IT implementations demand supplementary organizational investments in, e.g. supporting technology, reorganization, communication structures, and further training and education (see e.g. Dresner, 2008; Porter & Teisberg, 2006). Furthermore, the organizational conditions in health care are a bit peculiar. In the words of Mintzberg (1979), health care is a "professional bureaucracy," which means that the main actors in the organization are highly specialized and have strong work autonomy. This results in fragmented and diffuse decision power and leadership, and the practitioners often have to shoulder several different roles and identities—i.e. both clinical and administrative responsibility. This complicates IT implementations and organizational change, and it requires that the processes subjected to change, and the change agents, are well defined and visualized. Moreover, the management of health care requires insight into the organizational activities and benefits from process orientation with a focus on patient value.

Research in business economics has often been preoccupied with private sector studies, and the organizations examined are mostly commercial and product oriented. Health care (and especially public health care), though, is somewhat distinctive due to, e.g. its knowledge intensity, versatile service production, deeply rooted professional roles, restrictive budget, political forces, and complex performance management. Also, health care usually requires, simultaneously, both a bottom-up and a top-down perspective when it comes to management and organizational change. This is so mainly because of the high degree of professional specialization on lower organizational levels (e.g. regarding physicians), which can lead to resistance and friction if change efforts are not well rooted on all levels. For the same reasons, change initiatives often come from these lower levels, and this requires effective communication between top and bottom levels.

What is more, external political decision-makers who might be influenced by the prevailing political climate, in many regards, govern health care. They may have an agenda different from that of health care professionals and sometimes lack the proper understanding of health care necessary to make the best decisions for patients, personnel, and society.

Additionally, measuring results in health care alone is very complicated. Obviously it is hard to measure healthiness and quality. Consequently, in order to understand health care, and the system in which health care exists, one should think of the situation as a complex interplay between caregivers, care takers, organization, management, and IT. These actors come together in an intricate internal environment with different work cultures, and they also have to consider a fluctuating context.

Taken together, all the previously-mentioned characteristics and factors make health care a highly multifaceted organizational environment. However, the problems studied are not necessarily health care specific. Many of them exist in large multi-department ventures that involve advanced technology, extensive regulation, specialized professionals, complex cultures, and miscellaneous work tasks.

POSSIBLE DO'S AND DON'TS

Examining the digitization of the three processes presented in this chapter shows that many of the sought after benefits in the GVD project—the major IT venture mentioned in the introduction—actually have occurred in the cases studied. However the empirical findings also confirm the notion that digitization is associated with some risk. Table 12.1 is a compilation of the possible benefits (do's) and disadvantages (don'ts) found.

Even though, as Table 12.1 shows, there are both pros and cons with regard to digitization the importance, or impact, of the possible benefits by far exceed the potential disadvantages. According to the respondents, quality and cost reduction are most important. It is a matter of being able to cure as many patients as possible, in the best way, on a tight budget. And in this respect, digitization has contributed enormously. This is evident in all three processes investigated, and the bullet points can be used as a basis for discussion when considering similar implementations.

Just like the benefits, the disadvantages are not necessarily given. The important thing is to manage digitization in such a manner that they do not occur. Furthermore, the negative effects from digitization often exist only as the involved actors' prejudices or fears, and they do not have to occur. But, of course, sometimes they do, and when the preparatory and preventive work fails the concerned parties have to be prepared to manage them. In other words, it is crucial to have contingency plans to minimize negative effects. Thus, the best academics and practitioners can do is to be aware of the possible effects presented in Table 12.1 and consider them in connection with IT implementations.

Table 12.1 Examples of Important Possible Benefits and Disadvantages Due to Process Digitization

Potential benefits	*Potential disadvantages*
• **Enhanced administration, process flows, and patient logistics** in the shape of, e.g., shorter waiting queues, quicker treatment processes, and increased connectivity. • **New and improved methods for diagnosis, treatment, aftercare, and follow-up**, i.e. higher health care quality. • **Decreased geographical dependence**, which facilitates distance health care, collaboration between organizations, second opinions, specialist advice, and a flexible work force. • **Improved cooperation possibilities** between health care institutions, which increase health care quality regarding time, treatment, and security. • Generally **increased cost efficiency and productivity**. • **Improved working environment,** e.g. a better ergonomic situation, less bulky machinery, more light, and less noise. • **Shorter process and convalescence times.** This means that more patients can be managed per time unit without having to expand the workforce. This also leads to less time on sick leave for employers and employees. • **Environmental benefits** due to the discarding of hazardous former techniques, technology, and toxic waste. • **All information can be managed in one system**: e.g. patient journals, lab results, referrals, prescriptions, and x-ray images. This can increase efficiency immensely. • Sophisticated cipher coding and higher computer consciousness contributes to **patient information security**. • **Elaborate statistics possibilities.** This facilitates, e.g., follow-ups, feedback, research, and process optimization.	• Some involved actors are worried that health care becomes more sensitive to new kinds of undue infringement of personal integrity. But **nothing indicates that the** actual total **risk regarding patient information security is** in any way **heightened**. Indeed, most indications suggest that security is increased. • As health care becomes more accessible and transparent, the **demands from patients on health care increase**. Sometimes this leaves both parties unsatisfied. • The increased collaborations between health care organizations cause a high **dependence on widespread standards, nomenclatures, and similar work processes.** This can add stress, administrative work, and costs. • The digitization brings about **high computer dependence**. All involved parties have to rely on a working network, and when computers are down many health care processes are affected negatively. Subsequently, this can lead to negative stress and inefficient personnel. • **Computer experience varies** a lot from division to division, and poor computer skills can add frustration and negative stress among personnel. • The **administration, maintenance, and management** of digitization require many working hours and **are expensive**. • The extensive use of computers, in many cases, has led to **superfluous documentation**. Because of this, many health care organizations experience information overflow, which tends to generate inefficiency. • **Work environmental aspects.** Less bodily movement, less face-to-face contact with coworkers, and growing gaps between professional categories. • In the beginning of every IT implementation the work is slowed down and **a lot of energy is devoted to learning**.

Furthermore, digitization has been going on for decades now, but still many IT projects fail (see e.g. Markus, 2004; Standish Group, 1994; Dedrick, Gurbaxani, & Kraemer, 2003). Just as in the GVD example, budget and time are often too optimistically forecasted. And the functionality of the outcome is often not concordant with the initial specification of requirements. The explanations for why digitization projects fail are

numerous. Many of them are project specific but some fairly generic ones are detected in the present research.

Moreover, by detecting, structuring, and analyzing the effects of digitization, several conclusions can be drawn concerning possible actions that might smooth the progress of development, implementation, and adoption. Except for counteracting the general reasons for failure mentioned previously, the following suggestions are perceived as feasible solutions to the complex of problems identified in health care. Some of the main reasons for failure and important adoption related success factors are presented in Table 12.2.

Table 12.2 Examples of Important Reasons for Failure and Critical Success Factors

Common reasons for IT project failures	*Critical success factors*
• **Inadequate forecasts of work, time, and budget.** • **Unclear initial specification of requirements.** • **The return on investment (ROI) from digitization is complex.** The benefits usually occur after some time, and they are hard to isolate and identify. • **The ROI and performance measurement techniques at hand are poor** as regards concrete effects, and even worse concerning intangible ones. • **Deficient mixture of people in the project.** All key actors should be represented. • The "IT people" have **insufficient knowledge** of the target organization and its activities, and the "target organization people" have patchy knowledge of IT and implementation projects. • **Resistance to change among practitioners.** • **Territorial thinking.** No one wants to change their way of working and let go of the systems they have learned. • **Legacy systems.** Existing technology, and the monetary and non-financial investments already made, can hinder new investment in digitization. • **Fear of poor information security** among producers and/or customers. • **General distrust in technology** among producers and/or customers. • **Fear of the undermining of professional status** and decreased demand in the labor market among practitioners.	• **Education and information.** This is necessary so that medical professionals understand the possible benefits and how to implement and utilize the systems. • **User-based development.** The users have to be involved during IT development, so that the systems have the functionality that medical professionals request. • **Common standards and nomenclatures.** This is essential for making the transferring, collecting, processing, and storing of digital information possible. • **Performance measurement.** The work with development of new and improved methods for measuring health care activities has to continue and be intensified. • **Politically enabled alignment.** Regardless of whether the drivers of IT development are central political decisions or monetary based business incentives, a politically enabled alignment of systems and procedures would facilitate the adoption process. • **Agreements on the legal framework.** The laws and regulations affecting health care and the development of IT-based systems and components have to be investigated and agreed upon, maybe even altered. Right now, there is some confusion regarding their actual application. • **Ensured information security.** The work with enhancing information security has to continue, e.g. through improved encrypted coding and organized supervision. In addition, the actually quite high security has to be communicated to patients and other parties involved.

The left and right sides in Table 12.2 are not directly correlated. However, considering the possible success factors in connection with IT implementation can prevent some of the causes of failure. The bullet points are a result from these studies of the digitization of three specific processes in Swedish health care, but they probably also apply to other similar organizations characterized by complex structures, high specialization, and the need for differentiated IT functionality.

THE DEGREE OF DIGITIZATION AND THE DECONSTRUCTION OF IT

The results suggest that it can be fruitful—for both academics and practitioners—to conceptually divide the digitization process, or level of IT maturity, into periods of *digitization*, *consolidation*, and *optimization*. Although the relative starting points of these digitization stages are fluent, they occur in that chronological order. Here digitization means either the development, diffusion, and utilization of IT or the process of data, information, and knowledge being transformed from analog to digital. Consolidation involves either making existing IT systems compatible—in the sense that the various systems can communicate with each other and produce coherent and desirable data and information—and in line with the vision of the organization, or investing in IT that meets these requirements. Optimization is about refining the IT systems portfolio to achieve optimal functionality on all levels of the organization, and to align all outputs from the IT systems to the strategies and visions of the organization.

Moreover, this digitization–consolidation–optimization process is partly cyclical or iterative. This means that different parts of the organization may have reached diverse degrees of digitization and may have implemented various kinds of IT. Additionally, all organizations operate in a multifaceted context that also has reached various stages of digitization and includes different types of IT. This affects the conditions—and, thus, the possible do's and don'ts—for a certain organizational entity's digitization because the unit undergoing digitization, consolidation, or optimization—or several of the developments simultaneously—can either be helped or impeded by the surrounding level of digitization.

The health care organizations that are investigated in the present work can be placed in the overlapping area between consolidation and optimization. This means that digitization has been going on for some time now and most health care organizations are fairly digitized. So the present efforts are primarily focused on consolidating the numerous IT systems in order to obtain a compatible IT infrastructure and to be able to register and generate sought after data and information. When a consolidated IT systems portfolio is in place, the next endeavor is to optimize the data and information generation so as to support a process-based organization and to increase health care performance. Meanwhile, the digitization process continues in parallel. This

implies that in the coming years, health care organizations will be increasingly occupied with optimization and modification of existing digital systems. Hence, information handling—i.e. what can be done with information per se—will be the most important task instead of pure digitization efforts.

Another intriguing finding is that there is no single and almighty IT. Instead, the concept should be broken down into sub-categories depending on the specific context. Otherwise it might be unclear how to justify IT investments, and implementation procedures can be smoothened by considering which kind of IT is involved. For instance, in health care, IT should at least be divided into "administrative," "embedded," and "clinical" IT. Administrative IT entails systems for handling patient information such as referrals, scheduling, and patient records. Embedded IT involves digital components in tools and machinery, and clinical IT involves aids for, e.g. diagnosis and treatment.

These ITs support different activities that demand various functionality, and different actors are involved. Therefore it can be rewarding to handle the funding of these ITs through separate accounts, just as other organizational investments charge a variety of accounts. This does not only apply to the financial aspects of the investments. The ITs often need to be treated differently regarding organizational matters such as further education, supplementary investments in technology, and evaluation. An example of why investments in IT in health care should be handled separately is that health care has been in the forefront of high tech IT development for a long time, but at the same time the actors involved are extremely skeptical to other fields of application. For instance, clinical and embedded IT is highly advanced and popular among practitioners, while administrative IT often is frowned upon, and its functionality is frequently rudimentary.

These types of IT can be broken down further. One way to do this is by dividing administrative IT into "internal" and "external"; embedded IT into "general purpose" and "innovational"; and clinical IT into "diagnostic," "treatment," and "follow-up." Also, there can be several other types of ITs in health care. These are just the ones detected during the present work. However, the distinctions can help when identifying IT related needs, motivating IT spending, and discussing opportunities and problems associated with IT.

Thus, it is important to consider which types of IT are involved in the activities at hand. This is so because if the entire IT composition is seen as one simple entity, and digitization investments are carelessly lumped together, the risk of unwanted results and unfulfilled anticipations is impending.

IT STRATEGY DIFFERENTIATION

All the points made this far boil down to the fact that organizations should have different IT strategies—hence, different do's and don'ts apply—depending on the various degrees of IT maturity and the specific IT compositions.

Moreover it is vital to consider the context regarding, e.g. competition; culture; political climate; laws, regulations, and policy systems; and other factors that might impact the shaping of the IT strategies.

In addition to this IT strategy differentiation on a horizontal level, it is often useful for organizational systems to have separate IT strategies for the various vertical organizational levels such as the department, organization, company group, and industry level. For instance, different departments usually have different IT needs, and the appropriate IT functionality is probably not the same on the organization and company group levels.

Consequently, this research suggests that the previously common way of handling IT as one single artifact and applying one IT strategy for the entire organizational system is obsolete. It is also one significant explanation of why digitization endeavors like the GVD project often fail. And considering the maturity of IT, the composition of ITs, and the context at the various horizontal and vertical levels in the organizational system in the strategies development process can increase the chances of successful digitization.

One final remark here is that the IT strategies should be tailored in line with organizations' visions and goals; be transparent, communicated, and understood throughout the organizations; support sustainability; and make sense to all key actors. This is essential. And while they might seem obvious, many organizations overlook these aspects.

SUMMARY AND FINAL REMARKS

This chapter started out with the GVD example. This was done because the project is considered a fruitful point of departure for discussing some do's and don'ts of digitization, and unraveling a few of the mechanisms that affect the intertwined fabric of organization and IT and its outcome in the shape of potential digitization effects.

In order to understand IT, organization, and organizational change, the phenomena have to be recognized as intermingled. Thus, academics and practitioners should not ponder any of them in isolation. On top of this, the health care system is constituted by a complex interplay between caregivers, care takers, organization, management, and IT. These actors come together in a multifaceted environment with different work cultures. Also, the system exists in a context made up of, e.g. the societal economy, technology, political forces, and laws and regulations.

These preconditions constitute a situation where digitization can lead to important benefits such as enhanced cost efficiency, productivity, and quality. However, the actors involved should be aware of the possible disadvantages, or challenges, from digitization such as computer dependence; varying IT maturity among practitioners; and transition periods during implementations. If such phenomena are considered beforehand it is easier to manage potential problems if they arise.

As shown previously, there are many reasons why digitization projects fail: for instance, resistance to change; territorial thinking; general distrust in technology; inadequate estimations of work, time, and budget; and unclear initial specification of requirements. These problems can be counteracted by, e.g. user-based development, education and information, common standards and nomenclatures, performance measurement, politically enabled alignment, agreements on the legal framework, and ensured information security. In connection to this it is also important to realize that the degree of digitization determines the conditions for utilization of IT. For instance, the present work shows that health care digitization should at least be divided into periods of "digitization," "consolidation," and "optimization."

Finally, the IT artifact should be contextualized and broken down into sub-types depending on the specific situation. For instance, this research shows that in health care, at a minimum, IT should be divided into "administrative," "embedded," and "clinical." The most important result of this is that IT strategies should be developed considering both IT maturity and the composition of ITs, as well as the context at the various horizontal and vertical levels in the organizational system at hand.

DISCUSSION QUESTIONS

Based upon this chapter:

1. Why are not all anticipated benefits from digitization realized, and how can this be attended to?
2. How can the concept of degree of digitization be broken down, rebuilt, and categorized to represent generic modern conditions?
3. How can the IT artifact be broken down, rebuilt, and conceptualized in the shape of a new taxonomy or typology of ITs in order to represent generic modern conditions?
4. What aspects are important when developing organizations' IT strategies, and why?

NOTES

1. "Common health care documentation," in Swedish.
2. "IT in health care," in Swedish.
3. "The Gynecology Clinic," in Swedish.
4. A health care center situated approximately 25 miles north of Stockholm.

RECOMMENDED FURTHER READING

Carlsson, B. (2004). The digital economy: What is new and what is not? *Structural Change and Economic Dynamics*, *15*(4), 245–264.

Dresner, H. (2008). *The performance management revolution: Business results through insight and action*. Hoboken, New Jersey: John Wiley & Sons, Inc.
McNulty, T., & Ferlie, E. (2002). *Reengineering health care: The complexities of organizational transformation*. Oxford: Oxford University Press.
Porter, M. E., & Teisberg, E. O. (2006). *Redefining health care*. Cambridge: Harvard Business School Press.
Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science*, *18*(5), 749–762.

REFERENCES

A special report on health care and technology. (2009, April 16). *The Economist*.
Bannister, F., & Remenyi, D. (2005). Why IT continues to matter: Reflections on the strategic value of IT. *The Electronic Journal Information Systems Evaluation*, *8*(3), 159–168.
Carlsson, B. (2004). The digital economy: What is new and what is not? *Structural Change and Economic Dynamics*, *15*(4), 245–264.
Dedrick, J., Gurbaxani, V., & Kraemer, K. L. (2003). Information technology and economic performance: A critical review of the empirical evidence. *ACM Computing Surveys*, *35*(1), 1–28.
Dresner, H. (2008). *The performance management revolution: Business results through insight and action*. Hoboken, New Jersey: John Wiley & Sons Inc.
Fryk, P. (2009). *Modern perspectives on the digital economy: With insights from the health care sector*. Doctoral Thesis No. 145, Department of Business Studies, Uppsala University, Sweden.
GVD: Landstingets Miljardfiasko (GVD: The County Council's Billion Fiasco, in Swedish). (2007, November 2). *IT i vården* ("IT in Health Care," in Swedish).
Hatcher, M., & Heetebry, I. (2004). Information technology in the future of health care. *Journal of Medical Systems*, *28*(6), 673–688.
Illing, G., & Peitz, M. (2006). *Industrial organization and the digital economy*. Cambridge: MIT Press.
Markus, M. L. (2004). Technochange management: Using IT to drive organizational change. *Journal of Information Technology (Palgrave Macmillan)*, *19*(1), 4–20.
McNulty, T., & Ferlie, E. (2002). *Reengineering health care: The complexities of organizational transformation*. Oxford: Oxford University Press.
McNulty, T., & Ferlie, E. (2004). Process transformation: Limitations to radical organizational change within public service organizations. *Organization Studies*, *25*(8), 1389–1412.
Mintzberg, H. (1979). *The structuring of organizations: A synthesis of the research*. Englewood Cliffs, New Jersey: Prentice-Hall.
Pettigrew, A. M. (1997). What is a processual analysis? *Scandinavian Journal of Management*, *13*(4), 337–348.
Porter, M. E., & Teisberg, E. O. (2006). *Redefining health care*. Cambridge: Harvard Business School Press.
Raghupathi, W., & Tan, T. (2002). Strategic IT applications in health care. *Communications of the ACM*, *45*(12), 56–61.
Standish Group. (1994). *The chaos report*. Yarmouth Port: The Standish Group International Inc.
Tapscott, D. (1996). *The digital economy: Promise and peril in the age of networked intelligence*. New York: McGraw-Hill.

Van De Ven, A. H., & Poole, M. S. (2005). Alternative approaches for studying organizational change. *Organization Studies*, *26*(9), 1377–1404.

Yin, R. K. (1999). Enhancing the quality of case studies in health services research. *Health Services Research (HSR)*, *34*(5), 1209–1224.

Yin, R. K. (2003). *Case study research—Design and* methods (3rd ed.). Thousand Oaks: SAGE Publications.

Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science*, *18*(5), 749–762.

13 Technology Acceptance Research
Reflections on the Use of a Theory

Christina Keller

Acquiring IT to support organizational needs is a crucial prerequisite to exploit its potential. Unfortunately, the acquisition of appropriate information systems is a necessary but not sufficient condition for utilizing IT effectively (Agarwal, 2000). Individual users can exhibit a variety of behaviors when confronted with a new information technology:

> *They may completely reject it and engage in sabotage or active resistance, they may only partially utilize its functionality, or they may wholeheartedly embrace the technology and the opportunities it offers.* (Agarwal, 2000, p. 86)

Thus, the problem of individual acceptance of information technology is crucial for managers and implementers, such as information systems developers and project managers. To predict and explain user acceptance, it is necessary to understand why people accept or reject the information system (Davis, 1989). Technology acceptance theories, particularly the Technology Acceptance Model (TAM), are considered the most influential and commonly applied theories for describing individual user acceptance of information systems (Lee, Kozar, & Larsen, 2003).

TAM assumes that an individual's acceptance of an information system is a necessary predecessor of actual use of the information systems, and that acceptance is determined by two major factors: *perceived usefulness* and *perceived ease of use*. Despite being one of the most widely applied theories in information systems research since its introduction in 1989, TAM has been a target of criticism as being too simplistic, not taking the user's organizational contexts in account, and avoiding controversial issues by concentrating too much on the individual user's self-reported perceptions. To refute the criticism, a number of extensions of TAM have been developed and tested, the most influential being Unified Theory of Acceptance and Use of Technology (UTAUT), which was presented in 2003, introducing the core constructs of *performance expectancy*, *effort expectancy*, *social influence*, and *facilitating condition*s as influencing factors of user acceptance.

This chapter deals with how technology acceptance models are applied in information systems research. First, the origins of the two prevalent technology acceptance models, TAM and UTAUT, are presented. Second, the use of technology acceptance models is exemplified by a case study in the area of online learning in higher education. Finally, reflections and implications for research and practice on the use of technology acceptance models are put forward.

TECHNOLOGY ACCEPTANCE MODEL (TAM)

The information systems research stream of technology acceptance originally emanates from theories of social psychology, among them Theory of Reasoned Action (Fishbein & Ajzen, 1975), and Theory of Planned Behavior (Ajzen, 1991). TAM is based on the fundamental idea of these theories: the role of intention as a predictor of behavior (for example use of an information technology). TAM assumes that an individual's acceptance of an information system is determined by two major factors or variables: *perceived usefulness* and *perceived ease of use*. Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). Perceived usefulness is, according to empirical studies, the stronger of the two determinants and influences the behavioral intention to use an information system directly. Perceived ease of use primarily influences the behavioral intention to use an information system via perceived usefulness, but also has a more limited direct influence on behavioral intention (see Figure 13.1). The dependent variables of technology acceptance models are *the behavioral intention* to use an information system and *the actual use*. There are studies defining acceptance as "the behavioral intention to use an information technology," studies defining acceptance as "the actual use of an information technology," and studies measuring both behavioral intention and actual use. Bearing on Theory of Planned Behavior (Ajzen, 1991), behavioral intention should have a direct influence on performance when the behavior is voluntary. Even when behavior is not voluntary, as may be the case in most professional settings, intentions are still regarded as key considerations (Hardgrave & Johnson, 2003) as "indications of how hard people are willing to try, of how much effort they are planning to exert, in order to perform the behavior" (Ajzen, 1991, p. 181). Thus, when the use of information technology is optional, the actual use often constitutes the dependent variable of the study. In research settings where the use of the information technology is mandatory, the behavioral intention is measured as the dependent variable (Hardgrave & Johnson, 2003).

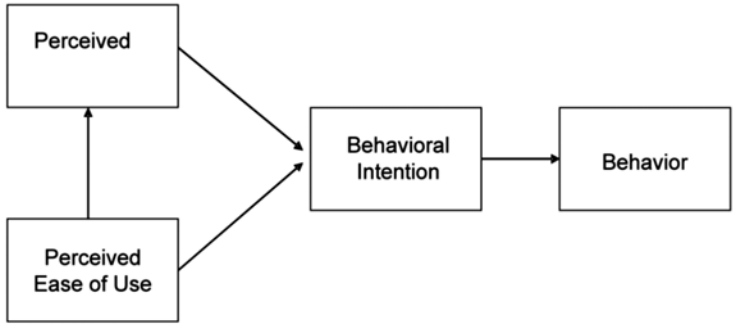

Figure 13.1 The original research model of Technology Acceptance Model (TAM; Davis, 1989).

TAM has been widely applied to a variety of information technologies and users. King and He (2006) performed a statistical meta-analysis of TAM, using 88 studies published during 1998–2003. The results showed TAM to be a valid model as the core constructs of perceived usefulness and behavioral intention were found to be highly reliable, and the influence of perceived ease of use via perceived usefulness was confirmed. Though generally strong, the statistical correlations of TAM varied among the studies of the meta-analysis. This variation was due to moderating factors outside the model, for example the experience level of users. With time, TAM has been extended to include more core concepts than perceived usefulness and perceived ease of use (see e.g. Compeau & Higgins, 1995; Venkatesh & Davis, 2000). However, the most elaborate and scientifically established extension of TAM is Unified Theory of Acceptance and Use of Technology (UTAUT), which will be described in the next section of the chapter.

UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)

Building on eight user-acceptance models having their roots in information systems, psychology, and sociology, Venkatesh, Morris, Davis, and Davis (2003) developed an extended technology acceptance model: Unified Theory of Acceptance and Use of Technology (UTAUT). The eight models used in the development process were Theory of Reasoned Action, TAM, Motivational Model, Theory of Planned Behavior (TPB), Combined TAM and TPB, Model of PC-Utilization, Innovation Diffusion Theory, and Social Cognitive Theory. When tested empirically by Venkatesh et al. (2003) in two organizations, UTAUT was found to explain 70% of the variance of intentions to use and actual usage of information systems. This is an improvement, compared to the explanation of variance accomplished

by the original user acceptance models, of between 17% and 53%. The four core constructs of UTAUT are *performance expectancy*, *effort expectancy*, *social influence*, and *facilitating conditions*. Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance: Is the system generally useful? Does the system enable the user to accomplish tasks more quickly or with higher quality? Effort expectancy is defined as the degree of ease associated with the use of the system: Is the interaction with the system clear and understandable? Is it easy to learn to operate the system? Social influence is the degree to which an individual perceives that important others believe that he or she should use the system: Do colleagues and/or friends want me to use the system? Will system use increase my social status? Facilitating conditions is defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system: Are there people available to help me to use the system? Is the system compatible with other systems? Performance expectancy, effort expectancy, social influence, and facilitating conditions are independent variables influencing the dependent variables of behavioral intention and usage. Gender, age, experience, and voluntariness of system use have an indirect influence on the dependent variables via the four core constructs. The relationships between the variables of the model are depicted in Figure 13.2.

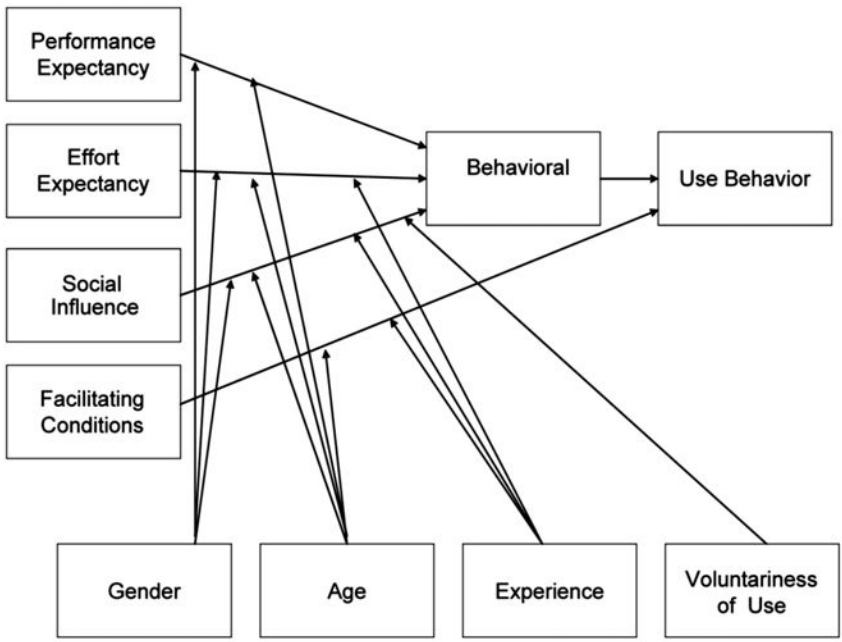

Figure 13.2 Research model of Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003).

Performance expectancy is, based on empirical studies, the strongest determinant in both voluntary and mandatory settings. It is dependent on gender and age in the sense that it is a stronger determinant for men and particularly younger men. Effort expectancy influences the behavioral intention to use information systems. The influence of the variable is dependent on gender, age, and experience of computer usage. The influence of the variable is stronger for women, particularly younger women in early stages of experience. According to Venkatesh et al. (2003), social influence is only a significant determinant of usage behavior if usage is mandatory. It also appears to lose its importance as a determining factor over time, as the information system becomes incorporated in the organization. The influence of the variable will be moderated by gender, age, voluntariness, and experience. The effect of the variable is stronger for women, particularly older women in mandatory settings and in early stages of experience. Facilitating conditions were only found to exert influence on usage, not on intention. The influence was moderated by age and experience in the sense that it was stronger for older workers with less experience of computer usage (Venkatesh et al., 2003).

Since its introduction in 2003, UTAUT has been applied to technology acceptance studies in a variety of fields, for example electronic commerce, mobile services, online learning, and healthcare. The next section of the chapter presents an example of a technology acceptance study focusing online learning, i.e. the use of virtual learning environments in higher education.

A COMPARATIVE CASE STUDY OF USER ACCEPTANCE OF VIRTUAL LEARNING ENVIRONMENTS

Previous Technology Acceptance Research on Virtual Learning Environments

Virtual learning environments (VLEs) are defined as "computer-based environments that are relatively open systems, allowing interactions and encounters with other participants and providing access to a wide range of resources" (Wilson, 1996, p. 8). Another word for denoting this kind of information systems is Learning Management System (LMS). Virtual learning environments are used at universities worldwide under brand names like WebCT, Blackboard, Moodle, etc. A number of research studies have used TAM in its original or extended version to explore students' acceptance of virtual learning environments (Selim, 2003; Ong, Lai, & Wang, 2004; Drennan, Kennedy, & Pisarki, 2005; Saadé & Bahli, 2005; Ngai, Poon, & Chan, 2007). Selim (2003), in a study of students' acceptance of course websites, found that perceived usefulness and perceived ease of use proved to be key determinants of the acceptance and usage of the websites, as the two constructs accounted for 83% of the variance in acceptance and

usage. The profound importance of perceived usefulness and perceived ease of use to influence students' acceptance positively is also confirmed by Ong et al. (2004), Drennan et al. (2005), and Saadé and Bahli (2005). Ong et al. (2004) also state that perceived ease of use has a positive influence on acceptance via perceived usefulness. Thus, perceiving the virtual learning environment as easy to use would contribute to perceptions of usefulness in its own right. However, additional core constructs of technology acceptance were introduced in the studies: *perceived credibility* and *cognitive absorption*. Perceived credibility is defined as "the degree to which a person believed that using a particular system would be free of privacy and security threats" (Ong et al. 2004, p. 797) and was found to influence acceptance positively. Cognitive absorption is defined as "a state of deep involvement" (Saadé & Bahli 2005, p. 320) in the task being accomplished. Cognitive absorption was found to influence perceived usefulness and perceived ease of use positively, but had no direct relationship to acceptance of virtual learning environments. Furthermore, Ngai et al. (2007) propose that the perception of having access to technical support influences perceived ease of use and perceived usefulness positively.

Consequently, TAM studies on acceptance of virtual learning environments show the importance of perceived usefulness and perceived ease of use. But complementary core constructs that influence acceptance, such as perceived credibility, cognitive absorption, and technical support, were also significant. The extensions of TAM in virtual learning environments research could be interpreted as a sign of the original model being insufficient in explaining all aspects of acceptance. Legris, Ingham, and Collerette (2003), in a critical review and meta-analysis of the technology acceptance model concluded:

> *TAM is a useful model, but has to be integrated into a broader one, which would include variables related to both human and social change processes, and to the adoption of the innovation model.* (p. 191)

To answer the call for a more comprehensive research model, UTAUT was applied the case study instead of TAM.

The case study: Acceptance of virtual learning environments at three Northern European universities

The research setting of the study was public health master education at three case universities: Nordic School of Public Health, Sweden (NS), University of Tromsö, Norway (UT), and Kaunas University of Medicine, Lithuania (KMU). The data collection was performed from 2004 until 2007, by interviews with key persons of the implementation process, for example, deans, project managers, and teachers. The interviewees were asked to describe the implementation process in order to examine decision-making and other

significant contextual factors such as structure and organizational culture. The interview also focused on the general level of acceptance of the virtual learning environment at the university, as well as the more specific core constructs of UTAUT, which were operationalized into the following interview questions:

- Performance expectancy: What advantages has the virtual learning environment (VLE) brought to the education? Has using the VLE increased possibilities of communication with colleagues? Has using the VLE increased possibilities of communication with students?
- Effort expectancy: Do you find the VLE easy to use? Is your communication with the VLE clear and understandable? Is the VLE generally considered to be easy to learn among staff and students?
- Social influence: Do the university board and management support the use of the VLE? Does staff in general support the use of the VLE? Is there resistance among staff towards the use of the VLE? Is it more prestigious for staff to use the VLE than not to use it?
- Facilitating conditions: Is there a technical infrastructure supporting the use of the VLE? Are there resources available for pedagogical and technical support? Are there resources available for staff and students to learn to use the system? Are there specific persons or groups available for assistance when problems occur using the VLE?

A total of 105 students in the public health master programs of the three universities responded to a survey questionnaire, capturing the four core constructs of UTAUT. The questionnaire items are presented in Table 13.1. Both the interview questions and questionnaire items were phrased by adapting the original items used in estimating UTAUT (see Venkatesh et al., 2003) to a research setting of online learning. The students were also able to state their opinions about advantages and disadvantages in two open survey questions.

At all three universities, the decisions to implement virtual learning environments were based on strategic considerations of the university management. At NS and UT, the decisions were made in order to increase the number of students by creating opportunities for online distance education. At KMU, the decision was made in order to allow the university opportunities to develop teaching and cooperation with other universities. The environment surrounding higher education had been turbulent in all three countries, but for different reasons. NS had experienced a drastic increase in competition from Swedish universities offering public health education. At UT, a new 2-year master program in public health was developed to comply with the Bologna agreement. Finally, in Lithuania the economic and social transition during the early-2000s affected all levels of society, including higher education.

In Table 13.2, the findings of the interviews and survey questionnaires on the core constructs of UTAUT are summarized.

Table 13.1 Students' Survey Questionnaire Items Measuring the Core Constructs of UTAUT

Core Construct	*Statement*
Performance expectancy	I find the virtual learning environment (VLE) useful in my education. Using the VLE improves my educational performance. Using the VLE increases the possibilities of communication with other students. Using the VLE increases the possibilities of communication with teachers/tutors. Using the VLE fits my style of learning and studying.
Effort expectancy	I find the VLE easy to use. Using the VLE is never frustrating. It was easy to learn and understand the VLE. My interaction with the VLE is clear and understandable. I can get the VLE to do what I want it to do without effort. It is easy to remember how to perform tasks in the VLE. To use the VLE does not require a lot of mental effort.
Social influence	Teachers/tutors encourage my use of the VLE. Other students encourage my use of the VLE. The university in general has supported the use of the VLE. Using the VLE improves my prestige among teachers/tutors. Using the VLE enhances my prestige among other students.
Facilitating conditions	I have the knowledge necessary to use the VLE. The VLE is compatible with other application programs that I use. A specific person or group is available for support when problems occur.

Table 13.2 A Synthesis of the Cross-Case Analysis

Core constructs	*NS*	*UT*	*KMU*
Performance expectancy	Low (staff and students)	Medium (staff) High (students)	High (staff and students)
Effort expectancy	High (staff) Low (students)	High (staff and students)	Low (staff) High (students)
Social influence	Low (staff and students)	Medium (staff and students)	High (staff and students)
Facilitating conditions	High (staff) Medium (students)	Very high (staff) Medium (students)	Medium (staff) High (students)

The degree of acceptance of the virtual learning environments varied among academic staff and students at the three universities. It was generally low at NS, medium at UT, and high at KMU. At NS, the advantages of the virtual learning environment were not yet discernable. At UT, the virtual learning environment was perceived as being a good way of delivering information to students. At KMU, the virtual learning environment was perceived to be highly useful in education and collaboration with other universities, although the perceived degrees of effort expectancy and facilitating conditions were relatively low. On the other hand, the perceived degrees of performance expectancy and social influence were high. At the NS and UT, the perceived degrees of effort expectancy and facilitating conditions were high, but did not seem to contribute in creating a generally high level of acceptance among staff and students. These findings raised questions about the importance of effort expectancy and facilitating conditions as "creators of acceptance." Are they less powerful than performance expectancy and social influence?

The high correspondence of degree of social influence between academic staff and students of the same university is noteworthy, and evokes a hypothesis that academic staff might transfer their shared beliefs, attitudes, and values to the students. The particularly negative perceptions of the students at NS seemed to be due to the culture of teaching on campus, which regarded the virtual learning environment as something negative. Lithuanian students regarded the web platform as a means of improved communication with teachers. Students at NS, on the other hand, seemed to associate the web platform with reduced communication with teachers:

> *Fronter [the virtual learning environment] could never substitute the inspiration and response that you get from meeting teachers/tutors and other students face to face. Fronter is aimed at cognitive tasks, not for building relations.* (Student, NS, 2005)

Norwegian teachers and students seemed to regard the web platform as an adequate tool for storage and retrieval of course material, and for postings of assignments, but nothing more: "It doesn't make me a better teacher in any way, but the technology works . . ." (Teacher, UT, 2005). On the other hand, students of the Lithuanian university were enthusiastic about the opportunity to interact with teachers by the e-mail feature in the virtual learning environment: "Now, at last we can speak to teachers one to one" (Student, KMU, 2004). The enthusiasm was shared by the university management: "This is the future of education, something new to offer our students" (Dean, KMU, 2004).

The impact of the organizational culture on the acceptance of the virtual learning environment was thus prominent at all three universities, but influenced acceptance in different directions. At NS, a strong organizational culture favoring education on campus worked against the acceptance

of the virtual learning environment. At UT, the organizational culture focused on academic freedom. This initially hampered the acceptance of the virtual learning environment, as academic freedom was brought up as an excuse for resisting change. In contrast, the organizational culture at KMU depicted concepts like 'new' and 'future' as something positive. The organizational culture at KMU worked in favor of innovations, including the virtual learning environment. Drawing on the findings of the cross-case analysis, it can be hypothesized that an organizational culture depicting the virtual learning environments as something positive led to higher degrees of social influence and performance expectancy. These two core constructs seemed to be particularly significant in creating generally higher degrees of acceptance among academic staff and students.

Having exemplified what a technology acceptance research study, the chapter goes on to summarize the criticism of technology acceptance research from the information systems research community. Finally, reflections on the use of technology acceptance models will be made and implications for research and practice put forward.

CRITICISM FROM THE INFORMATION SYSTEMS RESEARCH COMMUNITY

Being one of the most common research streams in the information systems world, technology acceptance research is continuously a target for criticism and reflections, internally and from other information system research communities. In a study by Lee et al. (2003), 32 information systems researchers assisted in critically examining TAM and specifying future directions by answering an open-ended questionnaire. The value added by TAM research was specified by the researchers as providing a parsimonious model to examine factors leading to information system acceptance, and to strengthen the research field by its rigor. The identified shortcomings of TAM research fell into four categories: First, it is a cumulative research approach primarily based on replicating previous studies with minor adjustments. Second, TAM research may be overdone: " . . . it has received disproportional amount of attention in IS research detracting research from more relevant research problems which may not be as easy to investigate rigorously" (Juhani Iivari in Lee et al., 2003, p. 766). Third, the narrow focus of TAM has reduced what is included in studies of technology and design. Finally, the inherent simplicity of TAM makes it hard to put into practice, as practitioners may experience a lack of tangible advice:

> *. . . imagine talking to a manager and saying that to be adopted technology must be useful and easy to use. I imagine the reaction would be "Duh!" The more important questions are what make technology useful and easy to use.* (Alan Dennis in Lee et al., 2003 p. 766)

Benbasat and Barki (2007) argue that the independent attempts by several researchers to expand TAM have created a state of theoretical chaos and confusion, in which it is not clear which version of TAM is the commonly accepted one. Furthermore, the authors agree with Lee et al. (2003) that the intense research focus on TAM seems to have diverted researchers' attention away from more relevant research. To solve these problems, Benbasat and Barki make five suggestions: First, going back to the original theories (Theory of Reasoned Action and Theory of Planned Behavior), to allow for novelty and discovery. Second, include a broader perspective of what users actually do in and around information systems. Third, develop longitudinal, multi-stage models to capture variables on system use at different stages of the implementation. Fourth, identify the antecedents of the beliefs contained in adoption models. Fifth, usefulness has to be measured beyond perceptions, with the aim of identifying information technology artifacts that are not only perceived to be useful, but also can be objectively shown to be useful.

REFLECTIONS ON BEING A TECHNOLOGY ACCEPTANCE RESEARCHER

The most outstanding advantage of being a technology acceptance researcher is that so many people have done this before! TAM is probably the most common research model in information systems research with approximately 11,300 hits in the research database JSTOR (August, 2010). Also the number of research studies applying UTAUT has grown rapidly since its introduction in 2003. There are thus many research studies to read and learn from before you embark on your own technology acceptance research journey. In technology acceptance research, a number of questionnaire instruments have already been developed by the seminal researchers founding the research stream. These questionnaires are validated and reliable. Therefore, there is no need to reinvent your own questionnaire. Use the ones that already are there—or adapt them slightly to your own research setting. Quantitative technology acceptance research could be regarded as *rigorous*, but perhaps not always *relevant*. UTAUT captures more of the social and organizational context than TAM through the core constructs of social influence and facilitating conditions. However, in order to answer research questions as to *why* an information system is accepted or not, the researcher needs to study contextual factors, such as structure, processes, and culture of the organization where the information system is put to use. In doing so, it is advantageous to combine qualitative interviews and quantitative survey questionnaires. It is more common to create quantitative survey items than qualitative interview questions from the core constructs of TAM and UTAUT, but there are examples of research

studies with qualitative approaches to data collection and analysis (see, for example, Narmaala, 2004; Keller, 2007, 2009).

However, the widespread application of TAM and UTAUT in information systems research is also a disadvantage to some extent. When planning a technology acceptance research study, the presumptive researcher soon discovers that a lot of previous research has already been done! As a result, to make a valid and relevant knowledge contribution requires research skills and creativity. As technology acceptance research is closely connected to the tradition of quantitative research, it is also difficult to gain acceptance and respect for the research findings in research communities with a strong qualitative or interpretive tradition.

When using TAM or UTAUT, it is important to be constantly aware of that factors outside the models might have explanatory value. For that reason, survey questionnaires and interview guides need to include open-ended questions where respondents are given the opportunity to 'speak their mind' about the use of the system and contextual factors. This way, factors that are not captured by TAM and UTAUT could be discovered and pinpointed. It is also essential to remember that technology acceptance models *per se* do not capture processes or sequences of events. To capture the sequence of events of an implementation process, for example, data must be collected at different points in time—before, during, and after implementation.

IMPLICATIONS FOR PRACTICE

Then, what about implications for practice of technology acceptance research? From the comparative case study, presented previously in the chapter (see also Keller, 2007, 2009), conclusions could be drawn about user attitudes and the impact of organizational culture that are important for managers and implementers of information systems to take into consideration. The implementers of virtual learning systems in the case study learned that implementation did not stop when computers and networks were 'up and running.' Instead, implementation was a long-term process of gradual user acceptance, heavily influenced by norms and values in the organization, as well as organizational structure and context. In higher education, it is not taken for granted that computerized information systems will enhance learning or even organizational efficiency. It took time to reach a satisfactory degree of acceptance of the virtual learning environment among teachers and students. It is reasonable to believe that this is the case in other types of organizations with strong organizational cultures and professional roles, for example health care.

Performance expectancy and social influence were found to be the most influential among the UTAUT core constructs in creating a generally high degree of acceptance of virtual learning environments. It is thus important

for managers and implementers to ensure that users perceive tangible usefulness and added value from the use of information systems early in the implementation process. It is also essential that the implementation process is supported throughout all levels of the organization and that the use of information systems is seen as prestigious. Moreover, resistance among staff and students should be recognized and dealt with constructively early in the implementation process. This is in accordance with the findings of Ginzberg (1981), who states the importance of reaching agreements on the use of an information system in early stages of the implementation process. Resistance to implementation of information systems entails high costs in time, energy, and money.

The core constructs of effort expectancy and facilitating conditions were not found to be very influential in generating generally high levels of acceptance of the virtual learning environment. However, this does not mean that efforts to provide ease of use and support should be neglected. The opportunity to experience ease of use and technical support should be provided and facilitated by managers and implementers, but will probably not be sufficient in themselves to create high degrees of acceptance.

FURTHER RESEARCH

In order to obtain a high degree of validity in technology acceptance studies, it is important to determine whether use of information systems is voluntary or mandatory in the studied organization. Most TAM studies have been conducted in voluntary contexts, while use of information systems in real-life organizations is usually mandatory (Venkatesh et al., 2003). The first version of TAM assumed that use of information systems is a voluntary choice for each individual. In reality, the information systems user may have a free choice of use in his or her spare time, but hardly at work or at school. In research contexts where users are obliged to use a certain information systems, the actual rate of use—in the terminology of technology acceptance research, "the behavior"—might not be very interesting to study, as there might be a high rate of use, whether the users accept the system or not. In such case, "the behavioral intention" and the degrees of the core constructs of TAM and UTAUT could be more interesting to explore. From this point of view, more technology acceptance studies of mandatory settings are needed.

The chapter concludes with a quotation from a leading information systems researcher: "Technology acceptance outcomes need to be extended to more formally include adaptation, learning, and reinvention" (Agarwal, 2000, p. 102). To fully understand why people accept or reject information systems the ever ongoing ability of the individual to adapt, learn, unlearn, and reinvent must be regarded. This can be done by having technology acceptance research include the whole and undivided context of the user.

DISCUSSION QUESTIONS BASED UPON THIS CHAPTER

1. What is your opinion about strengths and weaknesses of technology acceptance models in information systems research?
2. What do you think managers and implementers should do to enhance user acceptance of information systems? Are there different conditions for achieving user acceptance in different types of organizations, for example companies and nonprofit organizations?
3. In the case study reviewed in this chapter, significant differences in degree of acceptance of the same information system were observed in different countries. What influence do you think national and organizational cultures have on users' acceptance or rejections of information systems?

RECOMMENDED FURTHER READING

Benbasat, I., & Barki, H. (2007). Quo vadis TAM? *Journal of the Association for Information Systems, 8*(4), 211–218.

Keller, C. (2007). *Virtual learning environments in higher education: A study of user acceptance*. Dissertation No 1114. Linköping: Linköping University.

Keller, C. (2009). User acceptance of virtual learning environments: A case study from three Northern European universities. *Communications of the Association for Information Systems, 25*, 465–486.

Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems, 12,* 752–780.

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

REFERENCES

Agarwal, R. (2000). Individual acceptance of information technologies. In R. Zmud (Ed.), *Framing the domains of IT management: Projecting the future through the past* (pp. 85–104). Cincinnati, OH: Pinnaflex Educational Resources.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211.

Benbasat, I., & Barki, H. (2007). Quo vadis TAM? *Journal of the Association for Information Systems, 8*(4), 211–218.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly, 19*(2), 189–122.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.

Drennan, J., Kennedy, J., & Pisarki, A. (2005). Factors affecting student attitudes toward flexible online learning in management education. *Journal of Educational Research*, *98*(6), 331–338.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior. An introduction to theory and research.* Reading, MA: Addison-Wesley.

Ginzberg, M. J. (1981). Early diagnosis of MIS implementation failure: Promising results, unanswered questions. *Management Science, 27*(4), 459–478.

Hardgrave, B. C., & Johnson, R. A. (2003). Toward an information systems development acceptance model: The case of object-oriented systems development. *IEEE Transactions on Engineering Management, 50*(3), 322–336.

Keller, C. (2007). *Virtual learning environments in higher education: A study of user acceptance*. Dissertation No 1114. Linköping: Linköping University.

Keller, C. (2009). User acceptance of virtual learning environments: A case study from three Northern European universities. *Communications of the Association for Information Systems, 25*, 465–486.

King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management, 43*(6), 740–755.

Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems, 12*, 752–780.

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management, 40*(3), 191–204.

Narmaala, J. (2004). Reflections on technology acceptance in higher education. *Proceedings of the 12th European Conference on Information Systems*, Turkku, Finland.

Ngai, E. W. T., Poon, J. K. L., & Chan, Y. H. C. (2007). Empirical examination of the adoption of WebCT using TAM. *Computers & Education, 48*(2), 250–267.

Ong, C. S., Lai, J. Y., & Wang, Y. S. (2004). Factors affecting engineers' acceptance of asynchronous e-learning systems in high-tech companies. *Information & Management, 41*(6), 795–804.

Saadé, R., & Bahli, B. (2005). The impact of cognitive absorption on perceived usefulness and perceived ease of use in on-line learning: An extension of the technology acceptance model. *Information & Management, 42*(2), 317–327.

Selim, H. M. (2003). An empirical investigation of student acceptance of course websites. *Computers & Education, 40*(4), 343–360.

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

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

Wilson, B. G. (1996). *Constructivist learning environments: Case studies in international design*. Englewood Cliffs, NJ: Educational Technology Publications.

14 Developing Patterns of Explanations
Methodological Considerations When Analyzing Qualitative Data

Magnus Hansson

This chapter outlines an approach and practical recommendations for how empirical case-study-based data can be analyzed, in order to provide contributions to either existing or provisioning of new theory. The approach that is outlined is inspired by the thoughts of Corley and Gioia (2004), Gioia and Thomas (1996), and Elsbach and Kramer (1996), among others, and closely related to other empirical approaches to analyzing case-study data, such as the Grounded Theory approach.

The reason to outline this approach is that the vast majority of literature on research methodology, with few exceptions, does not provide any guidance, structure, or practical recommendations for scholars, students, and practitioners on how qualitative data can be analyzed. This is the case despite the fact that qualitative research methods have attracted increasing attention in information systems research.

Data analysis is often believed to be a hard but nevertheless important part of an investigation. Even if there is computer software available on the market to provide support in the performance of the data analysis, it is argued that the outcome of using the software will never be better than the inputs to the software. It is also argued that it is of importance to have a solid understanding of analytical procedures as well as steps in the analytical process in order to understand the applicability and use of computer software. Also, software does not remove the need for thought or handle the important data–theory links (cf. Walsham, 2006). As a result, there is a need for scholars, students, and practitioners to be able to conduct well-grounded analyses of collected data.

There is a set of arguments that can be put forward regarding the emphasis on the approach that is outlined. *First*, this approach for analyzing qualitative data provides a base for rigorous collection and analysis of, in particular, qualitative data and data from single or multiple cases. *Second*, it also provides support in determining sampling of either respondents or cases, for example, and focuses on the content as well as later or additional data collection. Applying this empirically grounded approach to analysis is relevant for different purposes, such as describing and analyzing a certain

phenomenon as well as generating a better theoretical understanding of a certain field of research. *Third*, this approach can also have the purpose of highlighting a phenomenon that has not been focused on in previous research in order to develop theory. This is done by outlining a set of arguments and clarifying a procedure that can be applied in order to identify concepts, compile themes, and aggregate dimensions. *Fourth*, this procedure can serve as a base for the development of patterns of explanations or for determining causal explanations of the dependent variable that is the focus of the specific research as well as a foundation from which theory, theoretical models, and theorizing can be derived.

The analytical procedure that is outlined can be applied in multiple settings when conducting organization studies (OS) and studies on information technology (IT) and information systems (IS). These disciplines are dedicated respectively to studying, for example, the social and technical aspects of organizing, collaboration, and cross-fertilization of one another.

IT research focuses on impacts of information technology; the development, deployment, and use of IT; organization and management of IT resources; and understanding how organizational phenomena affect the development and use of technologies and how technologies shape organizations (cf. Orlikowski & Barley, 2001). Being a field of research that centers on the design, deployment, and use of artifacts in order to generate tangible solution to practical problems, IT has a great deal in common with other fields of design. Researchers on IT face a challenge in the practical versus theoretical agendas (cf. Orlikowski & Barley, 2001; Benbasat & Zmud, 1999). Capitalizing on the often empirically grounded research and practical implications, it is argued that, as in other fields of research, there is a need for rigorous methods for data collection, analysis, and theorizing and theory construction, in order to manage the tension and balancing act between rigor and relevance (e.g. Walsham, 2006; Benbasat & Zmud, 1999, 2003).

Technology, or the IT artifact, is and has been treated, for example, as either something embedded in the organization, a black-box, or a part of social constructions, represented by multiple views of the technology (Orlikowski & Iacono, 2001). Adopting a view of IT as an embedded entity opens the door to an interesting aspect of studies of organizations as well as studies of IS, given the intersecting and cross fertilizing other fields of research (cf. Markus & Robey, 1988). In other words, explanations derived from variables related to organizational theory can help explain the role, function, use, or consequence of an information system in the organization. On the other hand, explanatory variables derived from an IS perspective can help explain, for example, the outcomes, roles, rules, routines, and institutional structure of an organization.

IT scholars have utilized concepts, propositions, instruments, and techniques developed in organizational science. This has brought greater sensitivity to the IT literature. Nevertheless, and following the arguments of Orlikowski and Barley (2001), IT researchers have to make much use of more recent developments in organization theory that include themes of

institutionalization, globalization, and entrepreneurship. There are also other aspects, such as organizational behavior in a broad sense, of organizational theory that can be brought into IT research in order to continue the development of a hybrid research area between the two fields.

Before outlining the procedure of analyzing empirical data, the chapter will define some critical terms that will be used in the description of the procedure for analyzing empirical data later on.

SOME KEY DEFINITIONS OF CRITICAL TERMS AND TYPICAL MODELS

Dependent and Independent Variables

There are some critical terms that will be used in outlining the procedure for analyzing empirical data later on in this chapter that need to be clarified at this stage. The term *variable* has both generalized and specialized meanings. In the general sense a variable is something that can be seen as a factor that changes or differs in what you study. One way of classifying variables is based on whether a variable is intended to describe or be described in the inherent and specific structure of the variable itself. If the variable under investigation is to be *described* in terms of other variables, it can be called a *dependent variable*. As Luft and Shields (2003) note, a dependent variable can be general in meaning, i.e. what the study is about and what the researcher aims to explain. If the researcher is using the variable in conjunction with other variables in order to describe a given dependent variable, such a variable is an *independent variable*. Further, empirical data are used to test or develop theories by way of various types of analysis. The purpose of the theory is to develop a model, at the conceptual level, that identifies one or more variables of interest that are expected to be associated with the behavior of the variable of interest. These variables are often referred to as dependent or explained variables and independent or explanatory variables, respectively (see also Chenhall & Moers, 2007).

Usually, the distinction between dependent and independent variables is clear. On the other hand, a variable considered as dependent for purposes of evaluating the objective of one study may be considered as independent for purposes of evaluating the objective of a different study.

Cause and Causalities

Following Luft and Shields (2003), there are multiple ways in which the term *cause* or *causality* has been defined in the social sciences. Broadly speaking and in a general sense, the term *cause* can refer to explained relationships between variables, as opposed to observed but unexplained associations between variables, that is, variables that provide explanations for other variables. This implies that explanations are, or should be, directional

or deterministic, non-intentional, or limited in scope or provide either full or partial explanations. It should be noted that there are often restrictions in the specific conditions or contexts in which explanations (explanatory factors) are valid, when using one variable to explain another.

Explanatory Models—A Few Examples

It is possible to detect several types of causalities or relationships between dependent and independent variables. There are some typical models that often occur in the academic literature. *First*, the additive model: This model has multiple (two or more) independent variables that have effect on or each partially explain the dependent variable. The dependent variable is not conditional on the value of any other independent variable. *Second*, in the intervening-variable model, one independent variable has an effect on another independent variable that has an effect on the dependent variable. It should be noted that the second independent variable does not have any effect on the first independent variable. In the intervening-variable model the effect of X_1 occurs on the condition that X_1 affects X_2 and X_2 in turn affects the dependent variable (Y). Notably, X_2 does not affect X_1 and X_1 does not either affect Y (directly). Once it is determined how and to what extent X_2 affects Y, its effect on Y does not depend on X_1. *Third*, interaction models (such as independent variable interaction and models with a moderating variable) are of use when distinguishing how much an independent variable (X_1) affect the dependent variable (Y) and how this is conditional on the value of a second independent variable (X_2). Also, X_2 is conditional on how much X_1 affects Y. It should be noted, however, that the two independent variables (X_1 and X_2) do not influence each other, and that Y does not affect either X_1 or X_2. *Fourth*, the cyclical recursive and the reciprocal non-recursive models are more process-based in character, as variables affect each other over time or simultaneously. That is, the cyclical recursive model implies that X_1 at a given time (T) affects X_2 at another time T_{+1}. X_2 at T_{+1} affects in turn X_1 at T_{+2}, and so on. The reciprocal non-recursive model implies that X_1 and X_2 affect each other simultaneously (cf. Luft & Shields, 2003).

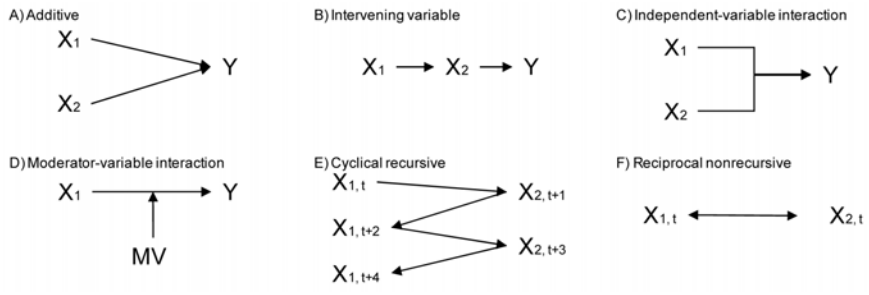

Figure 14.1 Explanatory models—a few examples.

Theoretical Framework

To define theory is a cumbersome task, as is defining what theory is not: "Lack of consensus on exactly what theory is may explain why it is so difficult to develop strong theory in the behavioral sciences" (Sutton & Staw, 1995: 371). Also, there is no clear demarcation between what theory is and what a research method is. Rather, theory can be seen as method, and method can be seen as theory. Often theory and method are treated as conceptually independent, which is not necessarily the case. Rather, both are highly interrelated in practice. "Theories without methodological implications are likely to be little more than idle speculation with minimal empirical support. And methods without theoretical substance can be sterile, representing technical sophistication in isolation" (Van Maanen, Sørensen, & Mitchell, 2007, p. 1146f).

Too often, in discussions related to how to develop theory, the focus is on evaluating theories on dimensions such as internal consistency, logic, organizations, clarity, and readability. As Whetten (1989) points out, theories are often judged in terms of their novelty, contribution, and contemporary interest. All of these criteria can be applied across methods, as methods have their own internal logic. Still, there are some basic principles that should be taken into account when developing a theoretical framework:

First, a theoretical framework can consist of one or more theories or models. When the researcher asserts the ambition to combine two or more theories or models, it becomes important to clarify the links between the theoretical components so that, instead of generating a fragmented framework, it becomes integrated. The researcher needs to clarify the links between the models applied and also how the (outcomes from) different models fertilize one another.

Second, it can be of importance for the researcher to be aware of and deal with the specific basic assumptions of the theory/ies, for example, assumptions regarding ontological and epistemological views, as well as views on human nature and the view of methodology (e.g. Burrell & Morgan, 1979). There is one disclaimer, however: It is not always necessary for researchers to explicitly state their scientific positioning. Rather, the researcher can, by conscious decisions, carefully select theory/ies, research methodology/ies, analytical procedures, and so on and by doing so implicitly establish their scientific position.

Third, there is a need for the researcher to maintain a paradigmatic fit of the applied theory/ies, methodology/ies, and analytical procedures and theoretical framework. That is, there is a need for developing an internal consistency between these selections, as a lack of fit would generate disparate ambitions regarding what type of knowledge is sought, for example.

SOME CONSIDERATIONS WHEN ANALYZING EMPIRICAL DATA

In this section, a step-by-step procedure for how an empirically grounded approach for analyzing empirical data is outlined. This can serve as a base from which theory, theoretical models, and theorizing can be derived (see

also Sutton & Staw, 1995; Weick, 1995). It should be noted, however, that this does not specifically place the focus on different data-collection methods and procedures in this chapter. Rather, the focus is aimed at the situation where the researcher has collected an extensive data set and is about to conduct the analysis.

It should be noted here that the procedure that is outlined is a generally applicable procedure relevant to multiple fields in the social sciences. The applicability is dependent on the nature of the data collected in the investigation that is being carried out.

Developing 1st Order Concepts

There are some basic principles and steps that should be considered when working with the procedure that is outlined in this chapter: When conducting an analysis of empirical data and in conjunction with, and with support of a theoretical framework that serves as a base for the case-study, it becomes necessary to start by identifying initial concepts and grouping them into categories. This is because the researcher has often collected an extensive set of data and has a need for organizing, sorting, and categorizing the data. This is often referred to as *open coding* in the research methodology literature. This open coding is done in order to develop the so-called 1st order concepts. These 1st order concepts can have the intention of capturing the "language of the informants" (Corley & Gioia, 2004) and can be seen as labels of the raw data. Here the researcher should utilize the strength of the collected empirical data and provide rich and bold descriptions of explanations for the dependent variable.

For a factor to be considered and extracted into the open coding (thus qualifying as a 1st order concept), it must possess some explanatory value regarding the dependent variable that is being investigated. Such a factor must appear as an explanatory factor in the data that has been collected. There can be multiple sources of information, such as the theoretical framework that serves as the base for the case study and/or the empirical evidence that has been collected specifically for the investigation.

A form of constant comparison should be applied in order to triangulate comparative data from different informants, times, and sources of information in order to discern the shared concepts. By applying a constant comparison and triangulating data, it is possible to enhance the trustworthiness of the study, in terms of greater validity.

Also, the constant comparison can be done in conjunction with the theoretical framework in a form of an either theoretical or empirical interchange, depending on where there starting point is. A theoretical interchange takes its starting point in the academic literature, by whose help the data is collected. The theoretical framework can serve as the base from which data collection instruments (e.g. the interview guide) are developed. Still, after the first collection of empirical data there can be a need for

conducting an initial analysis that can serve as a base for a second round of data collection with the same or an iteratively improved and modified theoretical framework. On the other hand, an empirical interchange takes its starting point in the empirical observation from which data is collected. The empirical data can serve as a base from which an initial analysis and comparison with the literature can be made. From this initial analysis it is possible that a need for complementary data, so the researcher might have a need for a second round of empirical data collection (see also Alvesson & Kärreman, 2007). It should be noted that theoretical and empirical interchange often is confused with the term *abduction*. *Abduction* as a research procedure stems from American pragmatism, where the researcher utilizes his/her personal knowledge and experience from long-term practice in a specific field as the starting point for the research (see e.g. Polanyi, 2002)

Regardless of whether the researcher applies a theoretical or an empirical interchange as a procedure for the research project, both approaches can serve as the base from which the identification and development of 1st order concepts are made. In this identification and development, a review of the empirical evidence and the theoretical framework applied should be conducted in order to identify potential factors or concepts that have explanatory value regarding the dependent variable that is being investigated. The 1st order concepts will serve as a base for later steps in the analysis of the empirical and/or theoretical evidence. This is done in a way in which arguments related to explaining the dependent variable are scrutinized and extracted into the open coding. In the first sequence of the analysis, it is suggested that a table be outlined to categorize the explanatory variables that are identified, in order to generate a structure and possible overview of the data. An example of such a table follows:

The identified variables should be given conceptual names or labels similar to concepts, as they appear from the empirical evidence or in the theoretical framework. An ambition here must be to develop conceptual labels that are representative and are empirically or theoretically grounded or related. A reason for this is may be to create descriptions and labels that capture the context in which the dependent variable operates. Further, in the development of conceptual names or labels, it may be necessary to

Table 14.1 Example of Table for Describing Explanatory Categories/Variables and Their Empirical Representations

#	*Explanatory category/ variable (1st order concept)*	*Empirical example*
1.		
2.		
. . .		

consider how they are developed, taking into account both their empirical or theoretical representations, in such way that they provide an abstracted representation of their explanatory value to the dependent variable that is under investigation.

On occasions when conceptual labels are somewhat similar but differ in their expression, it may be necessary to provide empirical evidence or representations from the theoretical framework of nuances of how the specific conceptual level represents the phenomenon that is under investigation. Still, it is recommended that the conceptual labels be constructed in such way that they are different from each other, avoiding overlaps. If there are overlaps it becomes necessary to either merge the overlapping conceptual labels or split them into two or more separate categories.

Developing 2nd Order Themes

Once a particular explanatory factor has been identified in the empirical investigation or in the theoretical framework, concepts are grouped around them. This is done in order to reduce the number of units, and later to theoretically abstract concepts to related 2nd order themes and aggregated dimensions (see Table 14.2 later). When developing themes and dimensions, it is essential to consider the properties and dimensions of each category. This is done for the formation of relationships between themes and dimensions and the development of an explanatory pattern. Also, this can be of importance when or if the researcher has the ambition to capture the temporal dimension of different variables, that is, a variable can have a certain (e.g. strong) explanatory power at a certain point in time (e.g. t_1) whereas the same variable can have another (e.g. weak) explanatory power at another point in time (e.g. t_2).

The advantage of the approach outlined for analyzing the outcomes of the empirical investigation is that it is possible to extract factors of explanations independently of the level of analysis and to focus of the empirical outcomes. Examples of different levels of analysis can be individual, group, and organizational levels (e.g. Luft & Shields, 2003). From this extraction it is possible to develop the 2nd order themes and later aggregated analytical dimensions in order to outline a pattern of explanations.

From the initial open coding and identification of 1st order concepts, the next step is to conduct *axial coding* in order to search for relationships and commonalities between categories. This is done in order to assembly the 1st order concepts and develop 2nd order themes. The axial coding that is conducted should follow a procedure whereby the data is put back in new ways following the open coding, thus linking categories in a relational form.

When developing the 2nd order themes, a basic intentionality should be to capture the 1st order concepts on a higher level of abstraction by compiling two or more 1st order concepts in order to form the 2nd order themes. It also becomes necessary to label each theme in a way that the labels capture

the common denominator of the 1st order concepts. The 2nd order themes should be given their labels either by developing a more general label that subsumes the 1st order concepts or by reference to the theoretical framework or adjacent literatures that describes the emergent themes well. Notably, as with the 1st order concepts, it is important that the 2nd order themes be distinctly separated from one another, avoiding overlaps. If there are overlaps, it is necessary to either merge the overlapping conceptual labels or split them into two or more separate categories.

Causal conditions and context have to be elaborated in juxtaposition to the dependent variable that is under investigation and when developing patterns of explanations. More specifically, in this approach subcategories must be linked to a category in a set of relationships focusing on the studied phenomenon, causal conditions, context, intervening conditions, actions(s)/interactional strategies, and consequences. This implies that all the identified explanatory variables and concepts should be related to the dependent variable/s of the investigation. These explanatory variables should be put in relationship to the specific events and incidents that affect the dependent variable of the investigation. Some of the explanatory variables might be context specific, representing the specific set of properties that pertain to the dependent variable. Further, in the analysis attention should also be paid to how certain conditions either facilitate or constrain the actions(s)/interactional strategies taken within the context.

The action(s)/interactional strategies have their specific properties. They can be processual as well as purposeful and goal oriented. When considering a development over time, it is likely that certain dynamics comes into play, so the explanatory factors, concepts, and themes should be considered

Table 14.2 Example of Table for Compilation of Concepts Into Themes and Themes Into Aggregated Dimensions

#	*1st order concepts*	*2nd order themes*	*Aggregated dimensions*
1.			
7.			
12.			
9.			
14			
2.			
. . .			
. . .			
. . .			

dynamically. That is, during a processual development, changes are very likely to occur, and therefore the variations and/or fluctuations of explanatory factors should be taken into account. For example, some of the concepts and themes are likely to possess a stronger explanatory value in the initial stages of a process vis-à-vis weaker explanatory value in later stages.

In other words, it is possible to take into account the temporal dimensions of the concepts and themes. If the ambition of the research is to capture certain variables dynamics, i.e. how they change over time, it is important to consider the temporalities of these variables. This can be done through the descriptions of each specific concept taking into consideration the factor's explanatory power in the different phases of the process that is under investigation. Finally, action(s)/interactional strategies of the phenomenon and context have certain consequences or outcomes that can differ, depending on the actual conditions.

The 2nd order themes serves as a foundation from which a compilation is made in order to develop aggregated analytical dimensions. Similar to the procedure for developing 2nd order themes from the 1st order concepts, here a second axial coding is conducted in order to search for relationships and commonalities between themes in order to assembly the 2nd order themes and develop aggregated dimensions. This second axial coding should also follow the procedure whereby data is put back in new ways following the previous axial coding, linking themes in a relational form.

Developing Aggregated Dimensions

When developing aggregated dimensions, it is also here important to label each aggregated dimension in a way that the labels capture the common denominator of the 2nd order themes and distinctly separates labels from one another. The aggregated dimensions should be given their labels either by developing a more general label that subsumes the 2nd order themes or by reference to the theoretical framework or adjacent literature that describes the aggregated dimension well. However, it is recommended that the labels be theoretically loaded when aggregated dimensions are labeled.

A theoretically loaded label of each aggregated dimension enables theoretical modeling and comparison to the theoretical framework or adjacent literature. A few examples of theoretically loaded labels are: motivation, productivity, competition, stress, product customization, employee involvement, information sharing, and information asymmetry. The theoretical framework or adjacent literature can provide support in the labeling, as it is beneficial to apply theoretically loaded labels. That is, in the analysis and search for commonalities as well as in the comparison to the academic literature, using labels similar to those in the literature simplifies the procedure and is helpful when developing or modifying theory or when theorizing (see also Weick, 1995).

It should also be noted that when comparing each of the aggregated dimensions it becomes essential to locate each property dimensionally. Doing

so develops the pattern of explanations of the studied phenomenon, process, or event and adds conceptual clarity and density: clarity in the sense that the properties of each aggregated dimension is clear and demarcated from other aggregated dimensions; density in the sense that each aggregated dimension is given a 'thick' description in order to generate a substantial information and explanation to each of the identified aggregated dimensions. Thick descriptions imply that the researcher has to provide a substantive and rich description that can enable an in-depth analysis.

Also, the technique that is outlined in this chapter is not linear but provides a process-oriented analytical procedure. This procedure should continue until a clear picture of the emerging relationships among the identified factors of explanation until saturation is reached. Saturation implies that no new or relevant data seem to emerge regarding a specific category. The development of categories and their content should hold the ambition to generate a dense, rich, and extensive description of each variable as well as to provide an outline of the relationships between categories.

When analyzing empirical data, there are some critical considerations that need to be taken into account. One such consideration is when identifying explanations from two or more (multiple) empirical studies and/or identifying explanations from both one empirical investigation as well as the literature if the results are analytically comparable. That is, can the identified explanations serve as a base for the development of a pattern of explanations or theoretical model to the dependent variable that is under investigation?

When identifying explanations from two or more empirical studies and/or from one empirical investigation and the theoretical framework, it is necessary to identify their common denominators, similarities and differences in applied research design (methodology), theoretical foundation, empirical and contextual setting, and the level of analysis that is applied for the specific investigation. The primary reason for this is to distinguish the basic assumptions and commonalities in order to compare 'apples with apples.' Below, I outline four examples of basic assumptions and considerations regarding research methodology, theoretical foundation, empirical and contextual setting, and level of analysis that have implications for the research being conducted:

First, regarding the *methodological considerations*, in terms of data collection and analytical procedures, such considerations will have implications on what type of explanatory factors can be derived from and in the analysis. All research methods have their specific limitations, and for that reason, as a researcher, it becomes necessary to recognize and address such limitations. It is essential for the researcher to critically reflect upon the limitations of the investigation and clearly outline what strategies that have been applied in order to deal with such limitations.

Second, when it comes to the *theoretical foundation* it can be of importance to identify the basic assumptions of the theory/ies applied. Examples of such assumptions are the ontological, epistemological view of human

nature and the view of methodology (*e.g.,* Burrell & Morgan, 1979). A major reason to identify the basic assumptions is to be able to develop a coherent theoretical framework and integrate theories that are situated within the same paradigmatic domain. As a researcher it is often necessary to focus on maintaining a paradigmatic fit of the applied methodologies and theoretical framework in the research being conducted.

Third, the *empirical and contextual setting* is of importance when comparing two or more cases. Before determining the empirical and contextual setting of the cases, it is often necessary to distinguish the analytical typicality of the cases, or at least their representativeness and limitations. This must be done in order to recognize both the strengths and weaknesses of the cases and to what extent the results from the specific case are valid for other (similar) cases. In the framing and justification of the selected case/es for the study, it is often necessary to clarify its empirical and contextual setting, or in other words, the boundaries and territories of the cases as the unit of analysis relevant for the purpose of the research that is being conducted. Examples of exogenous factors that can be taken into consideration when determining the context of the case are: industry structure, type of competition, type and number of customers, level of unemployment, etc. Examples of endogenous factors are: the organizational structure, decision-making, type of processes and procedures, internal relationships, etc. Notably, the contextualization and outlining of the borders of the case/es under investigation must be in relation to the purpose of the study at hand.

Fourth and finally, there are several possibilities regarding the *levels of analysis* that can be taken into account with conducting a research study. For example, analysis can be carried out on the societal, organizational, sub-unit, group, and individual levels. As theory is often constrained to certain level/s of analysis, it can therefore be of importance to recognize such constraints so that the application and analysis can be conducted on a comparable analytical level. Still it should be noted that explanations on one level of analysis may have implications for another level of analysis.

On the one hand, it could be argued that applying different, yet complementary, methodologies would be beneficial in that explanatory factors can be identified via both a critical analytical review of the literature and the empirical work. An iterative approach can successively improve and both add density to and clarify the focus of a study. Iterative is used in the sense that the researcher has the ambition to continuously improve and develop the identification of explanatory factors.

When it comes to the applied analytical procedures there are some differences. As discussed previously, an explorative approach has been argued to be relevant for a field of research that has been a somewhat neglected topic in organizational science. In the different analyzes, adjacent and anteceding literature has played an important role for the operationalization of

explanatory factors, as it has served as a lens through which the studied phenomenon has been viewed.

Even if there are differences in analytical procedures to the extent that both qualitative data and statistical analyses have been applied, there are paradigmatic similarities among these procedures. A broad approach has been applied in order to expand the research domain of a previously (at least to some extent) unknown and little researched phenomenon. The applied explorative approach can provide an opportunity to cover the width, depth, and longitudinal aspects of the dependent variable that is in focus. It can be worth taking into account the possibility of that the phenomenon, event, or process can be studied in two or more cases, using complimentary methodologies, incorporating endogenous and exogenous variables of explanation in a broad perspective. This is necessary in order to generate a substantive and broad coverage of potentially explanatory factors for the dependent variable that is the focus of the study.

When it comes to comparative studies, there are often relative deficiencies in the comparisons. Every methodology, theoretical framework, empirical, contextual setting, and level of analysis has its limitations, which is why it often is important to bridge the gaps and outline strategies to mitigate such limitations.

It should be noted that a pattern of explanation is not a finite model or explanation for the dependent variable that is in focus in the study. It can be a cumbersome task to measure, for example, interaction effects between explanatory variables or operationalize the variables into statistical measures. Rather, a pattern of explanations can be seen as something tentative. A tentative pattern of explanations hold its purpose and can contribute to a specific field of research given that it also indicates possible directions for future research.

Empirically close research methodologies, such as the one outlined in this chapter, often receive criticism for lacking the ability to provide theory. Weick (1995, p. 387) argues, "A difficulty arises because theory work can take a variety of forms, because theory itself is a continuum, and because most verbally expressed theory leaves tacit some key portions of the originating insight." Weick (1995) declares the need for more precise descriptions of what is being abstracted, and how references are used. Data itself is not theory, and theory does not capture all the information in data. Still, there is a risk that researchers confuse data with theory and may simply be midway through the process of generating theory or theorizing on a certain phenomenon. Lists of variables are further from a well-developed theory than are narratives, but a list of variables can serve as a foundation from which theory can be developed. The tacit message in a list is that items not on this list are less crucial determinants than those that are on it. "But as long as there is an implied set of relations among items in the list, or one can infer such relations, there are the beginnings of a theory" (Weick,

1995, p. 388). These outlined arguments point to a serious issue in research and the development of theory.

Another point that can be made is that theorizing is how researchers think about the relationships among elements in the world that are given researchers' attention. The social world is complex and hard to isolate from random noise. If researchers pay too much attention to available or potentially available data, researchers are trapped by operations, and theorizing is stifled. If researchers pay no attention to data, our theorizing will be rather too remote and will occur entirely on the conceptual plane. In either case, the potential interplay between method and theory is limited. Researchers play a central role here, because they must be equipped to sufficiently respect both the primacy of theory and the primacy of evidence.

As a researcher, it can be a huge task to assert the ambition of developing a full-fledged grand or middle-range theory. Provide, rather, a serious effort towards the development and outline of a tentative pattern of explanations. The ambition should be, rather, to handle a process of theorizing consisting of activities such as abstracting, generalizing, relating, and explaining. "These ongoing activities intermittently spin out reference lists, data and list of variables. Those emergent products summarize progress, give direction, and serve as place markers [. . .] they have vestiges of theory but are not themselves theories" (Weick, 1995, p. 389). Still, there is a trade-off between theory and theorizing.

DISCUSSION QUESTIONS

Based upon this chapter:

1. How would you compare the analytical procedure that is outlined in this chapter to other analytical procedures for analyzing empirical data?
2. What types of results are possible to achieve from a scientific study when applying an analytical procedure as outlined in this chapter?
3. What are the advantages and limitations of applying an analytical procedure like the one outlined in this chapter?

RECOMMENDED FURTHER READING

Alvesson, M and Kärreman, D. (2011) *Qualitative Research and Theory Development: Mystery as Method*. SAGE Publications, Thousand Oaks, USA.

Alvesson, M. and Kärreman, D. (2007). Constructing Mystery: Empirical Matters in Theory Development, *Academy of Management Review*, 32 (4), 1285-1291.

Eisenhardt, K. (1989). Building Theories from Case Study Research. *Academy of Management Review*, 14, 532-550.

Miles, M. B. and Huberman, A. M. (1994). *Qualititative Data Analysis,* Second edition. Sage Publications, Thousand Oaks, USA.

REFERENCES

Alvesson, M., & Kärreman, D. (2007). Constructing mystery: Empirical matters in theory development. *Academy of Management Review*, *32*(4), 1285–1291.

Benbasat, I., & Zmud, R. W. (1999). Empirical research in information systems: The practice of relevance. *MIS Quarterly, 23*(1) 3–16.

Benbasat, I., & Zmud, R. W. (2003). The identity crisis within the IS discipline: Defining and communicating the discipline's core properties. *MIS Quarterly, 27*(2), 183–194.

Burrell, G., & Morgan, G. (1979). *Social paradigms and organisational analysis—Elements of the sociology of corporate life*. Lancaster: Ashgate.

Chenhall, R. H., & Moers, F. (2007). The issue of edogenieity within theory-based quantitative management accounting research. *European Accounting Review, 16*(1), 173–195.

Corley, K. G., & Gioia, D. A. (2004). Identity, ambiguity and change in the wake of a corporate spin-off. *Administrative Science Quarterly, 49*, 173–208.

Elsbach, K. D., & Kramer, R. M. (1996). Members' responses to organizational identity threats: Encountering and countering the *Business Week* rankings. *Administrative Science Quarterly, 41*, 442–476.

Gioia, D. A., & Thomas, J. B. (1996). Identity, image and issue interpretation: Sensemaking during strategic change in academia. *Administrative Science Quarterly, 41*, 370–403.

Luft, J., & Shields, M. (2003). Mapping management accounting: Graphics and guidelines for theory-consistent empirical research. *Accounting Organizations and Society, 28*, 169–249.

Markus, M. L., & Robey, D. (1988). Information technology and organizational change: Casual structure in theory and research. *Management Science, 34*(5), 583–598.

Orlikowski, W. J., & Barley, S. R. (2001). Technology and institutions: What can research on information technology and research on organizations learn from each other. *MIS Quarterly, 25*(2), 145–165.

Orlikowski, W. J., & Iacono, C. S. (2001). Research commentary: Desperately seeking the "IT" in IT research—A call to theorizing the IT artifact. *Information Systems Research, 12*(2), 121–134.

Polanyi, M. (2002). *Personal knowledge, towards a post-critical philosophy*. London: Routledge.

Sutton, R. I., & Staw, B. M. (1995). What theory is not. *Administrative Science Quarterly, 40*, 371–384.

Van Maanen, J. (1979). The fact of fiction in organizational ethnography. *Administrative Science Quarterly, 24*, 539–550.

Walsham, G. (2006). Doing interpretative research. *European Journal of Information Systems, 15*, 320–330.

Weick, K. E. (1995). What theory is not—theorizing is. *Administrative Science Quarterly, 40*, 385–390.

Contributors

Dr. Leon Michael Caesarius is assistant professor at the Department of Business Studies in Uppsala University, Sweden. His research focuses on understanding the organizational implications of the management of knowledge and the role of information technology solutions in such endeavors.

Dr. Mathias Cöster is affiliated to Gotland University where he holds a position as assistant professor. His research comprise studies of IT influence on industries and business strategies.

Dr. Peter Dahlin is affiliated to Jönköping International Business School, Sweden. His research interests include business network dynamics, corporate mergers and acquisitions, and social network analysis.

Dr. Peter Ekman is assistant professor at Mälardalen University in Västerås, Sweden. He has also been a visiting assistant professor at the University of Richmond Robins School of Business, VA. His research and teaching interest is in the intersection between marketing and IT and he is currently engaged in a study of multinational corporations (MNCs) use of global IT.

Dr. Lars Engwall is senior professor of business studies at Uppsala University. He has published widely in the management area, particularly on organizational aspects of media, banks, and universities as well as on the creation and diffusion of management knowledge. He is a member of a number of learned societies.

Dr. Lars Frimanson is affiliated to Uppsala University, Sweden. His research focuses on the behavioral, organizational, and medical effects of accounting information systems.

Dr. Pontus Fryk's academic interest is in organization, management, strategy, and change. He specializes in the digitization of health care and its implications for management, quality, and productivity.

Dr. Magnus Hansson is assistant professor and researcher at Swedish Business School and Centre for Empirical Research on Organizational Control (CEROC) at Örebro University. His research interests are within organizational theory, primarily focusing on restructuring, downsizing and plant closures, and research methodology.

Dr. Stefan Hrastinski is associate professor at KTH Royal Institute of Technology. His research interests include online learning and collaboration in educational and organizational settings.

Dr. Christina Keller is assistant professor and researcher at Jönköping International Business School and Uppsala University, Sweden. Her research interests include online learning, design science research, and information systems in health care.

Maria Kollberg Thomassen is affiliated to the Norwegian University of Science and Technology and is a research scientist at SINTEF Norway. Her research interests include planning and control of operations, supply chain collaboration, and performance measurement.

Dr. Cecilia Lindh is assistant professor at Mälardalen University, since 2009. Her research interest concerns business relationships and her current fields of studies are on the role of information technology and the internationalization of business. She has published her research in edited books and is head of the undergraduate program in International Marketing.

Dr. Eva Lövstål is assistant professor at Blekinge Institute of Technology in Karlskrona, Sweden. Her research is focused on corporate and individual entrepreneurship. She is particularly interested in the question of how to create a supporting environment for entrepreneurship.

Dr. Gunilla Myreteg is assistant professor at Uppsala University, Sweden. Her research interest includes how information technologies, especially ERP systems, are designed and used in organizations for a variety of information purposes.

Index