Progress in IS

Jan vom Brocke
Alexander Simons *Editors*

Enterprise Content Management in Information Systems Research

Foundations, Methods and Cases

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Foreword

From 2005 to 2020, the digital universe will grow by a factor of 300, from 130 exabytes to 40,000 exabytes, or 40 trillion gigabytes (more than 5,200 gigabytes for every man, woman, and child in 2020).

John Gantz and David Reinsel: "The Digital Universe in 2020"

In today's digital information age, rapid technological advancements allow us to create, copy, and distribute information more quickly than ever before. Innovations in information and communication technologies have brought us so many conveniences that it is difficult to imagine our lives without smart phones, tablets, e-mails, instant messaging, social media, and the like.

However, while they are useful and often entertaining, these tools also have their drawbacks. We have come to a point where we are highly dependent on the Internet, where we are always reachable via various communication channels, and where it is increasingly difficult to keep pace with the many phone calls, e-mails, instant messages, and tweets we receive every day. We have to back up so many files—not just reports, spreadsheets, and charts, but also photos, music, and videos—that we risk losing track of them, especially if we create and share multiple versions of the same documents. Put simply, our technological capacities to copy and distribute information are about to outgrow our personal abilities to process it.

The flood of digital information does not stop at the personal level; enterprises also face challenges with the management of digital information. Hundreds or thousands of employees create and share great quantities of information every day, and because they do it in an economic context, they must do it as efficiently and effectively as possible. Finding ways to ensure such efficiency and effectiveness is not easy.

Among the many challenges of today's enterprise information management are reducing search times, maintaining information quality, and complying with reporting obligations and standards. Many of these challenges are essentially old problems in new guises; but because of the vast quantity of enterprise information, they are more difficult to deal with than ever.

Several software systems—most notably, document management systems and (Web) content management systems—have been developed that can help companies deal with these and related challenges. But these systems have typically

been implemented with limited scopes (e.g., for the support of single business functions and processes), so they seldom address all of an organization's information assets. Perhaps this why increasing numbers of companies have implemented "Enterprise Content Management" (ECM) systems for the management of all forms of information, especially unstructured information.

Still, such implementations come with their own problems. Which content objects are to be put under the control of the ECM system? Which processes are affected by the implementation? How do they have to be changed? How should outgrown technology be replaced? Research is challenged to support practitioners in answering these questions.

The above questions show that ECM requires both technological and managerial capabilities, so it has been identified as a relevant field of research from the viewpoint of the academic discipline of Information Systems (IS). However, only a few research articles have been dedicated to the study of ECM implementation in the IS community. With this book we hope to contribute to establishing ECM as an important subfield of IS research.

This book could not have been published without the support of many people. First, we thank the members of a competence center on ECM that we founded in early 2008: Christian Buddendick, Jürgen Mussbacher, and Martin Petry (Hilti AG); Erich Frick and Richard Senti (Hoval AG); René Derungs, Wolfgang Schmied, and Urs Tschumper (Ivoclar Vivadent AG); Sven Lässer and Alex Luchs (National Public Administration Liechtenstein); and Pierino Casagrande and Stefan Novotny (ThyssenKrupp Presta AG). The experiences and insights they shared with us were invaluable in our studies, and several chapters in this book draw from their cooperation. We also thank the government of Liechtenstein for its financial support of the competence center initiative.

We are also grateful for the contributions of the researchers who accepted our invitation to contribute their work to this book. We are especially pleased that Tero Päivärinta, a pioneer in the area of ECM in IS research, provided the preface. Tero's work has inspired us and strongly influenced our research, for which we also thank him.

Finally, we extend heartfelt thanks to Christian Rauscher from Springer, who was a great help throughout the editing and publication process.

Vaduz, Liechtenstein

Jan vom Brocke
Alexander Simons

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Preface: ECM—Still an Ugly Duckling?

Certainly he is not handsome, but he is a very good child, and swims as well as the others, indeed rather better. I think he will grow like the others all in good time, and perhaps will look smaller. He stayed so long in the egg-shell, that is the cause of the difference…

H. C. Andersen: The Ugly Duckling

In one of the earliest white papers on the subject of Enterprise Content Management (ECM), Telleen (1995) outlined how intranets require a new paradigm for managing content in the enterprise. At the time Telleen wrote, all information to be accessed through an intranet was also to be included in the enterprise-wide concept of content management. Soon, the ECM concept gained ground in professional information management societies (especially the Association for Information and Image Management) and among prominent consulting firms, and practitioners started to involve a few diverging foci and definitions of ECM. 7 years later, Fowell (2002), McNay (2002), and Reimer (2002) introduced the concept in the academic outlets (Rickenberg et al. 2012).

Now, 17 years after the first practitioner cracks on the eggshell of the ECM duckling and on the tenth anniversary of the first academic swims with the other ducks, the small community of ECM scholars continues to struggle, characterizing the field as immature and ambiguous (e.g., Grahlmann et al. 2012; Rickenberg et al. 2012). It seems the ECM community, like H. C. Andersen's ugly duckling, still does not fully know "what the birds were called" or "whither they were flying," although we all love a swan—an academic piece of ECM research—when we see one.

Rickenberg et al. 's (2012) literature search found only 68 relevant academic ECM articles published in 2002–2012, and of those, only 7 appeared in recognized information systems journals. Most top journals in the information systems field have yet to publish a single article on ECM. If we compare these figures on academic attention to those of other types of enterprise systems, such as enterprise resource planning (ERP), data warehousing, or customer relationship management (CRM), the difference is striking. For example, a simple search of "enterprise content management" by Google Scholar covering January 1 through August 23, 2012, resulted in 220 hits, while "enterprise resource planning," "data warehousing," and "customer relationship management" had 4,520, 3,060, and 5,040 hits, respectively. ECM also received little attention in the recent curriculum

guidelines for academic information systems education (Topi et al. 2010); "content management" is briefly mentioned under the knowledge area of enterprise architecture, but the course suggestions that include data and information management, enterprise systems, and new technologies all ignore ECM. Is this scarcity of academic attention in line with the practical importance of the field?

A comparison of the ECM market with the ERP market reveals ECM's practical importance. According to Forrester's market analysis, the ERP market size will grow from $45.5 billion in 2011 to $50.3 billion by 2015 (CBR 2011). In turn, the Radicati Group estimated that the ECM market will reach $4.385 billion in 2012 and grow annually by 15 % during the next 4 years to $6.37 billion in 2015 (Radicati and Yamasaki 2012). Hence, the ECM market will be about 12 % of the annual ERP market in 2015. If we look at the software-as-a-service (SaaS) market, the picture changes remarkably. The SaaS market category "Content, Communications and Collaboration" is estimated to reach $3.954 billion in 2012, while the ERP SaaS market is expected to be only $1.957 billion (Mertz et al. 2011). Customer relationship management will still be larger than ECM in the SaaS market in 2012 ($4.341 billion), but it will grow more slowly than ECM, ending with a market size of $5.719 billion in 2015 (Mertz et al. 2011).

Based on this coarse reasoning, we can still state that ECM is something of an "ugly duckling" in academia, struggling to find its natural flock of swans with which the field could start to fly on its own. Compared to the market, ECM may have stayed in its egg and in the flocks of established ducks and geese for too long, focusing on the traditional ways of thinking about enterprise systems and software. For example, if we make the blunt assumption that a field's market size reflects its relevance and compare ECM to, for example, ERP, ECM should deserve at least twice the amount of academic research as it receives today. If ECM joined the swans flying up the winds of the SaaS business, ECM (together with electronic collaboration and communication) should be a key research topic! The ECM academics should do their best to influence the older ducks of information systems to update their education curricula, as we will need to educate more reflective ECM professionals in the future.

This book is warmly welcomed as a remarkable contribution that gathers together many, if not most, of the academic ECM ducklings that have pioneered and struggled to form the identity of the field. It provides one of the leaps that the field needs in its transformation from an unsure ugly duckling with a shaky identity (and little room in the pond among more established ducks and geese) to a beautiful swan. Let us "shake our feathers" and "stretch our slender necks." It is time to fly.

Luleå, Sweden Tero Päivärinta

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Contents

Part I
Foundations and Trends

Enterprise Content Management in Information Systems Research

Alexander Simons and Jan vom Brocke

Abstract The growing interest in technologies that support the creation and management of corporate materials—image brochures, marketing flyers, sales presentations, product catalogues, Web pages, and many more—can be attributed to challenges that result from steadily increasing volumes of digital information that impede an efficient search for corporate documents and their maintenance and reuse. Past Information Systems (IS) research has discussed a number of related challenges in the areas of knowledge management, (Web) content management, and document management. The latest development deals with the notion of enterprise content management (ECM), an integrated approach to information management that covers many of these and related concepts. ECM has received considerable attention in practice, and several market research institutions and consultancies expect increasing growth for the ECM market in the near future. With its focus on the confluence of organizational and technological issues, ECM is a relevant topic for IS research. Notwithstanding its relevance to both academia and practice, the concept of ECM has been largely ignored by the IS discipline and can be characterized as bereft of theory. As a response, this chapter collects, summarizes, and synthesizes ECM research from the IS discipline. With the help of four perspectives researchers can take to explore the concept, it characterizes and explains the concept of ECM and provides an overview and introduction to the other chapters in this book.

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Introduction

Some two decades ago, Rutherford D. Rogers, a former Yale library director, said "we're drowning in information and starving for knowledge" (as, e.g., quoted in Miller 2007, p. 124). Today's organizations face numerous challenges that are due to the rapidly growing number of digital files they create and receive (Rockley et al. 2003, pp. 8–12). As a result, knowledge workers are often unaware of existing content, or they spend extensive time searching for it; then, after an often fruitless search for information, they often re-create existing content, which results in inconsistent versions of the same content. Finally, if people are unaware of available content, unable to find it, or unsure about its accuracy, they can hardly work with it. This issue becomes crucial, as the majority of documents are typically not created from scratch but are built upon existing content that is spread across the enterprise. Hence, the management of content at an enterprise-wide level is a timely challenge for information and knowledge workers.

The concept of ECM has been discussed with increasing frequency by both researchers and practitioners (e.g., Smith and McKeen 2003, p. 648). While previous approaches, such as document management, Web content management, content management, and records management, focus on specific and typically isolated aspects of managing digital information, ECM has emerged as the consolidation of these and further concepts (vom Brocke et al. 2010, p. 2), providing a "modern, integrated perspective on information management" (Päivärinta and Munkvold 2005, p. 1). Thus, ECM reaches beyond single applications, business areas, processes, and functions to capture all of an organization's information assets, regardless of type, format, granularity, or source (Smith and McKeen 2003, p. 648). Examples include texts, figures, and data embedded in corporate documents like Web pages, records, e-mails, and reports.

The term "ECM" was introduced in 2001 by the Association for Information and Image Management (AIIM) International (Blair 2004, p. 65), a non-profit community of professional information and knowledge workers (http://www.aiim.org). Gartner's 2010 magic quadrant report forecasted that the market for ECM software and services would grow more than 10 percent annually between 2010 and 2014 (as cited in Roe 2010). With its focus on the confluence of people, content, technologies, and processes (O'Callaghan and Smits 2005, p. 1274), ECM has been identified as a relevant subfield of IS research (Tyrväinen et al. 2006, p. 628). ECM is a socio-technical phenomenon the implementation of which comes with several technological and organizational challenges (Munkvold et al. 2006, pp. 75–77). At present, there are many consultancy companies and vendor-focused textbooks on ECM (Nordheim and Päivärinta 2004, p. 1), and the majority of decisions about ECM adoption are influenced by business-oriented online magazines like KMWorld or AIIM E-Doc (Andersen 2007, p. 81).

Notwithstanding the increasing attention that ECM is receiving in industry, only a few IS researchers have explored the concept (Tyrväinen et al. 2006, p. 627). While there are long research traditions in related fields, including

information resource management, electronic document management, and knowledge management (Munkvold et al. 2006, pp. 86–93), ECM is an under-researched IS domain that is bereft of theory (Nordheim and Päivärinta 2004, p. 1; Päivärinta and Munkvold 2005, p. 1). There is little doubt that there is a gap between ECM research and practice, and IS researchers are challenged to engage in a field that is increasingly finding its way into the industry. Against this background, this chapter explores the meaning and boundaries of the ECM concept from an IS perspective.

Overview of ECM Research in the IS Domain

The conceptualization of ECM presented in this chapter is grounded in a systematic literature search among more than one hundred of the most influential IS journals (according to the consolidated list shared by the Association for Information Systems) (AIS 2010) and three major IS conferences: the European Conference on Information Systems (ECIS), the International Conference on Information Systems (ICIS), and the Hawaii International Conference on System Sciences (HICSS). The search within these publications was performed in January 2011, using eleven online databases and various journal and conference home pages, including the AIS Electronic Library (AISeL), Business Source Premier (EBSCOhost), IEEE Xplore, ProQuest, ScienceDirect, and SpringerLink (search term: "enterprise content management"). A backward search (i.e., a screening of the articles' references) (Webster and Watson 2002, p. xvi) was conducted to identify additional publications on ECM that the keyword search did not produce. This exercise led to only a small number of ECM-focused articles, suggesting that the concept of ECM is seldom the subject of IS research. Some of the few retrieved articles are summarized in the following (Table 1).

The analysis of these works suggests that ECM is highly relevant to the IS community (Munkvold et al. 2006, pp. 92–93; Tyrväinen et al. 2006, p. 628), but as a research field, it is still in its infancy (Nordheim and Päivärinta 2006, p. 649). Only a few IS studies approach the concept of ECM at the strategic level and/or report on enterprise-wide content management initiatives (Munkvold et al. 2006, p. 71; Päivärinta and Munkvold 2005, p. 1). Exceptions include case studies at J.D. Edwards, a global provider of enterprise resource planning software and services that was purchased by Oracle (http://www.oracle.com) in 2005 (Scott et al. 2004), and Statoil (http://www.statoil.com), a large Norwegian oil and gas producer (Munkvold et al. 2003, 2006; Nordheim and Päivärinta 2004, 2006; Päivärinta and Munkvold 2005).

With regard to research approaches, the literature review makes apparent that ECM research tends to be design-oriented and conceptual in nature (Nordheim and Päivärinta 2004, p. 1; Nordheim and Päivärinta 2006, p. 648; Tyrväinen et al. 2006, p. 632). For example, the two studies by Chiu and Hung (2005) and Kwok and Chiu (2004) on financial ECM systems appear to be largely design-oriented,

Table 1 Selected research papers on ECM from IS

Reference	Contents
McNay (2002)	ECM overview; information model; content lifecycle (create, approve, deliver, manage); ECM software and hardware issues; measurement of ROI and TCO
Smith and McKeen (2003)	Drivers and benefits of ECM (e.g., reduced material costs, time savings, branding); content stewardship (capture, organize, process, maintain); ECM governance
Kwok and Chiu (2004)	Enterprise content model and system architecture for global system integration and control flow management in financial ECM
Nordheim and Päivärinta (2004)	Functional and non-functional customization challenges of ECM (e.g., integration, usability); framework for ECM customization concepts
Scott et al. (2004)	Lessons learned from implementing three approaches to knowledge management at J.D. Edwards: Website community, intranet/extranet, and content management
Chiu and Hung (2005)	Privacy and access control for internal control flow management (e.g., editing, approving, and processing content) in financial ECM
O'Callaghan and Smits (2005)	ECM as an integrated approach to content management and document management; ECM strategy development process (e.g., content audits)
Päivärinta and Munkvold (2005)	ECM issues, objectives, and components; ECM compared to information resource management, knowledge management, and document management
Munkvold et al. (2006)	ECM issues and challenges (e.g., change management, collaboration); ECM compared to its reference areas (e.g., knowledge management)
Nordheim and Päivärinta (2006)	Strategic development and implementation process of ECM (e.g., strategy, feasibility study, solution scenarios, and pilot implementation)
Scheepers (2006)	Framework for implementing information portals in large organizations; user segmentation for improved planning of implementation effort
Tyrväinen et al. (2006)	Research framework of ECM that distinguishes four perspectives: content, processes, technologies, and the enterprise context
Chu et al. (2009)	Mechanisms for content abstraction and annotation; semantic-based approach to content management; creation of meta-content as a critical procedure of ECM

similar to the one by O'Callaghan and Smits (2005) on ECM strategy development. In contrast, the research framework presented by Tyrväinen et al. (2006) might be considered a conceptual contribution. There are only a few empirical studies on ECM, and quantitative studies are notably absent from the literature analyzed. In particular, the impact of ECM on individuals, groups, and organizations has rarely been investigated empirically. The aforementioned Statoil case narrative, for instance, covers only the initial phases of ECM implementation (Nordheim and Päivärinta 2006, p. 654), so it does not provide ultimate answers to how ECM systems influence organizational performance. ECM research also tends

to favor inductive rather than deductive research designs, and it is seldom grounded in theory.

Theories used in ECM research include Damsgaard and Scheepers' (2000, pp. 136–137) four-phase adaptation of Nolan's (1973, pp. 400–403; 1979, p. 117) stage model (used by Scott et al. 2004, p. 38), the four meta-theoretical motors of development and change in organizations by van de Ven and Poole (1995, pp. 520–521) (used by Nordheim and Päivärinta 2006, p. 650), and Trumbly and Arnold's (1989, pp. 27–30) interpretation of the 4P marketing mix for management information systems (used by Scheepers 2006, pp. 638–639).

The analysis of these papers also suggests that a common understanding of ECM has yet to be established in IS research. Many authors either do not explain their understanding of ECM or refer to Smith and McKeen's (2003) early definition of ECM as "the strategies, tools, processes and skills an organization needs to manage all its information assets (regardless of type) over their lifecycle" (p. 648). Considering that Smith and McKeen's (2003) definition of ECM served only "present purposes" (p. 648) in order to "establish the scope of the issue" (p. 657), the following section explores the characteristics and boundaries of ECM. The results presented are also grounded in ECM articles from related disciplines (e.g., Technical Communication) and papers from ECM-related fields like knowledge management, information resource management, document management, records management, (Web) content management, and enterprise resource planning.

Four Perspectives on ECM

Framework

Tyrväinen et al. (2006) present a framework that provides four perspectives on ECM research: content, processes, technologies, and the enterprise context (p. 628) (Fig. 1).

The research framework can be summarized as follows: The content perspective is at its core, as "in any piece of ECM research, the content perspective is involved in some way" (Tyrväinen et al. 2006, p. 628). The technology perspective integrates ECM issues related to hardware, software, and standards. The

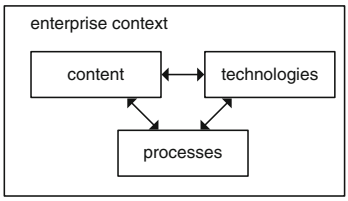

Fig. 1 ECM research framework (adapted from: Tyrväinen et al. 2006, p. 628)

process perspective involves both process development and deployment, where the former mainly refers to the development of processes for implementing and maintaining ECM systems and the latter primarily concerns the implementation of the content lifecycle activities (Tyrväinen et al. 2006, p. 631). Finally, the enterprise perspective describes the context for ECM, so it concerns organizational, social, and legal aspects in particular.

The framework in Fig. 1 suggests that ECM can be considered an enterprise-wide approach that includes not only technologies but also content and processes. Beginning with the enterprise context—that is, the scope and objectives of ECM—the next section synthesizes existing research on ECM based on these perspectives.

Scope and Objectives

Most IS researchers describe ECM as an enterprise-wide approach to information management. Munkvold et al. (2006), for example, write that "ECM represents integrated *enterprise-wide* [italics added] management of the life cycles of all forms of recorded information content and their metadata, organized according to corporate taxonomies, and supported by appropriate technological and administrative infrastructures" (p. 92). However, such an enterprise-wide approach to content management is seen as complementary to, rather than conflicting with, the many works in the field that primarily focus on content management initiatives and projects at the group level (e.g., departments, functional areas). ECM can be framed as an integrated concept that covers and aligns previously isolated efforts to manage content and documents at the firm level.

It has also been suggested that ECM be viewed as a phenomenon that spans organizational borders and applies to entire supply chains. Tyrväinen et al. (2003), for example, say that ECM "focuses on the management of textual and multimedia content *across and between* [italics added] enterprises" (p. 1). Pursuing an enterprise-wide approach to managing content reaches beyond the still prevalent short-term objectives of content management (e.g., ease of navigation, time savings) (Smith and McKeen 2003, p. 649). Recent reports and studies on ECM implementation projects mention very different objectives associated with ECM. Päivärinta and Munkvold (2005) conclude their analysis of a huge set of ECM case narratives shared by AIIM with the observation that "all in all, the emergence of particular objectives varied greatly among the cases depending on the business area or domain in which the enterprise was operating" (p. 3).

The many ECM objectives discussed in the academic literature can be divided into external and internal objectives. Most authors in the field identify regulative pressures related to compliance as one of the major external ECM drivers (Andersen 2007, p. 65). Other external drivers include: establishing a modern image of the enterprise, enhancing the value of services and products for the customer, improving external collaboration (Päivärinta and Munkvold 2005, p. 2), and promoting a company's brand and culture by standardizing document layout

and design (Smith and McKeen 2003, p. 650). Internal ECM drivers include the reduction of paper-based processes, better decision-making, more efficient information processing, improved competitive intelligence (Smith and McKeen 2003, p. 650), enhanced internal collaboration, more meaningful knowledge work, and better information quality (Päivärinta and Munkvold 2005, p. 2). Risk mitigation (Dilnutt 2006, p. 40) and increased efficiency in information distribution (Pullman and Gu 2007, p. 2) have also been identified as important ECM objectives.

Content

The current ECM definition from AIIM refers to documents, information, and content at the same time; it describes ECM as "the strategies, methods and tools used to capture, manage, store, preserve, and deliver *content* and *documents* related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured *information*, wherever that information exists [all italics added]" (Association for Information and Image Management 2011). Certainly, the conceptualization of ECM is not easy, as it remains unclear what types of digital assets are within its scope. IS authors refer to the concept of information in their ECM studies most frequently; specifically, they describe ECM as an approach that concerns the management of all possible forms of information. Smith and McKeen (2003), for example, write that ECM "is an integrated approach to managing *all of an organization's information* [italics added]" (p. 647). Therefore, it is not surprising that prior studies on ECM refer to very different types of information assets, including Web pages, marketing materials, reports, budgeting documents, images, technical drawings, presentations, e-mails, templates, invoices, and audio and video files (e.g., Blair 2004, p. 65; Iverson and Burkart 2007, p. 408; Päivärinta and Munkvold 2005, p. 4; Smith and McKeen 2003, p. 647; Tyrväinen et al. 2006, p. 627). However, some researchers also emphasize that ECM pertains to more than informational assets as carriers of organizational knowledge because it includes such digital goods as music files and background images (Tyrväinen et al. 2006, p. 629). In addition, congruent with AIIM's ECM definition, ECM focuses on unstructured information. While there are some exceptions (e.g., Chu et al. 2009, p. 2360; Nordheim and Päivärinta 2006, p. 649; Päivärinta and Munkvold 2005, p. 7), most IS researchers write little about structured data in their ECM studies. The framework for ECM strategy development by O'Callaghan and Smits (2005), for example, refers primarily to unstructured information (p. 1271), and John F. Mancini, the current president of AIIM, explains that "90 % of the information that organizations must manage is unstructured—information that does not neatly fall into the rows and columns of a traditional database" (Mancini 2004, p. 2).

Apart from information, authors frequently refer to content and documents in their ECM studies, and they often use the notion of content to describe the separation of content from its presentation and structure (Clark 2007, p. 45) and to the segmentation of documents into content components (O'Callaghan and Smits 2005, p. 1273). Such components of content (e.g., texts, graphics) can be assembled in various containers (e.g., brochures, flyers) of media and presentations, improving the speed in which these materials are created and ensuring their consistency and timeliness (O'Callaghan and Smits 2005, p. 1272). However, ECM pertains not only to single content components, but also to entire information products, most notably documents. This distinction is expressed in the property of granularity that defines the extent to which content is broken down into components (Rockley et al. 2003, pp. 165–166). Tyrväinen et al. (2006) write "the early content management solutions used either technically coarse content storage granularity with very large content units (files, documents) or high granularity with very small content units (data items in databases)" (p. 629). In this regard, the concept of ECM exceeds earlier approaches by including digital goods of varying levels of granularity, ranging from complete information products (e.g., documents) to the smallest components they contain (e.g., sections, paragraphs, or even sentences) (O'Callaghan and Smits 2005, p. 1274). Accordingly, O'Callaghan and Smits (2005) consider ECM the synopsis of both (Web) content management and document management (p. 1273).

Processes

At least two main process categories can be distinguished: software-related processes (including developing, implementing, and maintaining ECM systems) and lifecycle-related processes (Tyrväinen et al. 2006, p. 631). This review focuses on the latter category since the stages of the content lifecycle "change the content and affect not only how it is used in the organization, but also possibly the way organizations are able to operate" (Iverson and Burkart 2007, p. 411). Many content lifecycle models are present in IS research (e.g., McNay 2002, pp. 398–399; Päivärinta and Munkvold 2005, p. 4; Smith and McKeen 2003, p. 651). ECM is commonly understood as covering all of the phases in the content lifecycle, ranging from creation to deletion (Smith and McKeen 2003, p. 648). The Statoil case study by Munkvold et al. (2006), for example, "confirms the importance of a holistic focus on content life cycle, from capture/creation to long-term retention or deletion, as a core characteristic of ECM" (p. 85). Therefore, ECM can be distinguished from related concepts, most of which tend to consider single phases of the content lifecycle. For example, content management has traditionally focused on content creation, document management has focused on storage and retrieval processes, Web content management has focused on publishing

processes, and records management has focused on document retention. At a very basic level, the following lifecycle phases can be distinguished: creating and capturing, storing and retrieving, editing and reviewing, and retaining and deleting content (Fig. 2).

Creating and capturing content. At the outset, ECM includes the managerial and technological capabilities required to create and capture content efficiently. Content creation has evolved into a critical success factor for organizational performance, as information managers are increasingly challenged to maintain the consistency and timeliness of their information products at an enterprise-wide level (Scott et al. 2004, pp. 37–38). The key to efficient content creation is to systematically reuse content (Rockley et al. 2003, pp. 23–42). O'Callaghan and Smits (2005) consider content reuse a "paradigm shift," thus emphasizing that content producers, "rather than writ[ing] entire documents … create elements ('content objects') that can be assembled in different 'information products' (e.g. a brochure, a press release, a presentation), for a number of different 'delivery methods' and audiences ('target users')" (p. 1272). Rockley et al. (2003) identify the potential of reusing content as increased consistency of content, lower costs for content production and maintenance, and rapid configuration and translation of content (pp. 25–26). Compared to creating and reusing content, capturing pertains to collecting content from internal and external sources, a process that typically requires scanning and imaging, file conversion, and standardized data forms (Päivärinta and Munkvold 2005, p. 4).

Storing and retrieving content. Because of the huge amounts and various types of content created and used in organizations, the volumes of which impede the efficient search for information, content storage and retrieval processes have been identified as being key to any ECM strategy since, "clearly, content is useless if it cannot be easily searched or navigated" (Smith and McKeen 2003, p. 652). Making content searchable at an enterprise-wide scale requires appropriate storage pools (e.g., Intranet, team sites, and file servers) (Nordheim and Päivärinta 2006, p. 657), well-defined metadata, and a corporate taxonomy. In this context, metadata are "information about content" (Smith and McKeen 2003, p. 653) that exist beside the content and add context and semantics to it (O'Callaghan and Smits 2005, p. 1274). At Statoil, for example, a corporate taxonomy provided a basis for

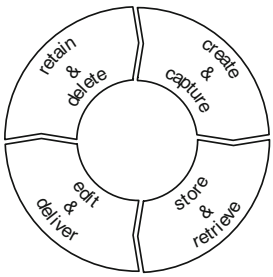

Fig. 2 Content lifecycle model

end users to navigate through and search for content, to categorize user roles and their responsibilities, to define and coordinate access rights, and to automatically generate metadata (Munkvold et al. 2006, p. 81).

The relevance of corporate taxonomy development becomes apparent in the diversity of strategies for information search and retrieval that typically exist in different business areas, thus highlighting the integrative character of ECM (Päivärinta and Munkvold 2005, p. 1). In many organizations, single business units use isolated content management applications that are best suited to their individual demands. Consequently, the integration of these isolated applications is at the core of ECM in order to enable the efficient exchange of content at the firm level.

The IS literature highlights several other challenges related to content storage and retrieval. Perhaps most noteworthy is the ECM security issues that Kwok and Chiu (2004) and Chiu and Hung (2005) discuss. Here, important ECM drivers include disaster recovery and protection of content against unauthorized access. Digitization of paper archives and storage on secure file servers can preclude the destruction of paper documents in case of water or fire disasters (Grudman 2008, p. 61), and ECM systems can significantly support the implementation of sophisticated security mechanisms for protecting content against misuse (Munkvold et al. 2006, p. 82).

Editing and delivering content. When content is edited, new versions are created, so content editing processes concern version management in particular. Munkvold et al. (2006) experienced a situation at Statoil in which "important documents … were sometimes saved plainly in personal file folders after their production and first-hand delivery (typically through e-mail), despite the espoused policy to utilize the shared document management systems" (p. 78). The consequence of such behavior is a decreased ability to edit and update content. Modern ECM suites provide shared and integrated file systems that can help to avoid these and related issues.

Other activities related to the editing process are reviewing and translating content, where the management of components, rather than complete documents, is important (O'Callaghan and Smits 2005, p. 1272). Rockley et al. (2003), for example, explain how memory translation systems can support the identification of content components that require revision in case the originally translated content is edited (p. 322). Once content is reviewed and approved, it can be distributed within an organization and published for external audiences. ECM systems can support content publication processes by safeguarding a consistent and compliant presentation, thus supporting the promotion of an organization's brand and culture for customers or other stakeholders (Smith and McKeen 2003, p. 650). Again, appropriate content reuse turns out to be important to ensure the consistency and currency of published content—in this case not only regarding the information it carries, but also in terms of appearance, thus conveying "a common look and feel to corporate materials" (Smith and McKeen 2003, p. 650).

Retaining and deleting content. ECM processes for content retention have gained significant attention in both research and practice. Smith and McKeen

(2003), for example, point to the importance of "establishing principles and standards for content retention and preservation and for its disposal" (p. 654). Governments, customers, and suppliers create enormous pressure on organizations to comply with various regulations and standards, so Andersen (2007) believes that many authors see compliance as the biggest ECM driver (p. 65). Similarly, an AIIM survey identified compliance as among the three most important business challenges that drove ECM adoption in 2007 (as cited in Swartz 2007, p. 14). The academic literature also indicates the relevance of processes for deleting content. In their study of the Statoil case, for example, Munkvold et al. (2006) observe that "there were no embedded routines for retention of information in the production, storage or archiving systems.… The 'cleaning and deleting of information' was not highly prioritized among the employees" (p. 79).

Technologies

The integrative nature of the ECM concept refers not only to its scope (i.e., enterprise-wide), focus (i.e., all organizational information), and the activities involved (i.e., all phases within the lifecycle), but also to the enabling and supporting technologies. The notion of ECM emerged as an umbrella term for a large number of different technologies and applications in the industry. The Real Story Group (http://www.realstorygroup.com), for example, maintains a comprehensive list of ECM vendors, from monolithic suites that promise to cover all types of information across an organization to specialized systems that focus on particular types of information, specific industries, or single business areas (Real Story Group 2010).

Accordingly, the academic literature mentions several applications, technologies, components, and functionalities relevant to ECM. At a very general level, these include systems for document and content management (O'Callaghan and Smits 2005, pp. 1271–1274), collaboration (Blair 2004, p. 65), digital rights management (Päivärinta and Munkvold 2005, p. 6), workflow management (Smith and McKeen 2003, p. 656), enterprise portals (Scheepers 2006, p. 635), Web content management (Smith and McKeen 2003, pp. 650–651), and records management (Dilnutt 2006, p. 40), to name but a few. These and related technologies enable and support the execution of all the activities in the content lifecycle. Regarding the distribution of content, for example, Iverson and Burkart (2007) distinguish electronic bulletin boards, e-mail and discussion lists, and Web portals (p. 405).

Grahlmann et al. (2010) present a holistic architecture for ECM systems in order to determine the functional scopes of the three ECM cases they studied (p. 1183). Their approach goes beyond functionalities at the process level (e.g., collaboration, communication) to distinguish ECM components at the presentation

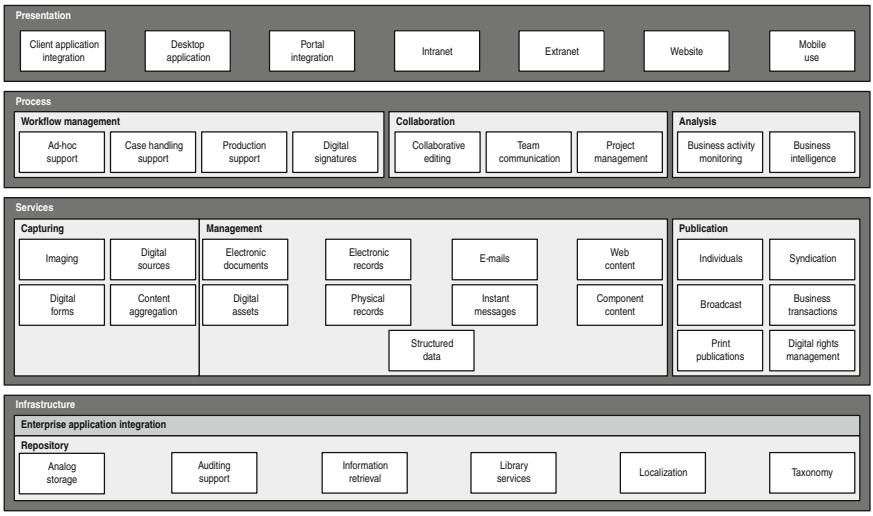

Fig. 3 Functional scope of ECM systems (*source* Grahlmann et al. 2010, p. 1183)

level (e.g. intranet, extranet), the service level (e.g., imaging, e-mails), and the infrastructure level (e.g., storage, library services), thus illustrating the variety of components and functionalities that are typically part of modern ECM systems (Fig. 3).

Summary and Outlook

In summary, ECM can be discriminated from related approaches, such as document management or content management, in at least four ways. Through an enterprise lens, ECM is an organization-wide approach that spans the boundaries of single business functions, areas, processes, and applications. From a content perspective, ECM covers the management of all forms of semi- and unstructured information, regardless of type, format, source, or granularity. As for the process dimension, ECM manages content over the entire lifecycle, from creation to deletion. At the technological level, ECM software packages include several established business applications, e.g., for document management, (Web) content management, and records management. Table 2 summarizes the main results from the literature review.

The results of the literature review confirm that ECM can be understood as an integrated approach to managing all of an organization's digital assets over their entire life cycle (Smith and McKeen 2003, p. 648). ECM systems are monolithic software suites that provide all the functionalities required for this management,

Table 2 Characterization of ECM

Perspective	Conclusions
Enterprise	The concept of ECM goes beyond applications at the group level (e.g., departments, functions) in that it integrates and aligns a multitude of information management efforts at the firm level. ECM objectives, which are both tactical and strategic in nature, go beyond the operative usage of digital assets in an organization (e.g., promoting an organization's brand, image, and culture)
Content	As a function of granularity, ECM covers single components of content (e.g., texts, images) and complete information products (e.g., documents). Content, which predominantly exists in an unstructured—or at least semi-structured—form, can be informational as a carrier of knowledge (e.g., textual content) as well as non-informational (e.g., multimedia content)
Processes	ECM covers the entirety of phases in the content lifecycle, including creating and capturing content (e.g., content reuse, scanning and imaging), storing and retrieving content (e.g., corporate taxonomy development, data security), editing and delivering content (e.g., version management, translation and reviews), and retaining and deleting content (e.g., compliance, preservation of content)
Technologies	ECM systems vary significantly in terms of their size and scope, reaching from monolithic suites that cover all types of information spread across an organization to specialized systems that focus on specific types of information, industries, or business areas; such systems integrate several related technologies (e.g., document management, content management, and records management)

ranging from scanning documents to keeping records. This description is in line with a statement that Connie Moore, Vice President at Forrester Research (http://www.forrester.com), made in a roundtable discussion on ECM:

> We use enterprise content management as an overarching term that describes a number of different technologies that up until recently have been seen as discrete markets. It includes document management, Web content management, records management, document imaging and digital asset management, among other things. We shifted away from using the term "content management," because the term generally was used to refer to Web content management only, and did not cover all the content in an enterprise. ECM encompasses all of the unstructured content in an organization (as quoted in Lamont 2004).

Between the time that this literature review was conducted and when it was published, a couple of ECM studies have been completed by IS researchers, and among them are also literature reviews (e.g., Alalwan and Weistroffer 2012; Grahlmann et al. 2011; Rickenberg et al. 2012). While we can see an increasing publication activity in the field, these reviews also show that a common conceptualization of ECM is still to be developed. Accordingly, it is hoped that this chapter can inform future studies in the field and support the establishment of ECM as a distinct field of IS research that is not only of high practical relevance but also of theoretical value.

The Remainder of this Book

The following chapters in this book present foundations and tools of ECM and application examples. Accordingly, the book is structured into three main parts. Part A explains foundations of ECM on different levels, including an ECM software overview on the market level, culture-related issues on the organizational level, and issues of technology acceptance on the individual level. This part also discusses the rhetorical challenges of ECM implementation. Part B presents methods and tools of ECM implementation, including ECM strategy development and content audits, readiness assessment, and content standardization. Part B further discusses the role of ECM in cloud computing and advisory support. Finally, Part C presents selected application examples of ECM, including case studies of the enterprises Hilti, Hoval, and J.D. Edwards. This part also covers the implementation of ECM in other contexts than the enterprise context, for example, in public administrations.

Apart from this introduction, Part A includes four chapters, which are summarized in Table 3. The table also shows which of the four perspectives on ECM these chapters predominantly take.

The chapter 'The Market for ECM Software' by Martin Böhn characterizes the ECM market as a "market of buzzwords" that features many different products that can have very different meanings, including document management, records management, and archiving. It presents different approaches to structuring the ECM market and also highlights current trends and potential developments in the future. The results are based on ten years of market research and consultancy in the field of ECM.

The chapter 'Factors in the Acceptance of Enterprise Content Management Systems' by Laurent Wiltzius, Alexander Simons, Stefan Seidel, and Jan vom Brocke identifies and explains twenty-two factors at different levels that influence

Table 3 Chapter overview Part A

Chapter	Authors	Title	ECM perspective			
			E	T	P	C
1	Alexander Simons, Jan vom Brocke	Enterprise content management in Information Systems research	x	x	x	x
2	Martin Böhn	The market for ECM software		x		
3	Laurent Wiltzius, Alexander Simons, Stefan Seidel, Jan vom Brocke	Factors in the acceptance of enterprise content management systems	x	x	x	x
4	Dave Clark	Rhetorical challenges and concerns in enterprise content management		x		x
5	Theresa Schmiedel, Jan vom Brocke	Cultural values matter: the role of organizational culture in ECM	x			

(Enterprise: *E*, Technologies: *T*, Processes: *P*, Content: *C*)

the success of ECM systems, reaching from information and communication and top management support to corporate taxonomy development and metadata management. The results draw from the academic literature and empirical data collected in qualitative interviews with ECM practitioners.

The chapter 'Rhetorical Challenges and Concerns in Enterprise Content Management' by Dave Clark discusses ECM from the viewpoint of technical communication. The author discusses the role that ECM plays in the discipline and highlights important rhetorical issues, including concerns about sales and implementation, issues with component-based writing, and new complexities for training and development. The chapter concludes with an outlook on future work in the field.

The chapter 'Cultural Values Matter: The Role of Organizational Culture in ECM' by Theresa Schmiedel and Jan vom Brocke analyzes the influence of ECM on organizational culture, and vice versa. It identifies and discusses the characteristics of an organizational culture that is supportive of ECM, and presents ways how to realize the same. The results are based on data collected in interviews and group discussions with ten ECM experts from academia and practice.

Grounded in these foundations, Part B presents methods and tools for ECM implementation (Table 4).

The chapter 'Strategy Development for Enterprise Content Management' by Martin Smits and Ramon O'Callaghan presents a conceptual framework for the development of an ECM strategy. The authors explain that ECM can be understood as the convergence of document management and content management and discuss important phases of ECM strategy development, reaching from auditing content to IT infrastructure investments. The framework has been tested for applicability in a practical case.

Table 4 Chapter overview Part B

Chapter	Authors	Title	ECM perspective			
			E	T	P	C
6	Martin Smits, Ramon O'Callaghan	Strategy development for enterprise content management	x			x
7	Andrea Herbst, Alexander Simons, Jan vom Brocke, René Derungs	Critical success factors in enterprise content management: toward a framework for readiness assessment	x			
8	Joachim Pfister, Gerhard Schwabe	Content management for advisory support information systems		x		x
9	Ivo Gonzenbach, Christian Russ, Jan vom Brocke	Make or buy? Factors that impact the adoption of cloud computing on the content level				x
10	Jörg Becker, Tobias Heide, Łukasz Lis	Fostering comparability in content management using semantic standardization				x

(Enterprise: *E*, Technologies: *T*, Processes: *P*, Content: *C*)

The chapter 'Critical Success Factors in Enterprise Content Management: Toward a Framework for Readiness Assessment' by Andrea Herbst, Alexander Simons, Jan vom Brocke, and René Derungs identifies a set of critical success factors for ECM, including change agent deployment and quick wins identification. On that basis, the authors present a framework that helps organizations to assess their ECM readiness. Two illustrative examples highlight the practical applicability of the proposed approach.

The chapter 'Content Management for Advisory Support Information Systems' by Joachim Pfister and Gerhard Schwabe discusses the role that ECM infrastructures and technologies play in advisory processes. The authors explain which types of content are typically required in advisory situations and propose an architecture for ECM-based advisory support information systems. From the user, information, and systems views, the chapter also discusses requirements that such an architecture has to meet.

The chapter 'Make or Buy? Factors that Impact the Adoption of Cloud Computing on the Content Level' by Ivo Gonzenbach, Christian Russ, and Jan vom Brocke focuses on the role of cloud computing in ECM. Specifically, the authors discuss what content should be managed in the cloud and what should not. Because this is a make-or-buy decision, they use transaction cost theory as a theoretical framework, so the chapter covers issues of specificity (e.g., standardization of content), uncertainty (e.g., legal situation), and frequency (e.g., frequency of usage).

The chapter 'Fostering Comparability in Content Management Using Semantic Standardization' by Jörg Becker, Tobias Heide, and Łukasz Lis focuses on issues of content consistency and comparability. It demonstrates semantic standardization of content at the example of research portals and proposes a generic portal structure for that purpose. This structure has to be customized to fit specific applications, and the authors use the design science research paradigm as an example to demonstrate such a customization.

Part C presents selected examples and cases of ECM implementation (Table 5).

The chapter 'The Knowledge Garden and Content Management at J.D. Edwards' by Judy E. Scott summarizes and discusses the implementation of three ECM-related initiatives at J.D. Edwards from 1995 to 2003. It explains the evolution of the different technologies, and identifies important lessons that J.D. Edwards learned at different implementation stages, reaching from the reuse of technical documentation to the development of an enterprise vision.

The chapter 'Lessons Learned from Implementing Enterprise Content Management at the National Public Administration in Liechtenstein' by Alexander Simons, Jan vom Brocke, Sven Lässer, and Andrea Herbst presents fifteen lessons learned from an ECM initiative in a public administration context, for example, the definition of a transition strategy from paper to digital records. The results are organized at the organizational and the departmental level and grounded in qualitative data collected over a period of nineteen months.

The chapter 'Exploring Two Approaches to Information Management: Two Swedish Municipalities as Examples' by Proscovia Svärd discusses the differences

Table 5 Chapter overview Part C

Chapter	Authors	Title	ECM perspective			
			E	T	P	C
11	Judy E. Scott	The knowledge garden and content management at J.D. Edwards	x	x	x	x
12	Alexander Simons, Jan vom Brocke, Sven Lässer, Andrea Herbst	Lessons learned from implementing enterprise content management at the National Public Administration in Liechtenstein	x	x	x	
13	Proscovia Svärd	Exploring two approaches to information management: two Swedish municipalities as examples	x			x
14	Alexander Simons, Jan vom Brocke, Stefan Fleischer, Jörg Becker	Conceptual modeling of electronic content and documents in ECM systems design: results from a modeling project at Hoval				x
15	Jan vom Brocke, Christian Sonnenberg, Christian Buddendick	Justifying ECM investments with the return on process transformation: the case of an ECM-driven transformation of sales processes at Hilti Corporation		x	x	

(Enterprise: *E*, Technologies: *T*, Processes: *P*, Content: *C*)

and similarities between ECM and records management. Based on different factors like drivers and focus the author shows that the two approaches have much in common but also differ in important ways. Case studies of two Swedish municipalities are used to discuss the results presented in the academic literature on this matter.

The chapter 'Conceptual Modeling of Electronic Content and Documents in ECM Systems Design: Results from a Modeling Project at Hoval' by Alexander Simons, Jan vom Brocke, Stefan Fleischer, and Jörg Becker presents a conceptual modeling language for describing documents and their contents. The modeling language facilitates description of how content is reused in different documents, the creators and users of content, and the software systems involved. The practical applicability of the proposed approach is demonstrated at the example of Hoval's spare parts catalogue.

Finally, the chapter 'Justifying ECM Investments with the Return on Process Transformation: The Case of an ECM-Driven Transformation of Sales Processes at Hilti Corporation' by Jan vom Brocke, Christian Sonnenberg, and Christian Buddendick focuses on justifying and evaluating investments in ECM systems. Using methods from capital budgeting the chapter shows how to assess the economic value of ECM implementation. The usefulness of the method is demonstrated for an ECM-driven process transformation at Hilti.

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The Market for ECM Software

Martin Böhn

Abstract The market for enterprise content management (ECM) systems is difficult to understand. ECM systems provide an information backbone for an entire organization, but the areas of application and how the systems are used and handled vary between enterprises. Technical standards and functional enhancements have further blurred the borders between the software sections, and the segmentation of the ECM market is complicated by the many different terms used. This paper demonstrates a way to classify ECM software systems and highlights substantial developments within the market. In an effort to enhance our understanding of how the term "ECM" is used today, this paper uses several approaches to specify the ECM market's segments. The focus points are the software offering/vendor, the area of application, and the customers' point of view. The evaluation is based on 10 years of market analysis of ECM software in the BARC laboratory, consulting customers in ECM projects, and doing market research on ECM solutions. By providing detailed information on the segments of the ECM market and market trends, this paper provides a theoretical approach to ECM market analysis and some practical tools with which to evaluate software solutions for their applicability in a specific project.

ECM: Market of Buzzwords

A fundamental problem for ECM is the lack of generally accepted, broadly used terms. The name of a product seldom says much about its potential uses because the same terms are often used to describe different kinds of software solutions with particular areas of application, while highly similar solutions are given different

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names. Vendors try to differentiate themselves from their competitors by making up new buzzwords in order to give their own portfolios the impression of being unique and innovative. Thus, the problem of a lack of a common understanding is increasing.

Some examples of terms with unclear meanings are:

- Document management (DM): DM is a small subsection of the common American definition of ECM provided by AIIM (formerly the Association for Information and Image Management, and now AIIM: The Enterprise Content Management Association). In the German market, DM is usually used as a synonym for ECM, covering much of its functionality (including process management). Depending on where a software vendor has its headquarters, the terms DM and ECM are used differently in the market.
- Records management (RM): This term is used to describe the management of information within folder structures (used to organize content for ease of access) or to characterize the long-term storage of content (including retention management).
- Archive: While most users agree that archiving describes the long-term storage of content, others associate archiving with the general safekeeping of content against unlawful access or loss. The associated retention periods also differ; in the public sector, an archive can imply permanent, "eternal" storage, while documents kept for as long as 40 years still fall under "mid-term storage." Commercial users use other storage terms.

As a result, prospective buyers and customers are unsettled and unsure of what to make of ECM, and many projects are cancelled, postponed, or reduced to small areas of application. Initiatives to implement ECM systems often fail from the start when the project team cannot agree on the targets or the associated terms. It is difficult to estimate the potential of new ECM software since the functionality and the achievable potential do not necessarily coincide with the names applied by the software vendors. The foundation for a classification of software as a segment of the software market can be established only by evaluating the possible fields of application, not by looking at buzzwords.

Approaches to Structuring the ECM Market

Market segments can be identified based on how the term "ECM" is used and on the various software offerings. Segmentation can be done by looking at the available functionality, the size of the vendor, or the focus of the offering. The approaches to classification can be combined in order to provide the specific segments, which will be analyzed more closely in later sections of the chapter.

Using segmentation by functionality, the analysis of the market shows that "ECM" is used to describe software solutions that cover various areas of application. The major software segments are:

- ECM as process-oriented DM: This approach, which covers all sorts of content along the information life-cycle, is the broadest approach.
- ECM as web content management (WCM): The focus of these solutions is on the generation, administration, and publication of content for the intranet or internet.
- Adjoining market segments: The functionality provided by these solutions supplements the classic ECM solutions. Vendor and customer projects usually focus on these partial solutions, which have to be included into a broader ECM strategy as a second step.

The segmentation by functionality is the most important and purposeful way to classify ECM software and is the foundation of this paper.

Segmentation by size or geographical pervasiveness divides the market into international, multinational, national, and regional software vendors. It is important to know whether the product is offered in a specific market by the vendor itself or by a partner and to know the partner's qualifications. Partners' understanding of the basic conditions of a market and the particular circumstances of a class of customers is usually better than that of the vendor, while the vendor often possesses a deeper technical knowledge and more experience in implementing, customizing, and maintaining the product.

Even though size and geographical pervasiveness are often proposed as requirements in software selection projects, they cannot be used to judge the quality of service or the range of possible uses. Small and medium-sized vendors can certainly offer high-quality software solutions, while some large vendors weaken their position with vague product development, obscure product portfolios, and cumbersome support.

Segmentation by focus concerns the area and scope of application, so it concerns the target customer base. While some software vendors offer general, broad solutions (suites), others specialize in certain functions, industries, or ranges of application. This form of segmentation is complementary to segmentation by functionality.

There are some limits to how the market can be segmented. The market is constantly in motion, with customer requirements changing and vendors trying to penetrate new market segments. Big vendors in particular try to close functional gaps through acquisitions (like Open Text and IBM have shown in recent years), while small vendors often engage in strategic alliances to broaden their functional offering or get into new markets. Many vendors also try to build a partner network in order to gain access to a workforce and knowledge about a particular region or line of business.

ECM as Process-Oriented Document Management

One has to examine the document lifecycle to understand the focus of these solutions. The document lifecycle covers all tasks and functions concerned with the capturing (creation or import), indexing, storing, searching, handling and

adaption, and distributing (collaboration, workflow, publishing), up and including to the long-term archiving and ultimate destruction of documents (Munkvold et al. 2006). A matrix can be developed along this lifecycle to determine which document sources (e.g., scanned paper, office documents, e-mail) and document types (e.g., contracts, invoices, meeting minutes, offers) are covered to what degree in which business areas (department/entire enterprise/several enterprises generally or specific to a line of business).

This matrix is completed by general aspects of information management like user and rights management or compliance (Böhn 2007). The key elements of ECM software used here are status-driven information management and workflow functionalities. In recent years, the offering of collaboration functionalities has increased to provide support for project-oriented, only slightly structured processes.

The development toward modern ECM started small, with the simple electronic storage of content, and more and more functionality was added. The focus moved away from storage to searching and then to the use of information. Business process became the focal point—first only small, sequential workflows, and then complex processes and project support through collaboration. No longer were single departments the goal of projects; the goal became the entire company, which was emphasized in the "enterprise" of ECM. The next step is to support more cross-company processes to connect customers and partners closely.

Within the ECM market are vendors based in other software segments that have gradually expanded their products. Collaboration software vendors in particular try to enhance their products with search, process management, and archiving.

Classification by Area of Application

The market for ECM solutions that cover process-oriented DM is characterized by vendors of software suites and specialists who provide a functionality or a service that is not available from an ECM suite or that has higher quality, lower cost, or a better customer experience (e.g., a better-suited interface). An overview of suites and specialists is given in Fig. 1 using a slightly modified document lifecycle as a structure.

ECM suites provide comprehensive solutions for the entire document lifecycle, sometimes by (secretly) using third-party products to strengthen their product offerings. Typical vendors of ECM suites in this segment are EMC Documentum, IBM, Open Text on a global level, and Allgeier, Ceyoniq, COI, d.velop, Easy, ELO, Fabasoft, H&S, iworxs, Optimal Systems, SAPERION, SER, and windream on a multi-national level (Böhn et al. 2009a).

Specialists for lines of business have created for business sectors offerings that include specialized functionality or pre-defined document classes, folder structures, workflows, and user interfaces. In addition, these specialists usually provide interfaces to the applications common in these industries. Typical markets are the public sector, engineering, and the pharmaceutical industry.

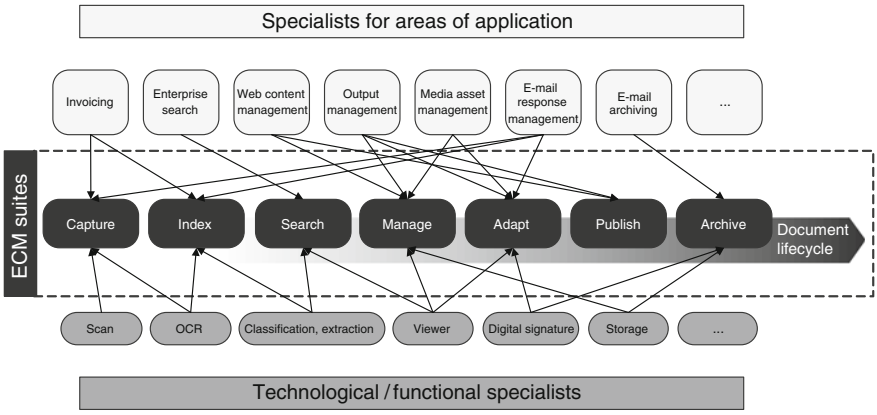

Fig. 1 ECM suites and specialists

Aside from the technical and functional features of the software, these vendors usually have the advantage of speaking their customers' language, using the right terms, and having a detailed knowledge of common problems in a particular field. Thus, they can address the prospective buyers effectively and provide a clear picture of the uses and potential benefits of their software.

Specialists in areas of application have created solutions that are only a part of an overall ECM strategy. These specialists make up for the lack of general functionality by providing specialized solutions that can be implemented quickly, along with specific support offers and attractive pricing. Not all of these solutions could be integrated into a comprehensive ECM scenario. Typical sub-markets are:

- Invoicing: Complete packages and specialized vendors for the capture, classification/extraction of invoice data and the distribution and checking are often used by ECM suites as well (Schiklang et al. 2010).
- E-mail archiving: To relieve e-mail servers and comply with regulations, vendors offer software and bundles of software and hardware (Gantner et al. 2008).
- Contract management, digital personnel file, etc.: Small vendors have created specialized solutions for some minor scenarios. The available functionality to capture, manage, and edit content is usually matched to the particular task, but the ability of the solution to be expanded to other areas is limited.

While some specialists have developed new solutions, others have stripped down existing ECM suites, used only certain modules, and added small parts.

Specialists for functions or technologies focus their development on clearly defined parts of the ECM spectrum. These systems are often used as enhancements of ECM suites that offer improved functionality or usability (Böhn et al. 2009a). These sub-segments include:

- (Enterprise) Search: These systems can include information sources in a combined search and automatically index the content. Access management is highly

important since most systems included in the search use individual access rights that have to be incorporated when providing search results. There are specialists for displaying search results and relationships between documents as well. These correlations can be visualized, such as in semantic webs.

- Document distribution (collaboration, workflow): Here specialists provide additional functionality to define, execute, administer, and monitor processes or project environments. Other advantages can be in access management, rules management, or integration into third-party applications.
- Display (viewer): The number of document formats that can be displayed and the available functionality (comments, annotations, measurements, etc.) characterize these systems.
- Archiving: Specialized solutions are available to access archive solutions and manage multiple storage devices. These solutions allow logical content management to be abstracted from the physical storage and offer centralized access and retention management.
- Digital signature: Almost all ECM solutions use specialized products to create new digital signatures for documents and folders and to check existing digital signatures. These vendors also provide functions to manage signatures and expiration of the validity.

Most of the technical infrastructure of an ECM system is also provided by third-party software; examples are databases and application servers.

Specialized software is available for certain business software, especially SAP ERP, Lotus Notes, and Microsoft SharePoint. These (mostly smaller) vendors integrate their software into these existing systems and thereby provide additional ECM functionality, such as archiving and advanced search. Most of the projects are done by companies that have defined this business software as a strategic product and where most of the employees use the product daily. Usually, several of these offerings have to be combined in order to realize a comprehensive ECM strategy, which makes the projects harder to manage.

Integrating ECM solutions into standardized applications and tools throughout the content life cycle is a key requirement in creating a common information platform and easy access to information (Päivärinta and Munkvold 2005), thereby offering significant added value to the user.

With the exception of technical specialists, there is significant competition between specialists and ECM suites in all of these segments. The suite vendors try to adapt their product and service offerings to bridge the gap between their offerings and their customers' needs. Much of the market development in recent years has been the result of developing new solutions or finding additional partners to improve their offering.

Many projects in many lines of business of many sizes have shown that, from a customer point of view, who has developed what functionality is not as important as who can provide training, technical support, and functional service. Therefore, prime contractor-ship is usually a highly rated requirement in software selection projects. During the evaluation, the contractor has to guarantee that he or she can

provide answers to all questions concerning the selection, implementation, and operation of the software so the contractor must either have extensive training in the third-party products used or ensure quick access to appropriate experts.

The differences between best-of-breed (combinations of specialists) and suites are often smaller than expected. Simply because a suite vendor can offer many solutions from a common price list does not automatically imply that these modules are truly integrated and can operate well together. Especially after mergers, it often takes years to get to a common codebase and metadata model. Here, as with the issue of terms and buzzwords, only a thorough functional evaluation can be the grounds for a decision; words and phrases don't mean much.

Classification by Client or Access Type

Because most ECM suites offer similar levels of functionality, the philosophy for handling documents becomes more important. Four segments can be identified based on the user group's requirements (Böhn 2008), as shown in Fig. 2.

- ECM as the leading application (the user's front end): Here the ECM system operates using a separate user interface (desktop or web client). Broad functionality is usually available. The functional gap between desktop clients (installed on the individual user's computer) and web clients (running in a web browser) has decreased in recent years as a result of technical developments like AJAX. The target audience for this kind of application is users who spend the majority of their working hours editing and managing documents and dealing with associated tasks and processes. Offline clients can access content and tasks without a connection to the content server. Mobile applications for use with smartphones and tablets are also available.

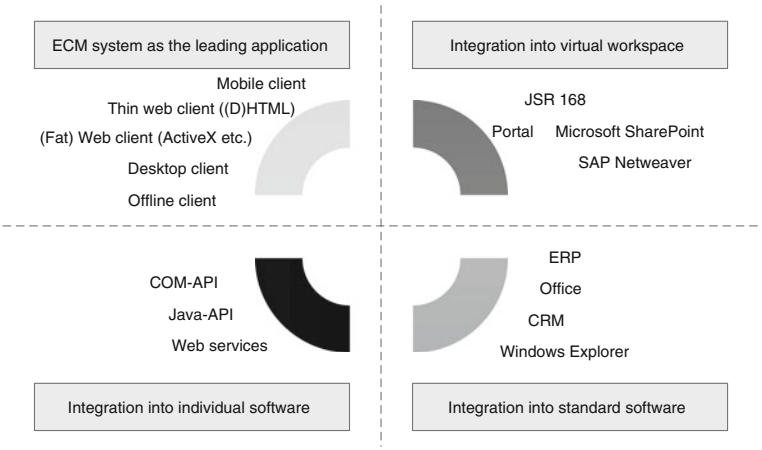

Fig. 2 ECM clients and access types

- Integration into existing standard software solutions: These integrations are focused on users who only occasionally use ECM functionality or who use only a few functions. By integrating the essential aspects of ECM into existing applications, the user can remain within his or her realm of knowledge and maintain his or her accustomed way of working. These users usually spend most of their working hours using one type of software (e.g., an ERP (enterprise resource planning) system, an e-mail solution, an office program, or the Windows Explorer), the necessary ECM functions are integrated into the existing interface. For search, document display, and so on new windows usually appear to display the content.
- Integration into individual solutions: Since interfaces are not available for all existing software products and since many proprietary, self-developed software solutions are used, linking these systems to the ECM software requires programming. Through the technical developments of recent years (component-oriented software based on Java or .Net languages; web services), it has become easier to exchange information (metadata and documents, as well as tasks, processes, and functions).
- Portals as virtual workplace: In this scenario, existing applications, including the ECM system, are combined in a new interface. Data and functions from several software systems are displayed in a common frame.

There is a trend in the ECM market to support a variety of ways to work with a system. Where vendors used to force a certain philosophy on the user (the technology of the client as well as the usability of the interface), the increasing competition has broadened offerings. Vendors have finally acknowledged that the usability of an ECM system is central to potential users' acceptance and that the user groups within an enterprise differ.

ECM as Web Content Management

Systems for the creation, administration, and publication of content in a company's intranet or on the internet are summed up in the term "web content management" (Smith and McKeen 2003). Depending on how it is defined, WCM is either a part of a comprehensive ECM solution or a synonym for ECM. This unclear use of terms is the result of many years of calling systems for managing web sites "content management" software. "Enterprise" wasn't added to broaden the focus (e.g., on scanned paper, office documents, e-mails) but to point out that more people and more information in the enterprise could be incorporated. Not only technically skilled users but also employees from different operating departments should be included in creating and editing content. Only a few vendors of ECM suites offer real WCM functionality, usually using third-party products.

Modern WCM systems are characterized by the organizational separation of tasks according to responsibility and the technical separation of content and

structure (presentation). The range of activities at least distinguishes between authors (often topic experts from business departments), editors, and administrators.

Current developments toward the much-discussed web 2.0 have also changed user demands and user behavior. There is an expectation for more dynamism, so information offerings must be changed faster and users should have the opportunity to keep informed automatically through subscriptions and messaging services (e.g., RSS feeds). Another issue is the clear movement toward an interactive, collaborative web where users participate in the creation and evaluation of content. Wikis, blogs, and forums transfer the tasks of creating and evaluating content to the user, while the platform provider, often simply another author or editor, provides technical services.

Related Market Segments

Based on the comprehensive definition of ECM, several functions should be part of a widespread ECM philosophy. However, because of the specific functional and technical aspects and nature of the corresponding projects, separate market segments have developed (like the WCM segment has). These segments are sometimes referred to as "ECM" as well, but specific terms are used on occasion. The most prominent are:

- Output management (OM): The term "Output management" in itself is not used coherently. OM describes solutions to mass-produce documents while achieving a maximum of personalization for the recipient, but the term is also used to characterize solutions for managing large amounts of printing or distributing content electronically. Most vendors have focused on one or the other of these aspects of the term, but some products cover both areas (Böhn et al. 2009b).
- Media asset management (MAM): The management of multimedia data is rudimentary in classic ECM systems; the metadata is used primarily to classify the content. MAM systems can also make use of the information in pictures, video, or audio files and can offer additional functionality like editors and converters. Term and rights management have also been extended to improve accounting, such as that with external agencies.
- E-mail response management (ERM): While the focus of e-mail management is on the storage of e-mails and their combination with other content, ERM supports the ability to react to incoming messages. E-mails received are automatically classified and answers are proposed using a knowledge base and templates (Gantner et al. 2008).

Only a few vendors can offer solutions in these specific markets in addition to general ECM functionality, and even these are usually not the result of a joint development effort but of either acquisitions or efforts by business units. Both vendors and customers usually choose to focus on a specific sub-segment so these subsections will not be integrated into classic ECM solutions in the near future.

Market Trends

In the past few years, the development of software solutions and their accompanying services have been driven by a range of factors. Sometimes vendors try to define new areas of application or ways of working to win additional customers, and sometimes customers provide the requirements for specific projects. Technical developments have also shaped the market.

Vendor View

The core drivers from a vendor point of view are the design of solution packages and mergers or partnerships. To obtain additional customers and to position themselves against specialists, vendors of ECM suites have increased their focus on building solution packages. This "ECM in a box" solution is used to reduce the implementation effort and make it easier for potential customers to start ECM projects. Large vendors in particular still have problems with the large market of medium-sized enterprises, as they still need to define practicable packages–clearly defined functional modules, application areas, and process models for implementing and operating ECM—for this market.

Mergers and acquisitions as well as strategic partnerships have increased many vendors' functional portfolios and manpower. Partner networks are used to distribute the software or support the individual projects, but they also influence product development. In particular, usability enhancements and interfaces to third-party systems are often the result of input from the partner channel.

The largest functional advancements have been made in collaboration and in data analysis. With the impact of Microsoft SharePoint, some vendors have shifted their development activities away from engineering new products and toward integrations into SharePoint to cover the collaboration requirements. The analysis of document content and content structures, as well as the control and supervision of processes, have been business drivers of the combination of ECM and business intelligence (BI) products. With business activity monitoring, real-time governance of workflows is available to facilitate the ability to react directly to delays and other problems.

Customer View

ECM customers have become more ambitious concerning their projects and more challenging for vendors. For some time now, the customers have increased the pressure on vendors to provide business solutions and real support in daily work, not just technical platforms (Andersen 2008). Capture, management, and search

are seen as given while complex processes and a structured exchange of information across enterprises have become the focus.

Process management is evolving from a simple transactional workflow to complete user support through consultative information processing (Böhn 2009). The systems are used not only to control a sequence of tasks (including business rules management), but also to provide the user with additional information. An additional requirement is for the systems to act proactively, such as by registering and analyzing incoming documents and starting the appropriate processes or (at least) informing an authorized user. Roles are assigned to users that characterize them as processors or experts on certain topics, allowing the system to use steering knowledge (assign tasks, identifying the next steps), support knowledge (provide additional information to the user, such as examples, explanations, and corresponding documents), and control knowledge (control completeness of processing, checking for contradictions and plausibility of user input against other available data). Users no longer have to keep rules or standard operating procedures in mind since the system can automatically ensure compliance with these rules. The rules can also be documented in the document history and in the workflow protocol. An overview is given in Fig. 3.

In addition, the importance of the organizational aspects of ECM projects is recognized more often than was once the case. Current projects focus not only on the storage and management of content but also on the regulation of information supply and information quality within the enterprise and with partners. Aspects of ECM like quality management, document responsibility, and the definition of and compliance with guidelines in the form of an ECM etiquette are highly significant.

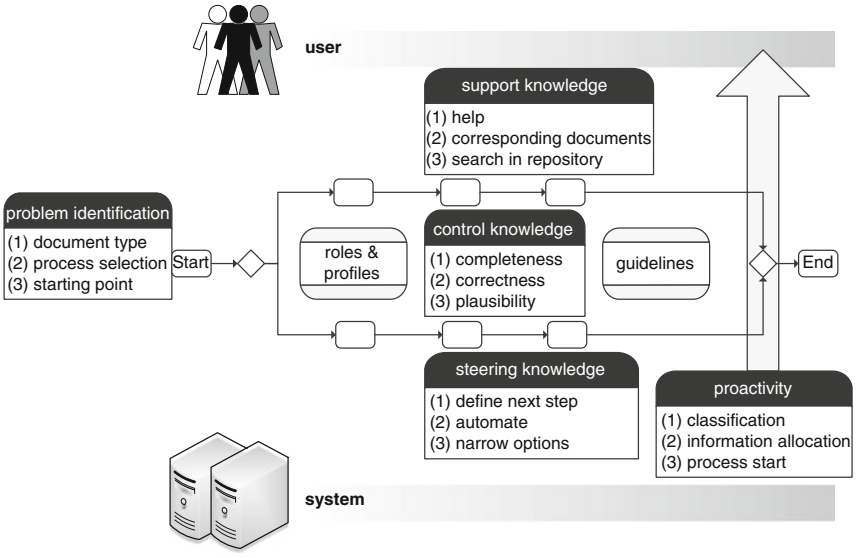

Fig. 3 Advanced customer requirements: comprehensive process support

Technical Developments and Standards

The interoperability of systems has always been a key issue. With the work on the interoperability standard CMIS (Content Management Interoperability Services), a new approach has been developed to ensure that content can be exchanged between repositories. The broader use of web services eases the task of combining software solutions.

The new software standards of component-oriented solutions and service-oriented architectures have forced vendors to re-engineer their software. This process is far from finished, as some vendors made the transition a year or more ago while others are still in development. However, just as standard databases have displaced vendor-specific solutions, there is no alternative to change; the benefits of implementing, adapting, and interconnecting the software are so significant that refusal to change would result in a massive competitive disadvantage.

Open Source and ECM

Currently, only a few open-source projects can address a large section of ECM functionality (e.g., Alfresco and Nuxeo). Projects are usually handled by partners who offer consulting and support; since ECM projects have a great impact on organizations, few initiatives are handled without external help. Open-source ECM products usually require a large amount of customization and even additional programming so expenses for external support or internal manpower are often higher than they would be using commercial software. Smaller organizations rarely use open-source ECM suites since considerable internal effort is required to address the complexity of installing, adapting, and supporting the system.

Open-source alternatives are widely used for functional components. Examples include full text databases (Apache Lucene) (web) application servers (JBoss, Apache Tomcat), OCR (OCRopus) and components for WCM (TYPO 3). Vendors of commercial software try to lower project costs by providing inexpensive or free alternatives to commercial third-party software. Open-source software is also used to close functional gaps, such as by providing basic WCM functionality through integration with TYPO 3.

Future of the ECM Market

Reports regularly predict the demise of the ECM software segment based on functional enhancements of large software platforms (most importantly, Microsoft Windows, Microsoft SharePoint, Lotus Notes, and SAP Business Suite) or on the fear that market consolidation could lead to only a handful of vendors. Reality has shown the opposite to be true.

While consolidation through mergers and acquisitions has been made on a global level, regional markets have developed new competitors. By having specific knowledge about a certain customer base and offering corresponding software and services, these new vendors can hold their own against the larger competitors. In addition, the functional enhancements of large software platforms have not crowded out classic ECM vendors but have led to closer cooperation with new business opportunities. Almost all large and medium-sized vendors have strategic partnerships, especially with SAP and Microsoft. The platform vendors offer a large customer base, and the ECM vendors provide additional functionality and knowledge about the functional and organizational aspects of ECM projects.

The ECM business volume of large software vendors will grow, but since the number of enterprises that use ECM software is increasing and the focus of current installations is widening, the market is growing as a whole. There will be some shifts in the market since basic content management functionality can be provided by software platforms, and small products with little functionality can become obsolete. With comprehensive ECM projects the classic ECM vendors still have more to offer to the customer than these general solutions; in addition, specialists can provide a technical advantage or improved customer focus with their products. The ERP market has shown that there is a demand for more than five vendors worldwide—there will not be a strong consolidation in the ECM market.

Summary

The market for ECM software is characterized by the technical maturity and the high standard of functionality available. Therefore, customers' software selection is less focused on the plain functionality than on a clear ECM philosophy of fitting vendors and products to the requirements. The focus on customers and clearly defined solutions determines the level of success in the market. Vendors are facing increasing pressure to provide a variety of user interfaces, support various ways of working, and comply with technical standards.

There is still room for improvement in addressing the customers' real problems. The systems are becoming easier to use, such as by providing better workflow definitions and graphical editors for user interfaces. However, the inconsistent use of terms and approaches has slowed market development, as many customers remain uncertain about the solutions and the benefits, about how to define their requirements, and about how to get the software that best fits their needs and budget.

From a customer point of view, the shift in their projects' focus has increased in importance as more companies have recognized the need for a clearly defined ECM strategy. This clarity helps companies get more benefit out of existing projects, which improves the return on investment and employee satisfaction. The political aspect of ECM must not be underestimated, as ECM projects lead to enduring changes in how they deal with documents, tasks, and responsibilities.

These changes must be communicated openly from the beginning to facilitate change management.

ECM is an important topic for enterprises of all sizes and industries. The market volume has not been fully exploited since many companies run no solutions or only small, isolated ones. This has been confirmed in the current economic crisis, since ECM has been one of the few software markets to show growth (Karlstetter 2010). Therefore, ECM is an important subject for any company to consider, and it provides a chance for the prospective project manager to develop an important position for himself or herself in the company. The question concerning ECM isn't "should we?" or "if we?"; it's "now, but how?"

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Factors in the Acceptance of Enterprise Content Management Systems

Laurent Wiltzius, Alexander Simons, Stefan Seidel and Jan vom Brocke

Abstract This chapter investigates the factors that influence the acceptance of enterprise content management (ECM) systems. Specifically, we identify and explain twenty-two factors at the enterprise, process, technology, and content levels that can influence ECM success. Our study builds on the technology acceptance model (TAM), and the results are grounded in both a systematic review of the literature on ECM, including related fields like document management and records management, and an analysis of qualitative data collected from five organizations. Practitioners can use the results in planning and conducting ECM programs, and the results can also inform future Information Systems (IS) research on ECM acceptance and contribute to the emergence of ECM as an important field in IS research.

Introduction

"Content, Content Everywhere" was the title of an *InformationWeek* article on the challenges today's organizations face because of the increasing flood of digital information (Conry-Murray 2008). These challenges include improving collaboration processes, avoiding wastes of time and money in the management of

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information, fulfilling reporting obligations and standards, and ensuring information quality (Päivärinta and Munkvold 2005). The problem itself is not new; prior IS research has discussed several approaches to solving the challenges that originate from the increasing digitization of information. While most of these approaches tend to focus on specific and often isolated aspects of information management, the notion of ECM is often used to refer to their consolidation, to an integrated and modern perspective of information management (Munkvold et al. 2006; Päivärinta and Munkvold 2005; vom Brocke et al. 2010). ECM concerns the "integrated enterprise-wide management of the life cycles of all forms of recorded information content and their metadata organized according to corporate taxonomies, and supported by appropriate technological and administrative infrastructures" (Munkvold et al. 2006, p. 69).

Notwithstanding the practical relevance of ECM, IS research has rarely explored the elusive concept of ECM (Tyrväinen et al. 2006). Much of the IS literature on ECM is design-oriented or conceptual in nature (Nordheim and Päivärinta 2004, 2006); there are few empirical studies on ECM, and the area of ECM is still bereft of theory (Pullman and Gu 2007). In particular, studies on end users' acceptance of ECM systems are lacking, information about which practitioners need when planning and conducting ECM projects. As a response, this chapter, grounded in a systematic review of the IS literature on ECM and qualitative interviews with representatives from five ECM-implementing organizations, identifies and explains factors that affect the success of ECM initiatives. TAM provides a suitable theoretical lens for our investigation.

The chapter is structured as follows. Section 'Background' provides the research background and introduces ECM and TAM. Section 'Study Overview' describes the research process and summarizes the literature review strategy and the procedures for collecting and analyzing the interview data. Sections 'Literature Review Results' and 'Interview Results' present the results from the literature review and the qualitative interviews, which are subsequently discussed in 'Discussion'. Section 'Conclusion' concludes the chapter with a summary and discussion of research limitations.

Background

Enterprise Content Management

ECM relates to the "strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured information, wherever that information exists" (Association for Information and Image Management 2011). To date, the concept of ECM has received only limited attention from the IS discipline. Exceptions can be found in, for instance,

Tyrväinen et al. (2006), who examine the relevance of ECM for IS research, and in Munkvold et al. (2006), who present a set of ECM-related challenges. Nordheim and Päivärinta (2006) and Scott et al. (2004) present case studies on ECM implementation projects at Statoil, a Norwegian oil company, and J.D. Edwards, a global provider of enterprise resource planning and business-to-business software and services. Smith and McKeen (2003) present the results from a focus group session on ECM and define the concept as "the strategies, tools, processes and skills an organization needs to manage all its information assets (regardless of type) over their lifecycle" (p. 648). More recently, some literature reviews and meta-analyses have also been completed, the results of which confirm that the number of academic publications on ECM is still very low (e.g., Alalwan and Weistroffer 2012; Grahlmann et al. 2011; Rickenberg et al. 2012) and that no consensus for a definition of ECM has yet emerged in IS research (Alalwan and Weistroffer 2012; Grahlmann et al. 2011). In this chapter, ECM is understood as an integrated approach to information management (Nordheim and Päivärinta 2006; Päivärinta and Munkvold 2005) that covers and aligns a variety of related concepts, such as document or content management, enterprise-wide. As such, the notion of ECM refers to the management of all types of (but particularly unstructured) information assets in an organization over their entire lifecycle, that is, from creation to deletion.

In categorizing ECM success factors, the present study draws on an ECM research framework presented by Tyrväinen et al. (2006) (Fig. 1).

The framework, designed to stimulate and guide future IS research on ECM, proposes four dimensions as relevant for ECM: *content*, *technology*, *processes*, and *enterprise* (compare Tyrväinen et al. 2006, pp. 628–631).

- Three views are distinguished with regard to *content*: the information view, the user view, and the systems view. The information view concerns the identification, analysis, and representation of content and the use of appropriate metadata. The user view addresses issues that include user identification, information needs, personalization, and content use (creation, maintenance, distribution, etc.). The systems view concerns content processing and storage, standards and formats, and the interoperability of systems.
- The *technology* perspective is closely related to the systems view. ECM systems integrate not only a number of technologies, including hardware, software, and standards, but also content and its users. As ECM systems operate in specific organizational contexts, Tyrväinen et al. (2006) see the major focus of ECM research as being on systems as opposed to technologies.
- The *process* perspective involves process development and deployment. Whereas the process development refers primarily to the design of processes for implementing and maintaining ECM systems, deployment primarily concerns the implementation of content lifecycle activities.
- The *enterprise* perspective describes the context for ECM and concerns organizational, social, and legal aspects in particular.

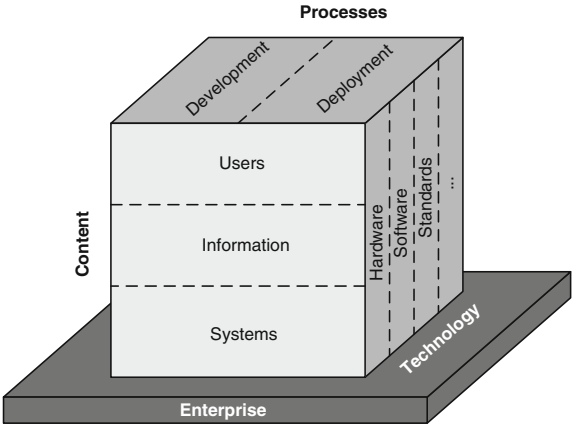

Fig. 1 ECM research framework (*Source* Tyrväinen et al. 2006, p. 628)

The Technology Acceptance Model

Research on factors that influence the integration of IS and business has a long track record, dating back to the 1970s (Legris et al. 2003). Davis' (1986) TAM has received considerable attention in the IS discipline. TAM, an adaptation of the theory of reasoned action (Ajzen and Fishbein 1980; Fishbein and Ajzen 1975), suggests two major constructs as influencing IS acceptance: perceived usefulness and perceived ease of use (Davis 1986). Perceived usefulness can be understood as "the degree to which a person believes that using a particular system would enhance his or her job performance," and perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort" (Davis 1989, p. 320). While perceived ease of use directly impacts perceived usefulness (but not the reverse), the theory suggests that both constructs influence the end users' attitude toward using a system. This attitude is thought to affect users' behavioral intention to use the system, which impacts actual system use (Fig. 2).

Notwithstanding its broad acceptance, TAM has been criticized for its simplicity (e.g., Lee et al. 2003). For instance, Dennis says, "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 makes technology useful and easy to use'" (as cited in Lee et al. 2003, p. 766). In this chapter, we aim to shed light on the antecedents of perceived usefulness and perceived ease of use in the context of ECM adoption in order to provide practitioners with a specific model that can help them understand why ECM adoptions are successful or not.

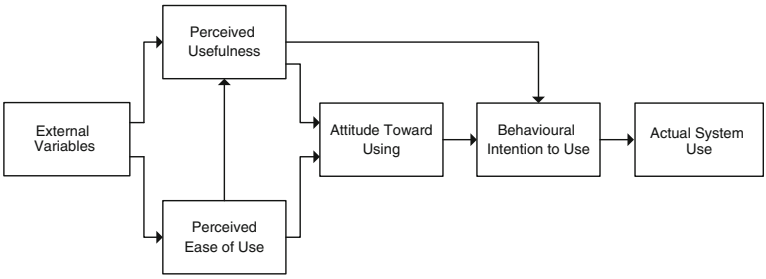

Fig. 2 TAM (*Source* Davis et al. 1989, p. 985)

Study Overview

The research process is comprised of a systematic literature review and a qualitative study using interviews.

For the literature review, we systematically searched more than 100 of the most significant IS journals (according to the ranking by the Association for Information Systems) for academic articles on ECM. While many of the ECM papers we retrieved produced valuable and relevant results for our study, none focuses on ECM acceptance, suggesting a research gap related to ECM adoption. Then we extended our literature review to consider related fields, including knowledge management, information resource management, electronic document management, records management, content management, and enterprise resource planning. This exercise produced a long list of articles that applied TAM to the acceptance of ECM-related technologies, allowing us to identify factors that affect both perceived usefulness and perceived ease of use. We organized the factors based on the four ECM perspectives of content, processes, technologies, and enterprise.

Next, building upon the results of the literature review, we conducted qualitative interviews with individuals from five organizations that implement ECM and that operate in diverse industries. The cases were selected based on their similarities, especially because they shared a common understanding of ECM–even though the scopes and objectives of their ECM programs differed: all five organizations considered ECM an approach that pertains to the level of the enterprise, includes all types of information, supports the management of all lifecycle phases, and is of both managerial and technological nature. At the time the interviews were conducted the characteristics of the case organizations were as follows: Organization A, with almost 20,000 employees in more than 120 countries, provides products and services to customers in the construction and building-maintenance industries. Its ECM project focused on issues related to the archiving of content. Organization B, employing approximately 1,200 employees, provides heating and ventilation technology to customers in more than fifty countries. Its ECM initiative aimed primarily at improving the efficiency and effectiveness of content reuse. Organization C is an automotive supplier company that provides

Table 1 Case organizations

Organization	Business area	Size	Interviewee	ECM focus
A	Manufacturing	~20,000	ECM project leader	Archiving, with additional functionality planned
B	Public service	~25	ECM project champion	Content exchange, storage, and retrieval; abolish hard copy archive
C	Heating and ventilation technology	>2,000	Technical documentation	Content reuse
D	Automotive supplier	~4,500	Business processes	Content reuse and compliance
E	Dental technology	>2,500	Information services	Regulations and standards; single-source publishing

steering systems for carmakers and employs around 4,500 employees in sixteen locations worldwide. The main purpose of its ECM initiative was to improve the efficiency of storage and retrieval processes that involve project-related documents. Organization D is a small governmental department that, as part of its larger e-government strategy, implemented ECM to digitize paper archives, support workflows, and improve document exchange with other departments. With more than 2,000 employees, Organization E delivers products and services to dentists and dental technicians from more than 120 countries. Its ECM project focused on the reuse of product-related content. Table 1 provides an overview of these five companies.

One qualitative interview was conducted at each site, and the average length of each interview was around one hour. The interviewees played key roles related to information and document management, such as technical documentation and information services, at the case organizations. Data collection took place from June to August 2010, through semi-structured interviews organized around the four perspectives of enterprise, processes, technology, and content. All interviews were audio-taped and fully transcribed, and the transcripts were sent back to the informants for approval.

The next sections present the acceptance factors identified through the literature review and the qualitative interviews.

Literature Review Results

Factors at the Enterprise Level

In the IS literature, *top management support*, *defined purpose of ECM*, *information and communication*, and *corporate culture* are often considered as influencers of end users' acceptance of ECM-related systems (Table 2).

Table 2 Acceptance factors at the enterprise level

Factor	Description	Selected references
Top management support	Active support by senior management (e.g., leading by example, funding)	Bals et al. (2007), Dhérent (2006), Di Biagio and Ibiricu (2008), Scheepers (2006), Shaw and Edwards (2005), Williams (2005), Xu and Quaddus (2007)
Defined purpose of ECM	Defining ECM objectives and benefits (e.g., search times, compliance)	Amoako-Gyampah (2007), Bals et al. (2007), Munkvold et al. (2006), Xu and Quaddus (2007)
Information and communication	Keeping users informed e.g., user support, maintenance)	Amoako-Gyampah and Salam (2004), Bals et al. (2007), Downing (2006), Grudman (2008), Remington (2006), Wager (2005), Watts (2005), Williams (2005)
Corporate culture	Establishing an ECM-friendly culture (e.g., willingness to share, trust)	Bals et al. (2007), Caldwell (2006), Downing (2006), Hung et al. (2009), Scheer (2007), Shaw and Edwards (2005), Straub et al. (1997)

Active *top management support* ensures the availability of required resources and an alignment of the ECM project with strategic business goals (Bals et al. 2007; Scheepers 2006; Xu and Quaddus 2007). It is also key that senior executives inform their staffs about the importance of ECM and, given the elusive character of the concept (Smith and McKeen 2003), lead them by example (Xu and Quaddus 2007). Because what organizations strive to gain through implementing ECM systems is sometimes not understood (vom Brocke et al. 2011b), a clearly *defined purpose of ECM* has been identified as another ECM success factor. Defining the purpose of ECM helps organizations to determine the triggers and goals of the initiative, to justify ECM investments, and to encourage executive support (Bals et al. 2007; Munkvold et al. 2006; Xu and Quaddus 2007). Bals et al. (2007), for example, write that knowledge management initiatives "should have a clearly defined purpose and provide value for the business (either directly through monetary gains/savings or indirectly through improvements in cycle times)" (p. 3). This requirement likely also applies to the management of enterprise content. Exemplary ECM objectives that have been identified include better internal and external collaboration, value-added or new customer services and products, improved content reliability and quality, and meaningful knowledge work (Päivärinta and Munkvold 2005).

ECM objectives must be communicated properly, a requirement that the literature has conceptualized as the factor *information and communication*. Information and communication refers to spreading the word about the initiative regularly, thus supporting feedback processes among ECM developers and users as well as the change management process itself (Bridges 2007; Downing 2006; Williams

2005). Bals et al. (2007) write that appropriate levels of training, communication, and support can positively influence end users' acceptance of ECM systems (also see Amoako-Gyampah and Salam 2004). When informing their staffs about ECM, organizations must also consider their *corporate culture*. For example, if end users perceive ECM initiatives as being dictated by management, they may resist the project (Scheepers 2006). Finally, the adoption of ECM requires appropriate levels of trust and willingness to share among the users, factors that are determined by the corporate culture (Bals et al. 2007; Caldwell 2006; Hung et al. 2009).

Factors at the Process Level

At the process level, which relates to both the development and deployment of ECM systems, the literature review revealed four factors that can affect end users' perception of the usefulness and ease of use of ECM: *involvement of end users*, *user training*, *transition management*, and *prototyping* (Table 3).

The *involvement of end users* in the development process allows organizations to identify and consider their individual needs and to assess how they do business (Slawsky 2007; Stevens 2006). Bridges (2007) writes, "Including users in the evaluation process ensures a more meaningful product and its ultimate acceptance" (p. 31), and Downing (2006) highlights that representatives from a variety of ranks and departments should participate in this process. Users can also serve as change agents who spread the word about ECM and explain it to their colleagues, which can improve their perception of the usefulness of the new system (Di Biagio and Ibiricu 2008; Shaw and Edwards 2005).

Table 3 Acceptance factors at the process level

Factor	Description	Selected references
Involvement of end users	Including the users in the ECM development process (e.g., change agents)	Bridges (2007), Di Biagio and Ibiricu (2008), Downing (2006), Shaw and Edwards (2005), Slawsky (2007), Stevens (2006), Wager (2005)
User training	Educating the future users of the ECM system (e.g., IT skills)	Amoako-Gyampah and Salam (2004), Bueno and Salmeron (2008), Dhérent (2006), Downing (2006), Grudman (2008), Maguire (2005), Remington (2006), Smyth (2005), Williams (2005)
Transition management	Replacement of the old system with the new one (e.g., flexibility vs. control)	Di Biagio and Ibiricu (2008), Garrido (2008), Nordheim and Päivärinta (2006), Smyth (2005), Xu and Quaddus (2007)
Prototyping	Prototyping the system with the end users (e.g., look and feel)	Bridges (2007), Di Biagio and Ibiricu (2008), Nordheim and Päivärinta (2004), Päivärinta and Munkvold (2005), Remington (2006), Scheepers (2006), Watts (2005)

Many IS authors consider *user training* to play a salient role in the adoption of ECM-related systems (e.g., Dhérent 2006; Maguire 2005; Remington 2006; Smyth 2005), and organizations that implement ECM must ensure that employees can use the new system (Johnston and Bowen 2005). Because of possible system extensions and new employees, user training is an ongoing endeavor (Maguire 2005; Scheer 2007). ECM also requires continuous development in the many capability areas of both technological and organizational nature (Blair 2004; vom Brocke et al. 2011a).

It is also likely that the implementation of a new ECM system requires organizations to replace their old content management system(s) with the new one. *Transition management* aims to preserve content and to migrate it from the old into the new system. The transition phase can be supported by, for instance, the parallel use of the legacy system and the new system in order to ease the transitions for users (Di Biagio and Ibiricu 2008; Garrido 2008; Smyth 2005; Xu and Quaddus 2007).

Finally, *prototyping* has been identified as another factor that can improve end users' acceptance of an ECM system (Päivärinta and Munkvold 2005). Prototyping can help users understand new opportunities that originate from ECM technologies, such as new practices around document management, content publication, or website management.

Factors at the Technology Level

At least two major approaches to implementing ECM can be distinguished: acquisition and customization of a single, large commercial ECM software package and implementation and integration of several smaller content management solutions across an organization. (See the market overview by the Real Story Group 2010). Thus, approaches to ECM implementation can be distinguished between *functional customization* and *systems interoperability*.

Nordheim and Päivärinta (2004) contend that *functional customization*, that is, the adaptation of an ECM software package that matches a particular organization's requirements, refers to ECM system functionalities in terms of content structuring, metadata modeling, taxonomy, and templates (categorized under the notion of content model management); functionalities for managing user roles and supporting the content lifecycle, such as content access, versioning, distribution, and retention (categorized as content storage and delivery management); and process support and automation. *Systems interoperability* can be defined as "the ability of two or more systems or components to exchange information and to use the information that has been exchanged" (IEEE Computer Society 1991, p. 114). Rockley et al. (2003) write, "Too often, content is created by authors working in isolation from other authors within the organization," a problem Rockley et al. call the "content silo trap" (p. 5). In today's organizations it is likely that content silos occur between departments particularly because departments frequently use

Table 4 Acceptance factors at the technology level

Factor	Description	Selected references
Functional customization	Adaptation of an ECM software package (e.g., content retrieval)	Nordheim and Päivärinta (2004), Nordheim and Päivärinta (2006), Scheer (2007)
Systems interoperability	Ability of ECM-related systems to exchange content (e.g., content silos)	Grudman (2008), Nordheim and Päivärinta (2004), Scheepers (2006)
Simplicity	Designing the ECM system in a user-friendly manner (e.g., efficiency)	Bueno and Salmeron (2008), Calisir and Calisir (2004), Downing (2006), Johnston and Bowen (2005), Maguire (2005), Neumann (2007), O'Callaghan and Smits (2005), Päivärinta and Munkvold (2005), Scheepers (2006)
Security	Assuring the confidentiality, integrity, and availability of content (e.g., espionage)	Chiu and Hung (2005), Smith and McKeen (2003), Stevens (2006), Tyrväinen et al. (2006)

isolated content management applications and very different approaches to storing and retrieving content. Therefore, given the enterprise-wide scope of ECM, the interoperability of existing document and content management systems appears to be another success factor for ECM initiatives.

The study of the literature revealed two additional properties that ECM systems must satisfy: *simplicity* and *security* (Table 4).

Päivärinta and Munkvold (2005) identify the development of "user-friendly, intuitive, and integrated user interfaces to content management, seamlessly integrated with 'front-end' content production and browsing solutions" (p. 6) as a core challenge in ECM initiatives. Maguire (2005) suggests that organizations that invest in records management choose a system that is "as simple as possible" (p. 156), and Downing (2006) considers *simplicity*—"minimiz[ing] the number of clicks and keystrokes needed to save or retrieve documents" (p. 45)—a core acceptance factor in electronic document management. Simplicity can also reduce the need for training and the duration of the transition phase while ensuring that the system can be used by people with different types and levels of IT skills (Johnston and Bowen 2005; Maguire 2005).

Finally, organizations that adopt ECM have to safeguard the *security* of ECM systems by developing and implementing efficient and effective access-control mechanisms. Chiu and Hung (2005) study financial ECM systems and understand access control "as the mechanism by which users are permitted access to resources according to the authentication of their identities and the associated privileges authorization" (p. 1). However, the definition of appropriate privileges for

accessing content is not an easy task at the enterprise level, as security levels that are too high can prevent employees from using the content they need efficiently (vom Brocke et al. 2011b) and affect end users' acceptance (Tyrväinen et al. 2006).

Factors at the Content Level

The literature review identified four factors that can influence the acceptance of ECM end users at the content level: *content audit and classification*, *content lifecycle implementation*, *corporate taxonomy development*, and *content tagging* (Table 5).

Content audit and classification often serve as a foundation for the entire ECM program (vom Brocke et al. 2011a). Because this factor includes analysis of existing information behaviors and needs (Smith and McKeen 2003), the involvement of the end user is important. O'Callaghan and Smits (2005) mention several questions to be answered in a content audit, including questions related to how much information is available, how many types of content there are, who manages and owns which content, who uses what content, how content is reused and repurposed, what content must be stored, in what form, and for how long, and what systems are currently used for managing content (p. 1275). Appropriate answers to these questions are central for successful content collection and management, and most of these answers can be related to the lifecycle of content. IS

Table 5 Acceptance factors at the content level

Factor	Description	Selected references
Content audit and classification	Analyzing content and its use (e.g., users, systems, reuse)	Caldwell (2006), Dhérent (2006), Jones (2008), O'Callaghan and Smits (2005), Smith and McKeen (2003), vom Brocke et al. (2010, 2011a)
Content lifecycle implementation	Supporting the content lifecycle (e.g., creating and distributing content)	Garrido (2008), Munkvold et al. (2006), Päivärinta and Munkvold (2005), Remington (2006), Schaffel (2006), Smith and McKeen (2003)
Corporate taxonomy development	Categorizing content hierarchically (e.g., browsing, indexing)	Bridges (2007), Calisir and Calisir (2004), Garrido (2008), Gilchrist (2001), Munkvold et al. (2006), Slawsky (2007), Watson et al. (2007)
Content tagging	Collecting and defining appropriate metadata (e.g., author, creation date)	Gilchrist (2001), Neumann (2007), Scott et al. (2004), Slawsky (2007), Smyth (2005), Sprehe (2005)

research has offered many content lifecycle models. Päivärinta and Munkvold (2005), for example, distinguish activities within the content lifecycle, including capturing, creating, reviewing, editing, distributing, publishing, storing, archiving, and deleting content. Munkvold et al. (2006) argue that the concept of ECM puts a holistic focus on these phases compared to related approaches that tend to support individual lifecycle activities, such as document management (storage and retrieval), Web content management (publication), and records management (retention) (vom Brocke et al. 2010). Accordingly, *content lifecycle implementation* requires organizations to implement ECM in a way that, from content creation to deletion, best supports their employees in their daily work.

There are several approaches to searching for content, among them indexes, tables of contents, and full-text searches (O'Callaghan and Smits 2005). Implementing an efficient approach to content retrieval often requires organizations to enable their users to browse content efficiently (Garrido 2008; Watts 2005). The classification of content via indexes enables connections between content assets (O'Callaghan and Smits 2005), and manual recommendations can further support ECM end users in their endeavors to find content (Gilchrist 2001; Slawsky 2007). An alternative to indexing content are full text searches on the basis of keywords (O'Callaghan and Smits 2005), the success of which is likely to influence end users' acceptance of ECM systems, which is why the selection and implementation of appropriate search mechanisms plays a salient role in ECM adoption. The first step in making content searchable is to implement a corporate taxonomy that categorizes content hierarchically and identifies information and record sources (Bridges 2007). Accordingly, Munkvold et al. (2006) identify *corporate taxonomy development* as a contemporary ECM challenge. The main problem is that people and departments develop and use very different taxonomies (O'Callaghan and Smits 2005). Therefore, the development of a corporate taxonomy is an important standardization and change management task because it imposes structure and control over the creation and storage of documents (Garrido 2008). The development of a corporate taxonomy can fulfill several purposes; in particular, it can serve as the basis for automatic generation of metadata (Munkvold et al. 2006).

The definition and use of metadata—here: *content tagging*—has been identified as another success factor of ECM implementation. In general, metadata can be understood as information about content (Smith and McKeen 2003, p. 653) that adds meaning and semantics to content (O'Callaghan and Smits 2005). The problem is that some metadata can be collected automatically (e.g., author, date, title), while other metadata must be provided by the authors (e.g., summary, purpose) (O'Callaghan and Smits 2005, p. 1281). Munkvold et al. (2006) distinguish two key challenges around the generation of metadata: a maximally automated generation of metadata and content creators' awareness of its importance. It can be expected that high levels of automatically collected metadata will positively affect ECM acceptance.

In summary, for each of the four perspectives of ECM considered here, the literature review revealed four ECM acceptance factors. The next section details comments about these factors from the five interviewees.

Interview Results

Factors at the Enterprise Level

The interviewees supported the relevance of *top management support*, as the following statement indicates[1]:

> I believe it's very important to get senior management to back the ECM project.

In particular, the interviews suggest that a lack of executive support can reduce ECM initiatives to simple IT projects, thus neglecting the enterprise-wide scope of ECM, involving processes, technology, and people. Still, gaining top management support was considered a noteworthy challenge of ECM implementation, particularly because of the elusive character of the concept. For example, one interviewee said,

> Some fifteen years ago we already envisioned an enterprise-wide content management project. At that time, however, we set our sights far too high …. There was no appropriate tool support available, and we were also not able to define the project scope clearly. It was for these reasons that our top managers finally rejected the project proposal … and I think they were right with that.

The interviewees considered the identification of ECM objectives and benefits and their illustration on the basis of concrete business examples difficult, as they did the justification of ECM investments. However, these are important preconditions for gaining top management support and for ensuring the availability of required personnel resources and funding. Regarding the definition of ECM objectives, one interviewee said,

> My experience is that it is very important to define and communicate the objectives of ECM clearly because, otherwise, acceptance cannot be established among the workforce.

The interviewees also expressed that organizations must determine the *purpose of ECM* and that it was important to explain to the users how the system will improve their daily work, what benefits ECM holds for the company, and what the ECM objectives at the organizational and individual level are:

> There are organizational ECM objectives on the one hand and individual ones on the other. It is important to consider the latter sufficiently in order to avoid a low level of acceptance by the end users.

The ECM initiatives differed significantly at each of the case organizations, reaching from supporting content retention and compliance to implementing single-source publishing and content reuse. Therefore, it appears important for organizations that adopt ECM to define the scope of ECM clearly; otherwise, it

[1] Quotes were translated from German to English by the authors.

will be difficult for the employees to understand what they can expect from ECM. Interviewees deemed *information and communication* critical to ECM adoption:

> Information and communication plays a central role in an ECM roll-out in, for example, requirements engineering, testing, training, and implementation.

Interviewees said that it is important for organizations to keep their staffs informed before and during the rollout. They considered the level of transparency in communication critical, and identified approaches to informing employees, among them presentations and company magazines. However, documentation was also considered key to communicating project progress by, for example, publishing time schedules, protocols, and project descriptions or updates on the Intranet.

During the interviews it became apparent that knowledge about the *corporate culture* plays a salient role in the context of ECM implementation. Tampering with work habits can cause employees unhappiness, which can then lead to resistance to the new system. This resistance can affect single users to entire work units that may have developed their own approaches to storing and retrieving content but are now directed to use a corporate ECM system. Depending on the prevailing corporate culture, it can also be necessary to invoke a change in the culture, as interviewees mentioned that, even with a pronounced corporate culture, the recognition of local cultural differences is important. For example, one of the interviewees said,

> What we have to consider … is that national cultures are different from one another.

Interviewees also mentioned instances in which organizations need to provide their local branches with flexible content management systems to enable them to compete in their markets. For instance, while a specific advertisement may be appropriate for one market, it may not for another. The interviews suggest that the implementation of appropriate information and communication mechanisms is important in order to allow for cultural shifts and promote awareness of local differences.

The respondents also mentioned that *monitoring and evaluation* is important for ECM success because they can help in justifying ECM investments and maintaining ECM systems.

Factors at the Process Level

The interviewees confirmed that *involvement of end users* is a vital factor for ECM acceptance, as it allows individual needs to be considered in the design of ECM systems. The interviewees considered the selection of key users from various departments, so-called ECM champions, important as they can facilitate communication between their colleagues and the ECM project team (e.g., by forwarding individual and departmental requirements and change requests to the

developers). More important, they serve as change agents who create enthusiasm among their colleagues (e.g., by explaining the benefits of the ECM initiative):

> There are opinion leaders in every company, and we have to be able to engage them. If these people are on our side, that's half the battle.

Throughout the implementation, ECM champions can also help employees in using the new system. Their involvement often results in constructive criticism and system design improvements. Respondents also highlighted the role of *user training*. Users need to be trained on how to apply the new ECM system, but they must also understand the positive impacts the system can have on their job performance. The interviewees also considered it important to ensure high-quality training, as employees may otherwise lose their trust in the system and their willingness to use it in their daily work.

User training should generally go beyond pre-implementation to provide ongoing support for users. Notwithstanding the importance of user training, however, the interviewees repeated the view that end users' acceptance must be established before the roll-out stage. While training is needed so users can get used to the new system, the interviewees also confirmed that a transition period in which the old and the new system run in parallel is crucial. *Transition management* allows the users to become familiar with the new system, recognize its benefits, and voluntarily switch to using it. Nonetheless, a final date should be communicated in order to create an incentive to become familiar with the new system quickly. The respondents said that such parallel operation allows the system to be adopted to departmental and local requirements and the content to be migrated from the old system to the new one. Regarding the length of the transition period, one of the interviewees observed,

> Some employees will, of course, have their problems using the new ECM system, particularly at the beginning. At one time or another, however, you'll have to shut off the old system, which is why the transition phase is crucial.

The interviewees also approved the concept of *prototyping* as a way to present and test the functionalities during the development phase. They indicated that mockups and prototypes should be kept as simple as possible in order to avoid presenting features that cannot be integrated into the final product:

> The presentation of mockups and screenshots that look promising but cannot be implemented is very dangerous. We are better off with a black-and-white mockup and a colorful later implementation instead of the reverse.

Finally, with regard to the process level, respondents highlighted the importance of process knowledge, arguing that a detailed understanding of existing procedures and processes is a prerequisite to identifying room for improvement and that it sets a baseline for the required functionalities of the new system. The relevance of *business process analysis* (as it was conceptualized in the study) found its expression in the following statement:

> I believe there is a strong relationship between software, content, and business processes.

In addition, the interviewees considered *project management* to have an impact on ECM success. For example, project delays and changes in the project team can result in losses of both knowledge and confidence in the project team.

> I consider it very important to use project milestones early in a huge project like this. These can not only illustrate project progress but also motivate employees …. The composition of the core project team should preferably remain the same during the implementation so learning from the experiences gained can be efficient.

Factors at the Technology Level

The interviews supported the two major approaches to implementing ECM systems that were identified in the literature review, that is, customization of comprehensive ECM software packages and development and integration of smaller content management solutions. With regard to *functional customization*, the interviewees acknowledged that ECM systems feature many functions that are not necessarily relevant to all employees and business units. One of the interviewees described the dilemma that comes with the implementation and customization of corporate ECM systems, explaining that, on the one hand, the implementation of different content management solutions at the departmental level is likely to fulfill their individual needs but also to result in inefficiencies on a global scale; on the other hand, the implementation of a single ECM system at an enterprise level can eliminate these inefficiencies, but it also requires the departments to give up their freedom in terms of content storage and retrieval and to raise the costs for technical maintenance:

> Departmental content management applications can, of course, be more customized than enterprise-wide ECM systems …. In contrast, the wider the scope of an ECM software package … the more users are restricted in their freedom to create and edit content.

With regard to content reuse, respondents pointed to the need for integrating existing applications, so *systems interoperability* was confirmed as another ECM success factor. Many of the case organizations used various applications for document and content management at a departmental level, so their integration was considered a core task in implementing ECM. As one of the interviewees said,

> The integration of existing applications is definitely a crucial success factor for ECM.

Interviewees suggested the use of project portfolios that can assist organizations in planning and conducting ECM-related projects and said that the *simplicity* of an ECM system is important for its success. Enabling intuitive use by designing the system in accordance with existing usability standards is a core task in ECM implementation.

> Easy tasks must be easy to accomplish. It is important to support the user in a way that prevents him or her from making mistakes. An ECM system has to be intuitive to the users.

Finally, respondents emphasized the role of *security*. The stored data must still be accessible decades later, independent of the format used, and appropriate security settings (e.g., clearance, access rights) must ensure that users can access only the content assets that correspond to their information needs (thus also avoiding information flooding):

> Content security means that content must be available at any time, never get lost, and always be traceable—even in thirty years.

> It must be possible to implement an approach to content management that not only enables employees to access content efficiently at an enterprise-wide scale but also ensures that content access is restricted to those who have the required privileges.

The interviews also suggest that *workflow support*, which facilitates a process-centric perspective on content management, plays an important role in ECM and that the integration of *collaboration* tools into an ECM system is important. As to collaboration, one of the interviewees said,

> The faster people can access information and the more people can access it, the better it is.

Factors at the Content Level

The interviewees considered a thorough analysis of content an important precondition for ECM adoption. *Content auditing and classification* involve not only the identification of content assets but also an assessment of their usage (e.g., content users and owners). It is similarly important for organizations to identify the systems in which content resides. Picking up on the digital information overload that employees face every day, the respondents mentioned various types of content (e.g., office documents, audio and video files, and images):

> What is important for us is to find all the information assets captured in our company, including Web sites, videos, reports, budget presentations, e-mails, office documents, and many more—actually, everything that flies around.

Some of the interviewees also stated that, at the most basic level, auditing content requires organizations to decide which content assets should be part of the ECM system and which should not:

> The decision of what digital assets to include in ECM is a fundamental one; not every email is business-critical, for example.

While the interviewees considered identifying content users important, they drew particular attention to the necessity of defining responsibilities for content:

> Establishing content ownership is critical to ECM success because, in our organization, many people work on the same documents.

ECM implementation often affects the way business is done so it can shift work tasks. For example, the definition of metadata requires additional efforts so it can lower user acceptance:

> Employees have to understand that it is worth the effort to store documents in a way that facilitates their later retrieval, such as with the help of appropriate keywords and other metadata.

In other words, some users will face more work (e.g., scanning documents), while others are freed from work (e.g., filing paper documents), and such workload shifts can influence the success of ECM implementations. One respondent argued that clear responsibilities for content can reduce the risk that employees will use content as an instrument of power by not sharing it with their colleagues.

In addition, the interviewees saw *content lifecycle implementation* as influencing ECM success. Some of the informants considered an efficient reuse of content particularly important in ECM implementation:

> The real work is creating document content for the first time. Synergy effects can be realized when these contents are later getting reused … and that's what content management is essentially about.

However, content reuse requires that users can find existing content, for example, through the use of a search tool. Challenges that were mentioned with regard to content search included response times and the quality of the search results. Another way to retrieve content is browsing, an approach that requires users to have a certain level of experience and to be familiar with the underlying file structures. In this context, respondents further distinguished between associations and recommendations; while associations, which serve as links between content objects, are automatically conducted based on existent metadata, recommendations are made by the users themselves. Accordingly, the interviewees deemed the selection and implementation of an appropriate set of search mechanisms relevant for ECM success:

> One of the biggest benefits of ECM, I think, is efficient content search on the basis of metadata that can associate content objects with one another. Just one mouse click enables you to browse all the relevant documents.

As IS literature has suggested, *corporate taxonomy development* plays a distinct role in content search—for example, to support browsing and the generation of metadata. The interviewees also deemed defining corporate standards for content handling relevant. Such standards describe, for example, what content is to be kept in the ECM system and how it will be distributed within the company:

> We conducted a survey among our market organizations in order to collect their content-management requirements. The survey results provided us with a foundation for defining content standards—for example, regarding the storage of documents. Among others, these standards described types of documents, required metadata, and some process scenarios.

Along this line, the use of predefined storage structures and content templates was suggested, as these can ensure consistency, establish maintenance cycles, avoid redundancies, and reduce the workload for tagging the content with keywords:

> I think it can improve end users' acceptance of ECM if they are provided with guidelines on how to store content. This, however, depends on both the extent of the changes made and the utility that the user finally experiences.

Content tagging, which the interviewees considered highly relevant, refers to generating appropriate metadata for characterizing content objects in order to allow other users to retrieve them later on. Respondents agreed that the use of metadata must be mandatory in order to leverage ECM systems' potential fully. ECM systems should provide easy-to-use tagging mechanisms to facilitate the use of metadata. There are several approaches to content tagging, such as automatically generating metadata or suggesting it to content producers who can then choose which metadata characterize a given content object best.

> We capture much of the required metadata automatically—for example, with the help of our ERP system.

Interviewees considered metadata especially important for content versioning, which is of particular relevance in collaboration-intensive settings, where multiple persons may work on the same file. Along with the ability to review what changes were made, the interviewees considered automatically informing users about updates a core ECM functionality. In this context, one interviewee said,

> Version management is the supreme content management discipline.

The use of metadata can increase transparency in content creation and usage. Some of the interviewees indicated that too much transparency can lead employees to resist using the system, as they may feel supervised. We categorized this issue as *user tracking*:

> Not all of the new workflows will be enthusiastically welcomed. There is a certain risk that ECM users become transparent.

Additional Factors

In summary, analysis of the interviews supports the relevance of the sixteen ECM acceptance factors identified in the literature review and identifies six additional factors that organizations should consider when implementing ECM: *monitoring/evaluation* (enterprise level), *business process analysis* and *project management* (process level), *collaboration* and *workflow support* (technology level), and *user tracking* (content level) (Table 6).

Table 6 Additional acceptance factors mentioned by the interviewees

Factor	Description	Level
Monitoring and evaluation	Avoid redundancies and inconsistencies in content (e.g., reviews, reuse)	Enterprise level
Business process analysis	Analyze business processes to identify content, users, and systems	Process level
Project management	Avoid project delays and changes in the project team (e.g., use milestones)	Process level
Collaboration	Support collaboration-intensive settings (e.g., versioning)	Technology level
Workflow support	Implement, support, and automate content-intensive processes (e.g., content reviews)	Technology level
User tracking	Prevent content users from feeling supervised (e.g., logs, metadata)	Content level

Discussion

In their critical literature review, Legris et al. (2003) identify three major shortcomings of prior TAM research. First, many of the studies that draw on TAM involved students instead of business representatives (Legris et al. 2003). The present study, which also builds on prior literature on ECM and related fields, is grounded in information collected from interviews with project leaders or members from five companies that implemented ECM initiatives. Second, Legris et al. (2003) identify a lack of TAM studies on business process applications. The present study considers the process perspective because ECM systems share several components with BPM systems (e.g., workflow management) (Allen 2007; Chambers 2007). Third, Legris et al. (2003) conclude that most IS research does not measure actual use, but only self-reported use, which also holds true for the present study.

All of the ECM acceptance factors that were identified in the literature review were also supported by the interviewees. This parallelism may be explained by the intimate relationship between ECM and its reference areas, such as document management, records management, and content management. ECM builds upon and extends many of these concepts (Munkvold et al. 2006; vom Brocke et al. 2010). In addition, the interviewees highlighted several important aspects of these factors that organizations that adopt ECM must consider and produced a number of factors that were not identified in the literature review: monitoring/evaluation, business process analysis, project management, collaboration, workflow support, and user tracking. While these additions may be due to the limited scope of the review, their relevance may also be explained by the emergence of ECM as an organizational phenomenon involving technological and content-related issues and processes at the individual, group, and organizational levels (Munkvold et al. 2006; Nordheim and Päivärinta 2006; Tyrväinen et al. 2006). For example, factors

like collaboration and workflow support reflect the fact that enterprise content is created, stored, edited, and applied in organizational work processes that often involve multiple departments and work units. Similarly, monitoring/evaluation becomes increasingly important, as content is used by many people, thus producing challenges, such as redundancies and inconsistencies, that must be mitigated and/or avoided. The relevance of business process analysis and project management shows that, in order to adopt ECM successfully, organizations must leverage well-established management approaches that enable them to handle the complexities of such organization-wide endeavors.

While many of the identified factors (e.g., top management support, information and communication, user training) are likely to apply to a number of technologies, our analysis suggests that some can be considered ECM-specific. Such is the case particularly for the five factors at the content level (content audit and classification, content lifecycle implementation, corporate taxonomy development, content tagging, and user tracking), which were derived primarily from prior ECM research and not from ECM-related literature (Table 5). Content auditing and corporate taxonomy development reflect the enterprise-wide scope of ECM, which exceeds the foci of its predecessors (Munkvold et al. 2006; Smith and McKeen 2003; Tyrväinen et al. 2006). The data suggest that thoroughly auditing content at an enterprise level can easily prove a Sisyphean task, while developing an enterprise-wide taxonomy for content management requires organizations to balance carefully between individual and organizational requirements. The identification of content lifecycle implementation, which aims at managing content efficiently from cradle to grave, is in line with Munkvold et al. (2006), who also suggest that ECM considers the entire content lifecycle. Compared to related approaches that often focus on specific types of information, the management of metadata becomes particularly relevant in the context of ECM, which includes all of an organization's digital information assets regardless of type, format, or source (e.g., Smith and McKeen 2003; vom Brocke et al. 2010). Along this line, in their study on ECM strategy development, O'Callaghan and Smits (2005) write, "Managing content is managing metadata" (p. 1274). Finally, the study suggests that tracking the behavior of content users can cause reluctance because the users may feel supervised. Hence, organizations that adopt ECM in order to gain control over the creation and use of content (Andersen 2007, p. 65) should also pay attention to possible negative consequences.

In summary, we find that all acceptance factors from related fields of research are supported in the qualitative research, which also identifies additional ECM-specific factors. Therefore, ECM can be considered an umbrella term for a number of related approaches but also a concept that confronts organizations with unique implementation challenges. This observation is in line with Päivärinta and Munkvold (2005), who observe, "ECM can be regarded as a modern perspective on information management that integrates the major issues covered in [document management, knowledge management, and information resource management], while also going beyond their individual and collective scopes" (p. 1). We locate these unique

challenges primarily at the content level, which supports the idea that content plays a salient role in any ECM-related research endeavor (Tyrväinen et al. 2006).

Conclusion

Grounded in a systematic review of the IS literature and an analysis of qualitative data collected in interviews with representatives from five organizations that have adopted ECM, this chapter presents and discusses twenty-two factors that can affect end users' perceptions of the usefulness and ease of use of ECM systems. While all of the factors that were derived from the review of ECM-related literatures were supported by the interview data, the interviewees provided additional factors that can impact ECM success. Therefore, our findings support ECM as an approach that integrates many issues of related fields of research (e.g., document management, knowledge management, information management) and that offers new and unique opportunities for IS researchers.

Many of the identified factors are likely to apply to a number of technologies (e.g., user training), but some can be considered ECM-specific (e.g., corporate taxonomy development). As such, the chapter can contribute to establishing ECM as a distinct field of IS research. The categorization of these factors was grounded in an ECM research framework that distinguishes four ECM levels: content, processes, technologies, and enterprise context. We find that ECM-specific success factors are mainly located at the content level, which supports the idea that the concept of content is at the core of ECM research (as suggested by prior work in the field) but also that content plays a leading role in ECM practice (as suggested by the interview data).

This study has some limitations. First, the list of ECM acceptance factors presented in this chapter cannot be considered exhaustive. The factors added from the interviews are based solely on a small number of interviews that were conducted in the course of this research. Additional empirical studies are required to determine their relevance in the context of ECM adoption. Second, no distinction has been made as to whether these factors affect end users' perceived usefulness or ease of use—or both. Third, even though the success factors were organized according to an established ECM framework, other researchers may have chosen other dimensions or levels of analysis (e.g., factors at the individual, group, organizational, or market level).

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Rhetorical Challenges and Concerns in Enterprise Content Management

Dave Clark

Abstract Enterprise Content Management (ECM) can present intriguing new opportunities for organizations' writers, but it also poses significant challenges to the rhetorical assumptions that underlie how writers design, work, and train. In this chapter, I suggest that designers and implementers of ECM consider the rhetorical changes ECM brings in terms of sales and implementation, component-based writing, and training and development.

Introduction

The field of technical communication specializes in researching and creating documentation for technical products and processes, including user manuals, white papers, specifications, and process and procedure manuals. The field is populated largely by academics and practitioners who are technologists and technophiles, although some are late, reluctant adopters of new technologies. Since I joined the field in the mid-1990s, we have shifted from working primarily with paper to working primarily online and we have changed our expectations for new graduates who wish to work in the field.

We are still learning to come to terms with ECM, even though it has been increasing in importance and influence for many years. In the late 1990s and early 2000s, we developed an interest in the related philosophies and methods of "knowledge management" that we hoped would lead to new roles and leadership opportunities for writers (cf. Wick 2000), but for the most part, we are end users of ECM. Technical communicators are rhetoricians, so our work is based in philosophical understandings that combine ancient and contemporary attempts to understand how listeners and

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readers are persuaded and served by texts, whether spoken, written, or multimedia. Our professional goals are fundamentally those of improving and maintaining the quality of documents, and we measure our success by whether those documents are rhetorically successful in helping users achieve their goals. Our interest in ECM, then, is primarily related to how it affects the writing, capture, storage, and retrieval of documents.

While our focus has typically been narrower than that of the information scientists and developers who study enterprise-wide implementations, numerous articles have pondered content management's impact on the future of technical communication (cf. Albers 2003; Carter 2003; Giammona 2004; Sapienza 2004, 2007). Most recently, the program for the May 2011 *Society for Technical Communication* conference included multiple panels on "content strategy" and "content management," along with sessions that focused on specific tools and frameworks used in implementing content management. The focus was on content management as employed in creating technical documentation, not on enterprise-wide activity.

In this chapter, I bring the rhetorical concerns of writing specialists to bear on ECM in the hope of providing readers with insight into the perspective of a segment of ECM's professional end-user population. I do not address all of the potential rhetorical implications of ECM but highlight some of the key concerns of technical communication's academics and practitioners as they relate to writing, workflow, collaboration, and document management in order to provide new perspective for designers and implementers of ECM. I provide an overview of how content management operates in technical communication and follow it with a summary of the key concerns and challenges ECM raises for our field.

Content Management in Technical Communication

The definition of "ECM" is something of a moving target. In 2005, the Association for Information and Image Management (AIIM) defined ECM as "the technologies used to capture, manage, store, preserve, and deliver content and documents related to organizational processes," while in 2011, they defined it as "the strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured information, wherever that information exists" (AIIM 2012). Since 2005, then, the AIIM has broadened ECM to incorporate not only tools but "strategies" and "methods." Arguably, tools and methods were already inseparable if we considered the goals structured into the design of the tools, but the newer definition emphasizes ECM's focus on *content strategy* at a time when interest in "knowledge management" as a management fad and term of note has leveled off. ECM now explicitly embraces a wider range of activities, including managing entire lifecycles of documents with a focus on maximizing their utility for business goals.

Notice, too, the careful distinction both definitions draw between "content" and "documents," a distinction that is of particular concern to technical communicators. A "document" is an instance of any of several organizational genres (like a memo, a letter, or a report), while "content" refers to "structured content," that is, discrete units of text that are tagged with metadata that indicate the text's potential uses, allowing them to be repurposed and reused in multiple genres and across multiple media. For example, a product description, properly crafted and labeled, could appear in user manuals, marketing brochures, sales materials, and training documents provided in many types of media.

This kind of content reuse has multiple advantages, including consistency, accuracy, and cost savings, but such reuse concerns some professional writers and communicators, who argue that, if it is to be as effective as possible, content should be carefully tailored for specific genres, uses, and contexts (Bacha 2008; Clark 2007; Hart-Davidson 2010). A product description that could work equally well in user manuals, marketing brochures, sales materials, and training documents would have to be highly generic, so it may be too sales-oriented for a user manual or not sufficiently sales-oriented for marketing materials.

Still, many in the field have embraced the changes brought about by content management, often even implementing technical-communication-specific systems in the absence of or in addition to the enterprise-wide solutions their organizations implement. These Component Content Management (CCM) systems take content strategy a step farther, allowing for granular control of content; allowing communicators to customize content down to the level of the sentence, phrase, or even word; and making it possible to reuse content even across genres. These systems often also integrate the Darwin Information Typing Architecture (DITA), a technical-communication-specific XML architecture that helps communicators standardize the writing and production of technical materials. Various ECM systems increasingly also include CCM, which can help with interoperability issues between systems.

The modular management of content is not new to technical communicators, who have long used various kinds of "single sourcing" to manage their documentation projects; like many technical writers, in the 1990s I used Adobe Framemaker with some third-party add-ons to output my PDF manuals into an online help system. However, implementing ECM systems means introducing a dizzying array of changes to technical communication departments, which are staffed by professionals who are accustomed to managing their own collaborations and to crafting genre-specific content. What makes content management different from previous technological changes we have encountered is that it automates processes that had been mostly achieved by cutting and pasting and by working extensively with style and output tools. Workplace practitioners have been catching up to these innovations rapidly and have embraced XML, just as they embraced HTML over a decade ago, but there is seldom sufficient time for reflection on the implications of these changes. For their part, technical communication scholars have had little access to the systems organizations use, which are often prohibitively expensive by academic standards, leaving us scrambling to

discover their implications. As a result, we are just starting to understand the implications of these systems for writing and designing technical content.

Rhetorical Issues

Hart-Davidson (2010) suggests that technical communicators have both embraced the potential and criticized the implications of content management (p. 132). Many communicators find the goals of ECM and CCM to be positive and acknowledge that our field is changing and that we must act to keep up, despite significant concerns about the potential of ECM and CCM to accelerate "outsourcing and work fragmentation" (Hart-Davidson 2010, p. 141; Bacha 2008; Clark 2002). For the purposes of this paper, I focus on the kinds of issues that increasingly fill our conference sessions: concerns about sales and implementation, issues with component-based writing, and new challenges for training and development.

Concerns About Sales and Implementation

Hart-Davidson (2010) wraps up his student-oriented overview of content management with the thought that "content management is not magic" (p. 141). Too often, content management systems are sold to organizational managers as "turnkey" solutions that will easily streamline processes and reduce costs, but vendors sometimes fail to acknowledge the enormous complexity involved in the design and implementation of successful systems and that it is costly to get to a point at which the organization will streamline and save. While companies have spent billions on planning, purchasing, installing, and implementing these systems, in their introduction to a special issue of *Technical Communication Quarterly*, which was devoted to content management, Pullman and Gu (2007) state, "A large percentage of such systems fail to yield the kind of effectiveness that is even remotely acceptable" (p. 2).

Technical communicators and other writers can be a great resource for those who hope to learn from these past failures, as the field is full of experienced (but often jaded) survivors of various content management initiatives who now understand that while "content management systems provide resources for enacting" complex communicative work, "they do not do that work by themselves. Nor do they help those who lack expertise in writing studies learn best practices" (Hart-Davidson 2010, p. 141). There is a central irony to content management in that the philosophies that underlie their adoption often follow knowledge management in its insistence that an organization *is* its information and knowledge. For example, Peter Drucker famously claimed that General Motors was a producer of information and knowledge just as much as a producer of automobiles (Drucker 1972). Still, a dichotomy lies in the fact that content

management systems pledge to verify that information and knowledge help to create an organizational culture that respects, organizes, and preserves knowledge, while content management tools often treat writing as a basic skill rather than a critical "strategic activity for a whole enterprise" (Hart-Davidson 2010, p. 142) and seek to automate and eliminate as much writing work as possible (Bacha 2008; Clark 2002).

It is easy to see why companies purchase these systems, given the rhetoric in their favor. These systems are pitched by vendors who have the enthusiasm of technophiles and who assert that the technology can solve organizational problems by empowering workers, increasing knowledge sharing (eliminating "content silos"), and improving content quality, all while cutting costs (Andersen 2007, p. 62). Managers often act on these quick fixes because of pressure from their managers, who are also being sold ECM fixes:

> Because business leaders tend to examine the value of ECM solutions and their disparate applications from a production process model, the extent to which the technologies promise to increase process efficiencies and reduce maintenance and system costs, they are increasingly drawn to the many attractive ECM vendor promises. In their marketing materials and published case studies, leading vendors such as EMC/Documentum, FileNet, Interwoven, Open Text, and Vignette claim that their software solutions will produce a big return on investment (ROI), reduce time to market, increase worker and process efficiency, improve content quality, and increase knowledge sharing and collaboration. (Andersen 2007, p. 63)

Common to all of these arguments, Andersen (2007) suggests, are the all-too-familiar claims of worker empowerment and enrichment that have been common to virtually every technological and managerial development for decades (Gee et al. 1996; Marvin 1988; Postman 1985). Andersen (2007) notes that these widely and consistently made claims are backed with white papers, vendor materials, and industry trade publications that present them as givens. Many of these publications' authors "tend to be the CEOs, vice presidents, marketing directors, and product managers of ECM vendors" (Andersen 2007, p. 68).

Vendors are not necessarily being untruthful; many are true believers who are so sure of their products and approaches that they offer free trials to organizations with the belief that rapid deployment and turnkey solutions really are possible and that, once the products are installed, they will sell themselves. It's difficult to draw any other conclusion from Andersen's eight-month study of a disastrous "90-day" free trial in a Fortune 500 company's technical documentation department (Andersen 2009, p. 137). Vendors like trials because it's easier to sell a system that is already operational than one that is still abstract, but Andersen found that the trial, which was extended several times before ultimately failing, failed largely because of a "lack of appropriate regulative practices." The vendor hugely underestimated the training and support required for rolling out a complicated and nuanced product.

Issues with Component-Based Writing

Andersen's vendor failed to secure the sale because the vendor believed, against all evidence, that implementation would be simple and straightforward and wouldn't require a significant investment of time and energy either by the vendor or by its customers. This outcome is common when the vendor "takes a systems-based approach towards managing content/information/knowledge" that assumes that implementing an effective content management system is largely a matter of selecting the right tool (Gu and Pullman 2008, p. 3) and that rhetorical issues will take care of themselves. However, if an organization is to gain the ROI it hopes for from a content management solution, it must think critically about the rhetorical changes such systems bring about and must train its writers (and not just its professional writers) to write for and interact with these systems.

Consider the changes that end users of content management, particularly writers, face. CCM systems operate by managing content at levels of granularity that range from the entire document to the document chunk down to the single word or punctuation mark. In doing so, they must rely on databases filled with content chunks that are associated with metadata but that may be dissociated from genre and presentation. As I suggested elsewhere, with CCM,

> a single piece of content, properly marked and stored, can automatically and simultaneously appear in user manuals, help files, and press releases that can in turn be automatically altered to appear in print, on the Web, or on mobile devices. Once initial designs are created, fonts, colors, and layout are added on the fly for the specifics of each genre and/or medium, and with, for example, a simple change to a style sheet, aesthetic changes can easily be applied to past as well as future documents, making it easy to maintain organizational consistency. (Clark 2007, p. 36)

The key complication for writers is the differences across genres. For generations, teachers have taken a genre-based approach to writing instruction. For example, students in business writing courses are taught that complaint letters, job application materials, reports, and technical documents vary in form, function, approach, and style, depending on what they are intended to accomplish. More recently, scholars of rhetoric have emphasized that genres also have unique characteristics depending on the organization and its history, culture, and structure. These genres change and evolve over time to serve varying organizational needs.

Unlike such customizable and flexible writing, content management operates by making genres rigid and form-driven, with required fields. CCM asks writers to compose text that is so generic that it can be reused across multiple genres, a task for which few have received training. Consider this example from Rockley's *Managing Enterprise Content* (Rockley et al. 2002), which suggests that some key text could be customized to work across genres (Table 1).

The assumption in this example is that moving across genres can be accomplished by adding or cutting phrases without considering tone, style, or organization. In this limited example, it seems to work well, but simple product descriptions are only a small segment of the writing work performed in

Table 1 Example of content customization

Brochure	Operations guide	E-commerce site
The B-Brother model 1984 is a programmable device that connects directly to consumers' televisions to track the channels they flip to, what programs they record, and what commercials they skip. The information is instantly transmitted to the cable or satellite provider.	The B-Brother connects directly to consumers' televisions. It can be programmed to track what channels they flip to, what programs they record, and what commercials they skip. The information is transmitted to the cable or satellite provider.	The B-Brother model 1984 is a device that connects directly to consumers' televisions to track their television viewing habits.

Source Rockley et al. (2002), p. 36

organizations, and even in this example, the amount of tagging and customizing is significant. As the amount of labor required to make such chunks work across genres increases, the potential savings drop off.

A more common model of reuse is reuse *within* genres. For example, if a company that produces laser printers also produces technical documentation for those printers, that documentation need only be as different as the products themselves are. Often the differences are small, and large pieces of the documentation can easily be reused for different models of printers. Therefore, writers need not spend significant time customizing and coding at the sentence and word level but can instead write genre-specific chunks that can be reused wholesale across different media.

Even in those cases, though, it is important for managers and writers to ask whether reusing content, while it may improve consistency and accuracy, ultimately serves their organizations best. Several key, interrelated issues can be exacerbated by uncritical reuse, even when everything otherwise goes well with a new implementation:

- *Reuse promotes consistency, not clarity.* Content management is often sold by emphasizing its advantages to organizations, rather than its advantages to an organization's key reading audiences, including its end users. In discussing writing for content management, Hackos and Rockley (1999) suggest, "Each component of information [should] be written exactly alike. This means it will be completely transparent when it is used in multiple locations" (p. 2). While the information will be transparent to writers and managers, will it be the best possible text for users? Consider the case of an end user of a laser printer who is struggling to use his new wireless printer with his Mac, even though it works fine with his PC. He checks the company web site, the printed manual, and the online help built into their printer's installation DVD and finds in each case an identically written description of the installation process—that is, the same description that didn't help him in the first place. As companies hope, many users would consult discussion forums at this point and find a solution, but

others will instead call technical support—or, worse, return the product and write a bad online review.

- *Reuse can limit writing and design craft.* Content management can provide disincentives to creative thinking about rhetorical problems. There is nothing new about the reuse of content within and even across genres; for example, technical communicators have always copied and pasted relevant, repeatable material in similar manuals for similar products. However, content management systems by their nature regularize and standardize processes and, in the process, interfere with customization and creativity (vom Brocke et al. 2010), if only by discouraging potential solutions that wouldn't fit inside the literal and figurative boxes presented by ECM. Rhetoric scholars have long worried that content management software strips writing of much of its status; Albers (2003) compared the effects of content management to the effects that late-nineteenth-century automated production had on craftspeople and product quality (p. 336). Just as worrisome is the possibility that optimal solutions for human users might not be developed because of the pressure to devote time only to those writing and design tasks that can be reused with minimal effort.
- *Reuse can create issues with internationalization.* Global organizations often must provide international users with translations, either out of necessity or by law. Few organizations can afford to localize their materials in any real way, so they rely on literal, word-for-word translations of their materials instead of undertaking the labor and expense of customizing for their target language and culture. Content management systems are frequently promoted as offering significant opportunities to save costs on translation (Hackos 2002; Rockley et al. 2002), but these savings are realized at the cost of clear communication by turning translation into a chunk-by-chunk process in which each reusable chunk needs to be translated only once into each target language. While this process is much less expensive than translating each of a dozen product manuals individually from beginning to end, it also provides "enormous incentive to not improve phrasings, change designs, or add user-requested content" (Clark 2002) because each minor change could mean significant new translation expenses across multiple languages.

New Complexities for Training and Development

Dozens of textbooks, conferences, and organizations are dedicated to teaching writers and non-writers how to become proficient at writing for organizations. In the United States, most university engineering, science, and business programs require students to take technical and/or business writing courses and introductory composition courses. The last fifteen years have also seen growth in "writing across the curriculum" programs that use the key courses in their disciplines to help students learn to write.

However, as educators we are still learning how to help students adapt to the new writing environments and expectations of ECM. All types of writers in ECM

organizations need significant skills in working with metadata, search optimization, and information design, even if their interaction with the ECM system is only in the form of storing and retrieving full documents. If they also write and design using web content management or a CCM system, they must understand writing differently than how they were taught in most writing courses.

Technical communicators are wise to view these changes as opportunities because preparing students for ECM environments can help them rethink how writing and other communicative work take place. We have long recognized the importance of helping students see their writing work as central to the work of their organizations and as consisting of far more than simply avoiding embarrassing errors or inaccuracies:

> From today's academic programs, most technical communicators do receive training, not in "how to write," but rather in how to perceive writing as a social and cultural practice and in how to take an inquiry-based, problem-solving approach to understand this practice in particular contexts….The lingering idea that writing is somehow a "basic skill" rather than an area of strategic activity for a whole enterprise sometimes causes managers to make poor choices when implementing CM practices and systems. Many see these as a chance to automate, or, worse, eliminate the work that writing specialists do. (Hart-Davidson 2010, pp. 141–142)

Many in the technical communication field echo Hart-Davidson's concerns that content management automates many processes that were once important parts of the daily work of practitioners, in some cases undercutting the perceived value of writing work. On the other hand, we might heed the first part of the quotation as it relates to how ECM can help us equip students for the new realities of organizational writing. For example, Rockley (2001) and Hackos (2002) argue that content management work can help writers return to writing, since freedom from the work of formatting, layout, and production, which is now standardized, allows writers to focus on writing. Others, including me, argue that this streamlining has the potential to strip communicators of much of their hard-won expertise in layout, design, and specialized tools; in my own work, I have argued that trimming writing work down to tagging "content" carries with it the risk that writers will be seen as little more than typists.

All of this furor over writing and content occurs at a time when writing is becoming more complex than ever and when our teaching has not yet caught up to organizational needs. Even contemporary technical writing textbooks rely on increasingly outmoded notions that conceive of writing as a discrete and singular task in which an author relies on traditional rhetorical understandings of audience, purpose, and context but is not asked to envision how her texts might be stored, distributed, fragmented, and repurposed in ways that were rare before the adoption of content management systems. Now particularly large organizations are adopting these systems, and we are far behind in preparing future workers to think and work with them adequately. We are in the business of studying writing and communication through the examination of organizational contexts, and those contexts are undergoing a significant technological shift; it's time for us to find ways to leverage and teach that shift.

Technical communicators are keenly aware of this problem, and practitioners at conferences and local meetings encourage me to ensure that students are receiving training in structured writing, XML, and related tools, while scholars emphasize the importance of teaching students rhetorical theories that will help them cope with contemporary networked communication (cf. Brooke 2009; Spinuzzi 2008). At the same time, students still need the same kinds of writing training as ever, training in coherence, conciseness, and sentence structure.

Despite years of assertions that technical communicators are well-positioned to play leadership roles in content management design and implementation (Johnson and Fowler 2008; Wick 2000), scholars are just beginning to develop best practices for fitting all of these needs into our curricula, and mainstream textbooks are just beginning to catch on and catch up. A consensus is emerging that not only technical communicators, but all students who work in organizations that use such technologies should be well versed in the theories and tools of writing (Eble 2008; Hart-Davidson 2010).

We can train students to work with these tools by leveraging rhetorical theory. Robidoux (2008), for example, suggests that content management authors can be trained by relying on current structured writing methods that are not dissimilar from Robert Horn's "structured writing," which finds its roots in classical rhetoric's similar concerns with structure. According to Robidoux (2008), "These strategies represent basic principles of content development, structure, and organization—principles described long ago by Aristotle, Aphthonius, and Hermogenes" (p. 120). Robidoux (2008) includes a thorough multi-module, multi-semester proposed curriculum, but I despair at the notion of trying to find space for it within existing programs, and it's altogether too much for training non-specialists.

Conclusion: Future Work

Technical communicators, who are useful to examine as representative ECM end users, are still learning to manage its cultural, rhetorical, and pedagogical implications:

- *Concerns about sales and implementation.* Content management is too often sold without adequate acknowledgment and understanding of the training, support, and process overhauls required for it to work effectively in an organization.
- *Issues with component-based writing.* CCM radically restructures long-standing rhetorical practices. The new processes it introduces can prioritize efficiency and cost savings over effective, audience-based writing.
- *New complexities for training and development.* Academics and practitioners are still learning to train writers to work with content management's very different understandings of invention, writing, storage, retrieval, and repurposing.

These issues are being explored by technical communicators, but there is plenty of room for additional exploration and research that will help all end users of ECM

to make new installations and implementations more rhetorically and financially successful.

"Knowledge management," both as a term and a philosophy, seems to have peaked in use and interest, and although it's not entirely clear that it was only a management fad, it has largely been replaced in business and management discussions by more pragmatic discussions of "content strategy" and a variety of tool-based approaches. Still, done well, organizational implementations of ECM systems carry forward knowledge management's assumption that organizations should restructure themselves in ways that emphasize the importance of capturing and reusing information and knowledge. However, organizations that do so will raise many questions about existing practices for publishing requirements, workflows, markup, storage, retrieval, and so on that it will touch "nearly everything about the culture of writing in an organization, beginning with how texts are understood and encompassing every step of the text generation life cycle up to and including the way a text should behave when a user interacts with it" (Hart-Davidson et al. 2008, p. 12).

From the perspective of professional writers, ECM is fundamentally a shift in how an organization reads and writes—two of the most critical functions in any company or industry. Hart-Davidson et al. (2008) suggest that all workers must "do accounting," but professional accountants ensure the organization as a whole is well accounted. Similarly, all workers must write, but professional writers should ensure that organizations are creating the kinds of reading and writing environments that best support organizational goals and priorities. An important part of creating those environments is following technical communicators in putting resources into thinking rhetorically as well as technologically about organizational goals.

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Cultural Values Matter: The Role of Organizational Culture in ECM

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Abstract Even though many enterprise content management (ECM) initiatives in practice struggle with cultural issues, research seems to have not yet addressed this intangible organizational aspect in ECM. Therefore, this chapter focuses on the role of organizational culture with regard to ECM. Organizational culture refers to the shared values embraced by an organization's employees. The chapter analyzes the mutual influence of the concepts of ECM and organizational culture on each other, examines the specific characteristics of a culture that is supportive of an ECM approach, and identifies ways how to realize such a culture. The findings provide insights on the intangible aspects to be considered when implementing and operating ECM.

Introduction

ECM has increasingly gained importance in today's information flooded business world. It focuses on the efficient and effective handling of all information assets in an organization (Smith and McKeen 2003). Only few scholars have addressed ECM in their research to date, but it seems to be common sense that ECM refers not only to technologies but also to organizational aspects of the management of content (Munkvold et al. 2006; Scott et al. 2004; vom Brocke et al. 2010, 2011b). Given this comprehensive understanding of ECM, it is surprising that research seems to have not yet focused on the role of culture with regard to ECM. This gap

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is especially remarkable considering that many ECM initiatives in practice struggle or even fail for cultural reasons—though the importance of culture for ECM is well-known (Bridges 2007; Rockley et al. 2003; Scott et al. 2004).

Against this background, the purpose of this chapter is to examine the role of organizational culture in ECM. Specifically, a closer look is taken at the influence of culture on ECM and the influence of ECM on culture to then determine underlying cultural values that generally support ECM as a management approach. The analysis is based on the understanding that a particular management approach reflects a certain philosophy on how to handle a specific facet of business to achieve performance improvements and competitive advantage (Schmiedel et al. 2013). Therefore, it is assumed that specific ways of thinking and, thus, specific value orientations are inherent in the philosophy underlying ECM as a management approach. These considerations serve as a starting point for the examination of an organizational culture supportive of ECM.

The analysis of the role organizational culture plays in ECM is based on interviews and group discussions with ECM experts from academia and practice. In the following, a brief background of ECM and organizational culture is presented. This introduction of the understanding of the two concepts which underlies this research is followed by an analysis of the mutual influence of these concepts on each other. Finally, the facets of an ECM-supportive organizational culture are examined, and ways how to realize such a culture are identified. Concluding, the implications for research and practice are discussed.

Background

Existing research provides several definitions for ECM and culture. To position the approach taken in this chapter, the understanding of the two concepts that underlie the research of this chapter is introduced. The following section elaborates on ECM and organizational culture as the major concepts of this research.

Enterprise Content Management

The term "ECM" stems primarily from software vendors and business analysts (Tyrväinen et al. 2006; vom Brocke et al. 2011a). For this reason, early ECM approaches in research and practice focused on technologies that support the management of content since ECM was understood as an IT solution to an organization's administration of information assets (e.g., Gupta et al. 2001; McNay 2002). Only in recent years has ECM been addressed more comprehensively as "the strategies, tools, processes, and skills an organization needs to manage all its information assets (regardless of type) over their lifecycle" (Smith and McKeen 2003, p. 648).

In fact, a recent literature review reports that two different perceptions of ECM can be identified in existing research (Grahlmann et al. 2011). One stream of research takes a content and technology perspective on ECM, including aspects like data management and functional requirements for ECM systems. The other concentrates on an enterprise or process perspective, focusing on the social aspects of ECM in addition to its technological aspects and, thus, taking an integrated perspective on ECM.

Despite this rather holistic understanding of ECM that has developed, one major organizational factor that seems to have not yet been sufficiently considered in ECM research is that of organizational culture. While the relevance of this intangible factor in ECM is well-known (Bridges 2007; Rockley et al. 2003; Scott et al. 2004), an in-depth analysis of culture's role in the context of ECM seems to have not been undertaken. Change management as a concept related to culture has been addressed in extant ECM research (Munkvold et al. 2006; Päivärinta and Munkvold 2005), yet there still seems to be lack of research on how to change an organizational culture so it is supportive of an ECM approach. The next section considers the concept of organizational culture.

Organizational Culture

Many scholars agree that shared values are the core element of culture (Straub et al. 2002). Parsons and Shils (1951) describe patterns of value-orientation "as the most crucial cultural elements" (p. 159). Hofstede's (2005) culture onion displays layers of culture "around a core that consists of values" (p. 10). Schein (2004) defines the essence of culture as deeply embedded, unconscious, and nonnegotiable "underlying assumptions", acknowledging that other culture researchers prefer the term "values". In other words, many approaches focus on a value-based definition of culture.

When alluding to culture, it is important to be aware of the cultural group one refers to. Every group shares specific values and culture research commonly distinguishes nations, organizations, and work groups as cultural groups (Leidner and Kayworth 2006). Even though research on culture typically focuses on one of these cultural groups, these categories have a complex interrelationship as no cultural group is homogeneous in the sense that all people who belong to it think and act the same way. On the contrary, every person is shaped by several cultural groups at the same time. For example, the region, the nation, the profession, the religion, the organization to which we belong influence our value system and provide us with a variety of cultural identities (Huntington 1997; Tajfel and Turner 1986).

While this chapter acknowledges the complexity of the culture concept, it focuses on the organization as a specific cultural group so it does not address the interrelationship between organizational culture and, for example, national or professional cultures. Against this background, the understanding of the culture concept that underlies this chapter can be summarized as follows: Organizational

culture refers to the shared values that are lived by an organization's members. Based on this definition, the relationships between the concepts of ECM and organizational culture are analyzed in the following.

Relationship Between ECM and Organizational Culture

Building on results from interviews and group discussions with ten ECM experts from academia and practice, and grounded in the academic literature on ECM and organizational culture, this section provides insights how organizational culture can influence ECM, how ECM can influence organizational culture, and what the relationship between ECM and organizational culture ideally looks like. In the following, the relationships between the two concepts of ECM and organizational culture are analyzed.

Impact of Organizational Culture on ECM

In this section, culture is considered an independent variable influencing ECM. The following paragraphs examine (1) how organizational culture can positively or negatively influence ECM, (2), why organizational culture influences ECM one way or the other, and (3) what the implications of these cultural influences are for the implementation and operation of ECM in an organization.

1. *How organizational culture positively or negatively influences ECM.* Culture has been identified as both a driver and an inhibitor of organizational management initiatives in general and ECM initiatives in particular (du Gay 1997; Gerstner 2002; Kutty 2011).

As a driver, organizational culture positively influences ECM. In fact, it is not surprising that it is hardly noticed when organizational culture functions as a facilitator of ECM implementations and operations. A smooth realization of an organizational ECM approach is far less astonishing than one in which organizational culture serves as an inhibitor of change. In this case, one typically does not notice any obstacles related to resistances based on people's cultural identity.

As an inhibitor, organizational culture negatively influences ECM. Cultural barriers to the management approach become apparent when employees perceive ECM-related tasks as a burden because these tasks do not seem to be compatible with some of their values. For example, employees from the marketing department may see ECM as an approach that restricts their way of working in that it limits their freedom to creatively develop and use content.

2. *Why organizational culture influences ECM positively or negatively.* The impact of organizational culture on ECM depends on the compatibility of the lived values in the existing cultural context of an organization with values that are

generally supportive of an ECM approach (cf. vom Brocke and Sinnl 2011). If the cultural context of an organization fits with an ECM approach, there is no conflict between existing cultural values and the ones that facilitate ECM. However, if the cultural context of an organization does not fit with the ECM approach, the existing cultural values conflict with those that generally support an ECM approach.

A closer look at the question concerning why culture influences ECM either positively or negatively reveals several cultural dimensions that determine the direction of influence. They include the following dimensions:

- *Perception of competition*: Based on the extent to which the employees of an organization perceive themselves as being in competition with their colleagues, knowledge and content may rather be hidden or shared. A culture of high competition in which individuals aim for predominance through knowledge advantages has a tendency to hinder ECM because employees will not share content voluntarily. However, a culture that emphasizes cooperation rather than competition is likely to influence ECM positively.
- *Handling of mistakes*: Depending on the way that mistakes are handled in an organization, employees may either fear control and blame for their mistakes or be happy to learn from their mistakes and from the opinion of others. A culture of surveillance and blame for mistakes is likely to negatively influence ECM, as people will not like sharing content (as they are afraid of any negative consequences based on potential mistakes), while a culture with a positive view of control as a chance for improvement and learning supports an ECM approach.
- *Meaning of self-fulfillment*: Based on the importance that is attached to individual self-fulfillment, employees either feel a loss of freedom and creativity or enjoy the uniformity gained through ECM. A culture of strong self-fulfillment may have a negative impact on ECM because employees may prefer to generate content creatively rather than to be obliged to (re)use given content. However, a culture that emphasizes uniformity rather than self-fulfillment may influence ECM positively.
- *Purpose of rules*: The role of rules in an organization can determine whether employees perceive ECM as dictatorial or as a common service. A culture in which rules serve as a means to dictate ways of working is unlikely to support ECM. Yet, a culture that sees rules as common sense-making structures positively influences ECM because employees may rather be happy to contribute to the bigger picture in this kind of culture.

These four cultural dimensions provide some insight into why organizational culture can have a positive or negative influence on ECM. The implications of these influences on ECM implementation and operation are as follows.

3. *Implications for the implementation and operation of ECM*. Cultural drivers or barriers can influence both the speed of implementation and the acceptance of ECM in daily operations. Regarding the former, an ECM implementation can be slower or faster depending on the existing organizational culture. Cultural

resistances, for example, can hinder an efficient implementation of ECM. As indicated above, these resistances are based on the given cultural context of an organization, which may negatively influence ECM.

Organizations that launch an ECM approach while ignoring cultural barriers are likely to face difficulties regarding its adoption in daily operations. The implementation of ECM systems, for example, does not guarantee that employees will adopt the measures and habits that are required for a successful long-term realization of ECM in an organization. If the given cultural context is not initially supportive of ECM, a change in organizational culture is required. Accordingly, the next section examines the impact ECM can have on organizational culture.

Impact of ECM on Organizational Culture

This section considers culture as a dependent variable influenced by ECM. The following paragraphs focus on (1) why ECM can influence organizational culture, (2) how ECM can influence organizational culture, and (3) what the implications of these influences are for the implementation and operation of ECM in an organization.

1. *Why ECM influences organizational culture*. A successful ECM approach requires a supportive cultural setting. It has been recognized that an ECM implementation influences the existing cultural context of an organization (e.g., Cameron 2011), as the cultural context needs to embrace a set of cultural values that are particularly supportive of ECM. In other words, the adoption of the management approach requires the inclusion of cultural values that are particularly supportive of ECM in the lived organizational culture. The extent of the required cultural change depends on the compatibility of the cultural context with values that generally support an ECM approach.

Organizations whose cultures prove to have a negative influence on ECM require a significant cultural change. The ability to implement and operate ECM successfully in such an organization depends to a large extent on the organizational competences to realize this cultural change.

2. *How ECM influences organizational culture.* ECM drivers for cultural change include the following:

- *Standardization*: With ECM comes standardization of the way in which content is managed in an organization, such as generation of corporate metadata models (Päivärinta and Munkvold 2005). This standardization intends to replace the individual management of content, which often does not allow efficient retrieval and reuse on a corporate level. By standardizing global corporate processes related to the management of content, organizations have the chance to define and implement a global culture that supports the ECM approach. In other words, standardization in the context of ECM can

drive required cultural change when organizations not only define and implement technical or methodological specifications but also realize common values that support their approach.

- *Professionalism*: ECM provides organizations with the opportunity to add to a professional appearance for external and internal stakeholders. An effective approach toward managing content has mainly been enabled through the availability of information systems, which allow, for example, a separation of presentation and content (Clark 2007), such as web content management systems. The professionalism that these systems facilitate can serve as an important driver of ECM-required cultural change. This is due to the fact that the resulting professionalism creates awareness of the benefits of ECM and can thus shape the values of the cultural context.
- *Collaboration*: ECM involves a significant amount of collaboration between employees, especially in terms of content and knowledge sharing (Päivärinta and Munkvold 2005). To ensure this collaboration, appropriate communication is required to foster the acceptance of ECM and the related information systems. The resulting collaboration, which accompanies the ECM approach, can then create a strong culture of teamwork. In other words, collaboration can serve as an essential driver of cultural change. In this regard, ECM can be considered an approach which strengthens the corporate spirit of an organization.
- *Qualification*: ECM requires that employees have a specific skillset. This skillset includes a certain level of IT-affinity but also managerial and soft skills when it comes to collaboration. Therefore, employees may need to obtain additional qualifications. For example, IT requirements may be especially challenging for employees who have difficulties with computers. However, these additional qualifications can serve as a strong driver of cultural change, as they foster a common understanding of the ECM approach.

These drivers of cultural change are some examples of how ECM can influence organizational culture. The following examines the implications of these impacts for ECM implementation and operation.

3. *Implications for the implementation and operation of ECM.* The effort required for the implementation of ECM in an organization depends to a large extent on how much cultural change the ECM approach requires. This, in turn, depends on the compatibility between the cultural context and ECM. In other words, the extent to which ECM influences organizational culture is determined by the organizational culture itself. Further, a cultural change that is based on an ECM initiative not only requires significant organizational efforts but can also go far beyond the timeframe of the ECM implementation.

As any cultural change, an ECM-induced cultural change can take considerable time before organizational structures and employees' behavior have transformed in the intended way. However, only this internalization of specific cultural values sustainably changes the way people work and supports the acceptance of ECM in

daily operations. While this section and the previous section focused on ways in which ECM and organizational culture can influence each other, the next section examines the specific cultural values that are supportive of an ECM approach.

ECM-Supportive Cultural Values

This section combines aspects of the previous two sections in that it takes a closer look at cultural values that generally support an ECM approach. These normative values determine the nature of an organizational culture that positively influences ECM on the one hand, and, thus, determine the influence ECM can have on a given organizational culture on the other hand.

The specific ECM-supportive cultural values presented here were identified in an iterative process with ECM experts from academia and practice. First, various values were collected that are generally perceived as being supportive of ECM. These values were then consolidated and ranked according to the degree to which they support ECM. The resulting top five values were considered core values supportive of an ECM approach. To gain a deeper understanding of the meaning of each individual value, definitions were derived as follows. First, terms for the definitions were collected from all experts. Second, these terms were consolidated and definitions were suggested to the experts. Finally, the definitions were discussed and refined. In this process, the following cultural values were identified as supportive of ECM:

- *Discipline* is defined as appreciating the bindingness of defined rules on the handling of content.
- *Transparency* is defined as appreciating the availability of content and the traceability of its usage.
- *Systematization* is defined as appreciating logic patterns for structuring content.
- *Trust* is defined as expecting security of the content that is generally available in processes and systems.
- *Responsiveness to change* is defined as being open to improved or new processes and systems for the management of content.

Based on the identification of these ECM-supportive values, an additional rating of those values according to their importance for ECM implementation and ECM operation was conducted as follows. Each expert was given 100 points for distribution among the five values. The more points were allocated to a specific value, the higher its perceived importance was. This exercise was done twice: once to rate the importance of each value for ECM implementation and once to rate the importance of each value for ECM operation. The resulting ranking of values revealed additional insights.

The importance of the five ECM-supportive values for ECM implementation was perceived in directly opposite order of that for ECM operation. While

Table 1 Importance of ECM-supportive values as determined by ECM experts

ECM-supportive values	Rating of importance to ECM through distribution of 100 points among the five values			
	Importance for ECM implementation (average of responses)	Rank	Importance for ECM operation (average of responses)	Rank
Discipline	15.0	5	26.7	1
Transparency	15.8	3	22.5	2
Systematization	15.8	3	20.0	3
Trust	18.3	2	19.2	4
Responsiveness to change	35.0	1	11.7	5

responsiveness to change is perceived as by far the most important in the context of ECM implementation, this value is significantly less important for ECM operation. Conversely, *discipline* is perceived as much more important for ECM operation than it is for ECM implementation. Table 1 provides an overview of the rating results.

The identified ECM-supportive values provide first insights on the nature of an organizational culture that positively influences ECM. The next section examines what measures an organization can take to realize these values, i.e., how these values can be incorporated in the given cultural context of an organization.

Measures to Realize a Culture Supportive of ECM

The identified ECM-supportive values make up the core of a reference culture that facilitates ECM. A comparison of these values with those being lived in the given cultural context of an organization allows identifying specific mismatches. For example, if the handling of mistakes in an organization is such that employees fear control and blame, a misfit can be identified with the ECM-supportive value of transparency, as employees will not appreciate the traceability of content usage. In cases like this, specific measures are required to change facets of the existing organizational culture to match with the intended reference culture.

Against this background, the experts involved in the study identified several measures how to realize a culture supportive of ECM by incorporating the identified values in the organization's culture. These measures include the following general and value-specific actions.

- General
  - Consider ECM-supportive values when hiring new personnel.
  - Generate awareness for ECM-supportive values (e.g., through cultural trainings, through communication of the personal benefit and the organizational significance of the values).
  - Pay attention to the needs of employees for integration and participation (addressing fear of employment loss).
  - Gain managerial support and involve key multipliers or influencers.
- Discipline
  - Link KPIs with positive and/or negative incentives.
  - Request case-related information through supervisors (to avoid the impression of control).
  - Point out employees' duty and the gap between the as-is and the to-be state (e.g., standards related to the archiving of documents).
- Transparency
  - Review incentives that may foster non-transparency (e.g., bonuses for patents).
  - Create awareness of already existing transparency (addressing fear of transparency).
  - Emphasize integrity (making idea theft taboo).
- Systematization
  - Minimize work efforts through system support (e.g., fixing metadata).
  - Establish awareness for processes (e.g., communicating benefits for the overall business process through structured content).
  - Emphasize the simplification that results from structured content.
- Trust
  - Spread a positive atmosphere through early success stories.
  - Walk the talk.
  - Increase trust in the solution through certificates and references.
- Responsiveness to change
  - Challenge existing content management systems (pointing out the danger of water, fire, theft).
  - Involve both tenured and young employees in work teams.
  - Identify and involve negative missionaries early.
  - Encourage continuous improvements and establish a service structure for continuous user support.

The identified measures provide first insights into how a culture supportive of ECM could be established in terms of actions that could foster the incorporation of specific ECM-supportive values in the culture of an organization. As initial findings, the identified measures provide a basis for future research. They may well be

complemented by other measures. Most importantly, the applicability of these measures for specific cultural contexts needs to be verified. Even though the identified measures seem generic, they may serve their purpose only in particular cultural contexts. Nevertheless, the identification of these measures provides an initial idea of how an ECM-supportive organizational culture may be created. In the following, the research findings are discussed in more detail.

Discussion

This chapter provides two major insights regarding the role of organizational culture in ECM. First, it sheds light on the relationships between the two concepts of ECM and organizational culture in that it examines their mutual influence on each other and identifies specific ECM-supportive cultural values. Second, the chapter introduces a set of initial measures that may establish an organizational culture that embraces the identified ECM-supportive values.

While the chapter emphasizes the establishment of an organizational culture supportive of ECM, it does not call for an overall change of the existing culture toward one that embraces only ECM-supportive values; ECM requires establishing a specific facet of organizational culture that supports the ECM approach, yet it also allows for the maintenance of cultural facets that have evolved over time, often tracing back to the founding fathers of an organization.

The same holds true for work group cultures. The suggested ECM-supportive culture is not intended to unify the cultures of the various work groups in an organization. There are usually good reasons why, generally speaking, the accounting department focuses less on creativity than the marketing department does. The results do not suggest standardizing these work group cultures but that they embrace the values supportive of an ECM approach in order for the initiative to be successful. While there may be some arguments suggesting that, for example, creative departments cannot perform ECM because it is against their nature, this chapter argues that ECM does not require giving up creativity but that, in addition to creativity, incorporating values like discipline and systematization is useful for tasks related to ECM.

There are limitations to the research presented in this chapter. The findings regarding the relationships between ECM and organizational culture and regarding the measures for establishing an ECM-supportive organizational culture are based on interviews and focus groups with ten experts from academia and practice. The involvement of more experts in the field of ECM may reveal additional or even controversial findings. With regard to the identified measures for realizing a culture supportive of ECM, further research is necessary to determine how far the findings hold true for any type of cultural context and how they can be complemented by measures that apply only to a specific cultural context.

As to implications for research, future work could address the described limitations, but it could also operationalize the identified ECM-supportive cultural

values in order to be able to measure them. Such operationalization would facilitate an analysis of organizational and work group cultures in terms of the degree to which they support ECM. This analysis, in turn, would indicate the amount of cultural change that is required to implement ECM in an organization.

As to implications for practice, the identified ECM-supportive cultural values may serve as guiding principles for organizations to determine the roll-out strategy of an ECM implementation. If ECM is initiated in departments with cultures that already embrace ECM-supportive values, the resulting early success stories can help inspire the rest of the organization and ease the overall implementation. In other words, quick wins may be realized with departments which foster the implementation of ECM based on their organizational sub-culture. For example, the cultural context of the accounting department is likely to have an appropriate cultural fit with the identified ECM reference culture, so one may expect a relatively smooth implementation of ECM, as the employees of this department are possibly already used to archive data based on compliance requirements.

Conclusion

It is widely recognized that the implementation of ECM in an organization often requires cultural change. Therefore, this chapter examines the role of organizational culture in ECM and provides insights based on interviews and focus groups with ECM experts from academia and practice. The chapter shows how organizational culture can influence ECM and how ECM can influence organizational culture. In addition, it suggests specific cultural values that are supportive of an ECM approach. Based on these values, measures are derived for how an organizational culture can be realized that supports the implementation and operation of ECM. While the presented research includes limitations, its contribution lies in its development of first insights on the role of culture in ECM that may serve as a basis for future research and that may support organizations, especially in developing a roll-out strategy for their ECM approach.

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Part II
Methods and Tools

Strategy Development for Enterprise Content Management

Martin Smits and Ramon O'Callaghan

Abstract Many organizations maintain a variety of systems and databases in a complex ad-hoc information infrastructure that does not fulfill the need for company-wide unstructured information management in business processes, business functions, and the extended enterprise. We present a framework and a method for implementing enterprise content management (ECM) in order to address this problem. Framework and method help to select content objects that can be brought under ECM to create business value and guide the IT investments needed to realize ECM. Framework and method were tested in a large high-tech organization that runs four key business processes and a very large set of unstructured content. Application of the framework and the method resulted in the identification of twenty core content objects and 100 content features that were well accepted by the thirty managers involved in two key business processes.

Introduction

Most organizations today generate information at such a rate that it is a challenge to put it in a format and a place where it can be found again when needed. Much of these data is unstructured and not in a format that it can be found efficiently. Many organizations maintain a variety of systems and databases in a complex ad-hoc architecture that does not fulfill the need for company-wide unstructured

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information management in business processes, business functions, and the extended enterprise (Weill et al. 2002). ERP and other systems do not exchange workflow information easily, so much of the unstructured data is re-keyed manually, leading to errors, inaccuracies, and duplications (Nordheim and Päivärinta 2006; Oesterle et al. 2000).

A key challenge for organizations is to decide which unstructured data must be put under some kind of management control and which can be left unstructured and unmanaged (Gupta et al. 2001; Smith and McKeen 2003). This problem has both a business perspective and a technology perspective: The business perspective involves the analysis of information and content needs in organizational units and a decision concerning which content will be managed and how it will be managed. The technology perspective involves the analysis of the existing systems that provide content management solutions and their potential interconnection in an overall architecture to meet the content management needs. This paper addresses these business and technology perspectives and provides a framework with which to develop content management strategies and their underlying architectures.

Our research method is based on the design science approach (Hevner et al. 2004). In order to address the business and technology issues, we design an ECM framework artifact based on the analysis of ECM literature and then evaluate the artifact by applying it in a case. In this chapter, we define ECM (section 'Defining Enterprise Content Management'), develop our ECM framework and method (section 'Framework for ECM Strategy'), test the framework and the method in a large high-tech organization (section 'Testing the Framework in a Case'), and end with discussion and conclusions (sections 'Conclusions' and 'Further Considerations').

Defining Enterprise Content Management

Enterprise Content Management (ECM) has emerged as the convergence of two earlier technologies for managing unstructured information in organizations: document management (DM), and content management (CM).

Document Management

Document Management (DM), which is well established, was well-regarded in the 1980s and 1990s (Wei et al. 2002). DM systems organize and make files accessible (Sprague 1995) using the following parts (based on Boiko 2002):

- File storage: The system 'knows' the physical location of each file it tracks but doesn't require the end user to know that location.

- File categorization: The users can assign file types and groups based on the criteria they choose.
- Metadata services: The users can attach any kind of extra data to a file (such as owner, status, and creation date) based on its type.
- Collaboration services: The users can check files in and out of the system and jointly edit them.
- Workflow services: The users can route files from worker to worker in an organized way.
- Versioning services: The users save a historical series of files and can retrieve them when required.
- Access services: The users can find files through tables of contents, indexes, and full-text searches.

DM systems do not necessarily deal with 'documents'. Although users often target systems toward word-processing and other office files, DM systems have no restrictions about the types of files they contain. Therefore, DM systems could more accurately be called *file-management systems* (Boiko 2002).

Content Management

Content management (CM) was originally associated with Web-development projects. As the Web moved past small, informally designed sites and into large, rapidly changing sites, the need for strong management tools increased. Systems vendors addressed this need by offering *content management systems* (Boiko 2002; Hackos 2002), although Websites are only one of many outlets. As the number of outlets and the information shared between them grow (e.g., multiple Web sites, print publications and anything else that can be created from the same information, especially in e-business networks), the need for a generic approach also grows (Boiko 2002). CM is an overall process for collecting, managing, and publishing content to any outlet.

CM and DM systems have a great deal in common: Both systems seek to categorize information, apply metadata to it, organize its creation through workflow and collaboration, and give end users complete access to it. However, the two systems also differ in significant ways (based on Boiko 2002):

- *DM systems deal with files*, while CM systems deal with content components. Files don't make good containers for content, as they can hold only one component per file if their metadata is to prove at all useful for finding individual components.
- *DM systems were invented to manage files that other applications create*, not to work with what's inside them, while CM systems are directly concerned with creating content, as well as managing it. In both systems, the user controls the

creation of metadata for storage and access, but only in the CM system does the user control the creation of the content as well.
- *DM systems provide access to the files under its control*, while the purpose of a CM system is to create publications that are a combination of the components under its control. To create publications, CM systems need all the access power of DM systems plus the ability to construct a publication automatically out of the components that it finds.

The focus of CM on content components represents an important paradigm shift to *content re-use*. Rather than writing entire documents, authors create elements ('content objects') that can be assembled in 'information products' (e.g., a brochure, a press release, a presentation) for a number of 'delivery methods' (print, mail, intranet, extranet, internet) and audiences ('target users'). Reusing content has multiple advantages: Costs can be saved by writing once and using the information in two places, not only eliminating duplicate writing tasks but also reducing the time needed for reviews, as once a module is written, it can be reviewed, tested, and readied for use in multiple documents. The cost reduction associated with reuse is augmented by the ability to ensure that information is correct, complete, and appropriate to the needs of the users. For example, Dell Computer Corporation creates manuals for a wide variety of related products by creating interchangeable modules. Variations in the information needed to support individual products can be tagged and selected so the author of a manual for a desktop computer uses the same core modules as does the author of a manual for a laptop computer. Where the information differs, the authors write unique modules or modify existing modules by labeling the details that are different (Terra and Gordon 2003).

Enterprise Content Management

The concept of ECM encompasses both CM and DM. ECM capabilities manage many different types of content (e.g., images, office documents, graphics, drawings, print streams, Web content, email, video, and rich media assets) (AIIM 2008). The definition of ECM has expanded beyond core library services to include imaging, workflow, records management, enterprise report management/computer output to laser disc, collaboration, and Web content management (Duhon 2003). ECM has become the umbrella term for a technology category for managing unstructured content, and the Association for Information and Image Management (AIIM) defines it as follows: "ECM is the strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured information, wherever that information exists" (www.aiim.org).

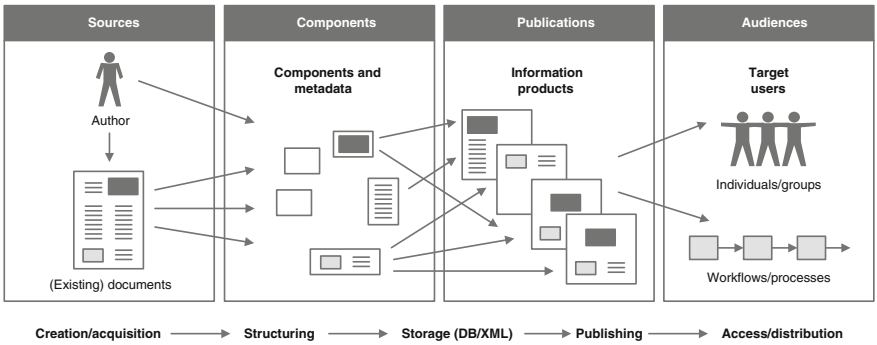

Fig. 1 Stages in the process of content creation (based on Gupta et al. 2001)

ECM involves tasks related to the development of content, from its creation (from sources) to its use by one or more audiences, as represented in Fig. 1 (Boiko 2002; Gupta et al. 2001):

- Create or acquire information from an existing source.
- Structure the information in the system by editing it, segmenting it into chunks (or components), and adding appropriate metadata.
- Create a repository of database records and/or files containing content components, documents, and metadata.
- Extract components out of the repository and produce targeted publications, such as Web sites, printable documents, and e-mail newsletters.
- Make the content easily accessible through a search engine or push it to key users.

One way to enable ECM is to create a central repository that unifies content structure and content access (search, retrieve, version, index, and archive). Creation of such a repository includes defining content structure standards (types, metadata) and content organization standards (taxonomy, indexes, cross-references). To function as a central repository, the ECM system must extend the following qualities over all content (Boiko 2002; Rockley et al. 2003):

- Unified content structure: How content is chunked and tagged (components and their elements) must be standardized across all data sources.
- Unified organization: The hierarchies and other organizational schemes used to categorize and access content must extend to any place the content is stored.
- Unified access: How content is queried and used must be the same across all data sources.

The management of content is based on metadata, which is information about the data (e.g., the instructions that come with the data). Metadata, which is not the content, exists in addition to or after the data and adds context and widens interpretation of the data (Everett et al. 2002). Metadata is also a set of standards

that groups agree to for information definitions. Standards, which are the basis of any kind of data sharing, bring the possibility of large-scale efficiencies in information interchange among groups that may not even know one another. Standards ensure that others can automatically reuse the efforts of another person or group since everyone follows the same standards (Boiko 2002; Stuckenschmidt and van Harmelen 2004).

To manage content, a choice must be made concerning what information must be included as metadata (Boiko 2002). Managing content is managing metadata since metadata makes it possible to share data across applications. In a content management context, metadata enables publications that need a somewhat different form of the same data to draw from a common repository (Wei et al. 2002). We develop a framework for ECM strategy to support this selection process and to identify content that is worth managing on an enterprise-wide scale.

Framework for ECM Strategy

An ECM strategy is intended to reduce the costs of creating, managing, and distributing content and to ensure that content supports organizational needs. An ECM strategy identifies content requirements, creates content for reuse, manages that content in a definitive source, and assembles content on demand to meet organizational and customer needs (Rockley et al. 2003). The ECM strategy development process starts by analyzing existing needs and how these needs are being met: who needs what information, how information supports users, and how it is produced, that is, what processes and technology are used to create content.

The ECM strategy consists of three components (based on Rockley et al. 2003, pp. 16, 17):

- CM system: ECM requires a robust CM solution that manages content in a single source. Most CM systems provide traditional DM functionality, such as secure access to content (check-in/check-out), revision control, reporting, powerful search and retrieval mechanisms, and metadata. However, ECM is not just technology; it addresses the interaction of business with content, people, processes, and tools. Authors need CM to assist them in finding, distributing, or publishing content and to ensure that the content they distribute is accurate and appropriate.
- Reusable content: Content reuse refers to writing once and reusing that content many times. Traditional documents are written in files that consist of sections, but reusable content is written as objects or elements, not documents. Documents are made up of content objects that can be mixed and matched to meet specific information needs. Reusable content is broken down into the smallest reusable object (section, paragraph, and sentence) so it is easy to select an element to reuse or repurpose it. However, even though content elements are reused, copying and pasting is eliminated because elements are stored in the

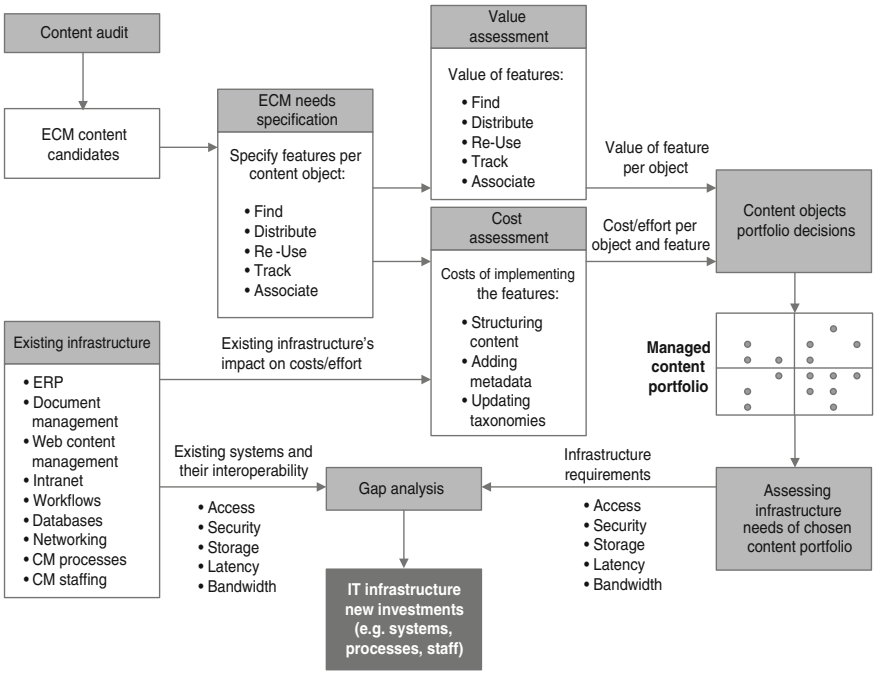

Fig. 2 Overview of the ECM strategy framework

database or CM system and are referenced (pointed to) for inclusion in a virtual document. In this way, the element can appear in multiple places while residing in only one.

- Processes: An ECM strategy also involves people and collaborative processes. The processes must create a collaborative environment in which authors share in the development of content to create a single, definitive source of information. The goal in defining unified processes is to ensure that all departments are aware of what content exists, that all authors can reuse existing content, and that all processes are repeatable and transparent, regardless of which department and which authors are following them.

Figure 2 shows the framework for developing ECM strategy, and the following sections describe the framework, the method, and the steps involved.

Content Audit

Determining ECM needs begins with a *content audit*, a list of the information in the organization. The purpose of a content audit is to determine how content is used, reused, and delivered to various audiences and how information (and the

processes that create it) can be unified, eliminating the 'cut and paste' method many authors use (Rockley et al. 2003, p. 104). The following questions are pertinent:

- How much content exists in a given organizational unit? How fast is it growing?
- How many types of information content are there?
- Who manages which content? Who owns the content? Who uses it?
- How is content reused and repurposed?
- What content must be saved, in what form, and for how long?
- What solutions, systems, and methods are currently used?

The content audit provides the organization with an overview of all of its content and how it is used and reveals those content objects that are potentially more relevant from the point of view of ECM. These objects will typically be those that are used most frequently or those used in important management decisions or key business processes. Since the process of assessing whether it is worth (or not worth) putting a given content object under ECM requires considerable effort, this preliminary step has the practical purpose of reducing the number of content objects that have to be scrutinized. The audit may reveal thousands of documents or *content objects* for a given business unit or process, but only a fraction of these should be analyzed in depth.

Specifying ECM Needs

ECM facilitates the *capture, creation, storage, maintenance, revision, reuse, distribution, search* and *retrieval* of content (AIIM 2008; Boiko 2002; Terra and Gordon 2003). For the purposes of this research, we focus on the elements that have value from the user (business) perspective and select five *basic ECM features*: find, distribute, reuse, track, and associate. The aim of this step is to review each content object and to specify whether the object needs to be made 'findable', 'distributable', 'reusable', 'traceable', and/or 'associable'. Focus group sessions with key informants (people knowledgeable about the content that belongs to a given organizational unit) specify the needed features for each object.

One of the key decisions concerning reuse is the level of *granularity*, which determines the smallest piece of information that is reusable. For an existing document, reuse may imply breaking it into smaller pieces (chapters, paragraphs, sentences), but the level of granularity can change throughout the content. In one instance, large sections may be reused unchanged while in others, content may be reusable at the sentence or even the word level. What's more, different levels of granularity can be used for authoring, for reuse, and for delivery.

Business Value Assessment

The next step is to assess the value of putting the content object candidates under ECM, a step that is accomplished object by object by analyzing the potential value of each feature separately. In other words, what is the value of making a given object findable, distributable, reusable, traceable, and/or associable? In practice, this value assessment can be done by surveying potential users (representatives of the key audiences) or by convening a focus group with key informants (typically, managers familiar with the information used in the main business processes) and asking them to rate the perceived value of each feature. Based on our preliminary experience, we developed some guidelines that can be used to initiate the value discussion in the focus groups:

- *Find*: The value of making a given object 'easy to find' is a function of a number of factors, including the number of users or potential users (audience size), the importance of the tasks for which the object will be used, the criticality of the problem being addressed, and the status of the author/provider of the information.
- *Distribute*: The value of making a given object 'easy to distribute' depends on the defined target audience that 'needs to know', the importance of the content object for that audience's task, or the importance of the object as informational input to a given business process.
- *Re-use*: The value of making a content object 're-usable' is a function of the diversity of authors, information products, delivery methods, and users; the frequency of use/repurposing; and the processes in which a given content object may be reused.
- *Track*: The value of making an object 'easy to track' relates to the size of the potential audience, the role of the user, the criticality of the process/task, and the need for compliance (e.g., Sarbanes–Oxley legislation in the US).
- *Associate*: The value of 'associating' a given content object with other content refers to search situations in which the user does not know exactly what he or she is looking for ('fuzzy requests'). Thus, the value will depend on the frequency/need for such 'fuzzy' inquiries, which tend to be more common in decision-making audiences, in collaborative networks, and in dealing with information from multiple sources.

A short questionnaire is used for each of these features. For instance, we asked respondents to answer (on a 10-point Likert scale) 'how important is it to reuse this content object?' These questions can be used in focus group discussions as well as in surveys of a large number of content users.

Cost/Effort Assessment

The cost of putting a content object under ECM is directly related to the effort and complexities associated with how the features (find, distribute, reuse, etc.) are implemented. The costs depend on the existing infrastructure and on how content is currently being handled. For example, the handling costs of a document that resides in the hard disk of a desktop computer are higher than those of a document already being handled by an enterprise system or a DM system. Therefore, both value and cost should be assessed on a relative basis, which depends on the existing tools, methods, technology infrastructure and information architecture.

As in the case of the business value assessment, it is useful to assess the costs for each of the five ECM features. Unlike the value assessment, the cost assessment must be conducted by *information management specialists* in association with key informants from the business units or processes. The costs per ECM feature depend on adding and managing metadata:

- *Find*: Making a content object 'findable' implies adding content-related metadata. To do that, one must take into account the terms that may be used by authors and users to classify topics and look-up. One way to implement this step is to consider a controlled list of keywords, associate them with the relevant business processes, and put them in a taxonomy. Examples of retrieval metadata are Title, Author, Date (created, modified), Keywords, Security (who can view the content), and Abstract.
- *Distribute*: Making a content object 'distributable' implies adding user profile metadata for targeting (pushing content) to different users or processes, developing and managing a user-oriented taxonomy, and grouping (clustering) content for a given audience. There are differences between Find and Distribute and in their implications for adding metadata: In 'Find', users find the content, such as when a user queries a content database and retrieves the selected content, while in 'Distribute', content 'finds' the users, such as when the system queries a person's database and sends out a message to selected people based on their profile and targeting criteria.
- *Re-use*: Making content 're-usable' implies breaking it into smaller documents/components ('bursting'), putting them in a content repository instead of formatted files, and adding metadata to each component for subsequent retrieval and use. The level of granularity is a key decision that has a major impact on costs and effort; fine granularity requires more complexity in modeling, authoring and managing content, but if content is not granular enough, the ability to reuse information can be compromised. Regardless of the level of granularity, however, authors still write complete documents, not elements, and assign the required granularity to elements (as defined in the information model) as they write. The main difference for authors is in following the assigned structure and in assigning or selecting metadata. In essence, the granularity defines how the completed document is broken down, tagged, and stored for reuse; but it does not define the authoring processes.

- *Track*: Making a content object 'easy to track' implies adding metadata for the review and approval workflow as well as content tracking. Status metadata, for example, could specify whether a document is in draft version, ready for review, in review, final, in approval, or approved. Content tracking adds version control metadata, such as who created the content, when it was created/modified, who reviewed/approved it, how long it took to create/modify/review, and where it has been reused (channel, information product). In addition, when content has been changed, users may want to be notified through alert messages.
- *Associate*: Making a content object 'easy to associate' implies making it easy to find related content automatically, which can be done by adding links to other content objects and by grouping or clustering related content. One can also use taxonomies to find related content. Whereas in 'Find,' people find content, and in 'Distribute' content finds people, in 'Associate,' content finds content.

Content Portfolio Decisions

The outcome of the value assessment and effort assessment is a series of scores for every content object and the five ECM features for each object. The users surveyed will have their perceptions of the relative value of implementing the ECM features for all content objects under consideration, and the information specialist will have rated his or her perception of the marginal effort/cost associated with the implementation of the ECM features for all the content object candidates. Thus, the total number of data points is five times the number of objects.

The next step is to plot these data points using a scatter diagram that plots objects based on value and effort required. Figure 3 illustrates a simple example with six content objects and thirty data points.

In the scatter diagram, each dot represents a decision concerning whether to implement an ECM feature for a given content object based on its value and the effort required. For example, dots that involve high value and low effort (i.e., in the top left quadrant) are clear candidates for implementation, and those that involve low value and high effort (i.e., in the bottom right quadrant) are clear candidates for non-implementation. Dots that would involve considerable effort but would have potentially high value (i.e., in the upper right quadrant) should be carefully analyzed, as the effort may well be justified (high risk, high gain decisions). The low cost, low value points (i.e., in the lower left quadrant) can go either way because the costs involved are relatively low. In practice, the final decision may be influenced by the potential value of having several features or objects implemented together as a set, even though they are initially assessed independently. The outcome of this step is a *managed content portfolio* that reflects the decisions concerning which objects will be put under ECM and which features will be implemented.

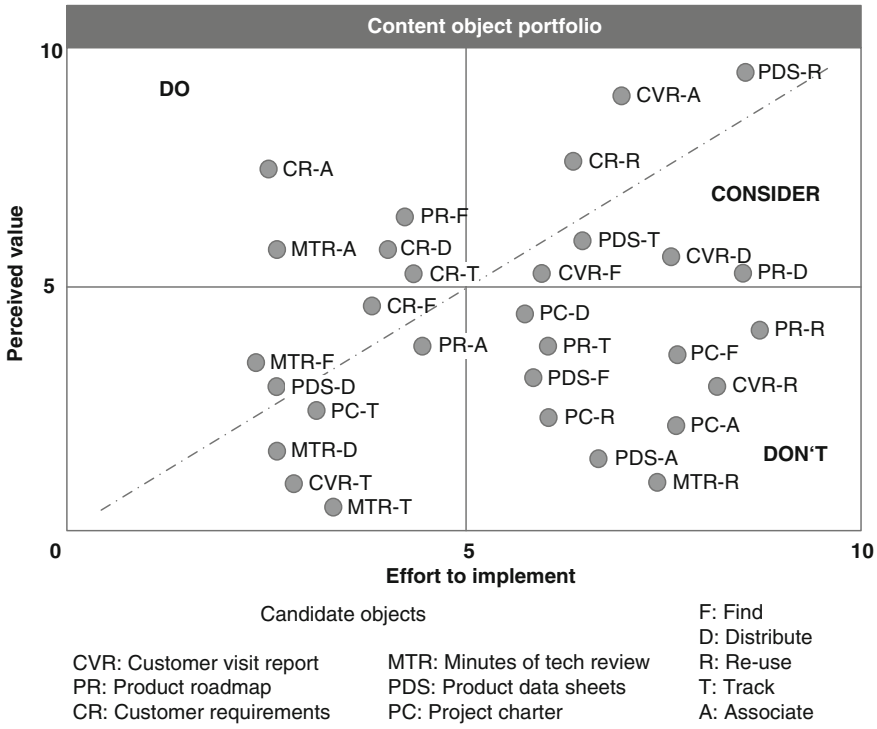

Fig. 3 An example of the managed content portfolio

Gap Analysis

The previous five sections (i.e., content audit, specifying ECM needs, business value assessment, cost/effort assessment, and content portfolio decisions) focused on selecting the most valuable enterprise content objects to be included in a managed content portfolio. The lower part of the ECM strategy framework (Fig. 2) focuses on the next step in the ECM process: deciding on the IT infrastructure needed to realize ECM. The need for new investments in the ECM infrastructure may influence the costs of ECM features, thereby causing changes in the managed content portfolio.

In the next section, we test the first five steps of the framework in a case. We consider infrastructure implications briefly afterwards ("further considerations").

Testing the Framework in a Case

The method was tested in a large manufacturing firm in the high-tech sector. The company has about 30,000 employees, four key business processes (business units), and a large IT infrastructure with a single-kernel ERP application and several dozen legacy applications. The scope of the exercise was limited to the two business processes that had expressed greater needs for ECM: the product development process (PD process) and the marketing strategy process (MS process).

Introduction to the Case

The PD process covers all business activities from determining the specifications of the products customers need (worldwide) to the manufacturing of the products in a handful of high-tech production plants and the delivery of the finished goods. The MS process covers all business activities regarding market development, product strategy development, and customer relationship management. Over the past decade, both processes have developed into a well-defined set of activities, including well-defined procedures for reporting and information exchanges to enable strict process control. However, most control activities focus on one process only, while coordination across the four business processes is still in its infancy. Considerable information (and content) is created and exchanged within each process.

Most managers, including the CIO and the supply chain manager, recognize that information exchanges between processes need to be improved. Therefore, the company began an ECM program in 2004 in an effort to improve access to valuable content in the many Websites (intranet, extranet, internet), the many group pages, and the overwhelming amount of PowerPoint (and other MS Office) documents.

Based on an analysis of thirty interviews and multiple internal documents, we estimate that the PD process creates forty formal documents (including formal product data sheets of up to 1,400 pages each) and an enormous amount of informal information. Informal documents include news and brochures for about 250,000 people and 15 million Intranet pages (about 60 % of all Intranet pages in the company) created by 500 people. Data to create reports, pages and Office documents come from many different groups and systems. As one interviewee explained, ‘Getting a business plan from a business unit is a nightmare’ and ‘putting content in the Autonomy (ECM) application is not possible because Autonomy is badly implemented.’ Formal ‘golden documents’ which are stored in well-developed planning systems take up about twenty gigabytes per year (project milestone dossiers are 40 mb each; 20 projects per business line (25) = 500

projects/year), while informal project content takes up twenty terabytes per year (up to 80 Gb per project).

Testing the Method

The *content audit* involved thirty interviews with key business managers and information specialists who are domain experts on the business processes and the information created and used in these processes. The interviews resulted in a list of twenty key content objects.

Value assessment was conducted in a focus group meeting with key managers of the PD process and the MS process. The session was used to discuss what the implementation of ECM would imply for the selected content objects and to determine the value of each feature (find, distribute, reuse, track, associate) for each object. After agreeing on the specification of the need and the value assessment, the group rated the features per object using a 1–10 scale.

Effort assessment was conducted with the help of IT staff and the chief IT architect who, with their knowledge of the existing CM tools and the new ECM solution, assessed potential difficulties in the implementation of the content objects in question and rated the relative effort on a ten-point scale.

The *content portfolio* contains twenty objects and one hundred data points (five features per object). The scatter diagram provides the basis for discussion on what to do with each content object and ECM feature.

The focus of our analysis here is not on the resulting content portfolio (the outcome of the process) but on the process of using the framework. The next section discusses the conclusions we reached in assessing this process.

Conclusions

The outcome of the ECM strategy process is a *managed content object portfolio*, which reflects the choices concerning what content should be put under ECM and, as such, represents the content management strategy. The tests conducted in the case led to the following conclusions:

- The method has conceptual and face validity.
- The usability of the method was not straightforward. The team concluded that a good team briefing is required before application.
- The value of ECM features and the efforts/costs of ECM features require in-depth discussion and examples of scoring the concepts.
- Since the process takes a long time, it is better to start with a session to select content objects and then to conduct a session to assess value/cost.

The analysis included twenty content objects (i.e., 100 feature dots), so it covered only a small sample of all content objects in a large firm. However, even such small samples can trigger effective ECM discussions among managers and facilitate shared ECM decisions, so full analysis of many content objects will take considerable time and effort. Further tests must be done with different groups, different content objects, and/or a survey based on a structured questionnaire in order to determine how to optimize the efficiency and effectiveness of the method.

Further Considerations

The value and cost assessment for developing the content portfolio was done on a relative basis, that is, taking into account the current situation, which is influenced by the existing IT tools, methods, and infrastructures. The development of an ECM strategy in an organization is not a 'green field' exercise but must take into account the existing infrastructure and must assess which elements will enable or constrain ECM implementation. In the end, the ECM strategy process must also identify elements of the IT infrastructure that should be changed, extended, or complemented with new systems/tools and how they will be integrated with the existing base.

Infrastructure Implications

Although the focus of this paper is on developing an approach to content management strategy (i.e., deciding on the ECM content portfolio), information managers will care about the subsequent steps that an organization must undertake in the area of software tools and IT infrastructure. As the organization moves toward implementation, a number of questions will emerge. What does the chosen content portfolio require in terms of tools and systems? How does the existing IT infrastructure support these needs? What should be modified or added?

The implementation of an ECM strategy should address issues such as the interoperability of information and document repositories with applications, consistency across processes to facilitate access and sharing of information, and modification of company's information systems architecture to accommodate ECM. In particular, the demands imposed by implementing each of the ECM features (find, distribute, reuse, track, and associate) will differ in terms of infrastructure needs. At a basic level, these needs can be articulated in terms of five technology domains—access, security, storage, latency, and bandwidth—some of which refer to the need to make content available so it can be easily searched and found (e.g., via a URL) in a secure way (only for those authorized to see a given content object and excluding others). Other technology domains—storage, latency,

and bandwidth—refer to the physical properties of the network and storage capabilities that will affect network configuration and response time.

ECM Governance

Having a powerful ECM system and/or IT infrastructure is useless if the content is inaccurate, outdated, or irrelevant to improving users' ability to perform. Organizations must be disciplined about the publishing process and the management of taxonomies.

Taxonomies, which are used in tagging (adding metadata to) the documents created, are developed continuously in organizations, but multiple people develop multiple taxonomies, resulting in multiple ways to find the same information. This difficulty leads to the governance question concerning who is responsible for maintaining the integrity of the taxonomies as they grow over time. Ongoing maintenance of the information architecture requires assigned responsibilities, not just the use of sophisticated tools.

Conclusions and Further Research

After defining CM and ECM, we developed a framework and a method to select content objects to be put under ECM. Applying and testing the method and framework in a large firm shows that content objects can be listed per business (sub-)process and then selected based on their added value and specific costs. Added value can be determined based on whether the object is 'easy to find,' 'easy to distribute', 'easy to reuse', 'easy to track', and/or 'easy to associate', while the costs of bringing content objects under ECM can be determined based on 'costs of structuring the content', 'costs of adding metadata', and 'costs of updating taxonomies'. Added value and cost per content object can be used to decide on an optimal content portfolio to be put under ECM.

The costs of ECM depend to an extent on the company's existing IT architecture, but the ECM portfolio decision can be used in planning investments in IT architecture. In this way, the ECM framework and methodology presented in this paper help to manage and bridge the complex relationships between IT architecture, business processes, information, and enterprise content. In line with the resource based view of the firm, investments are never made from scratch but build on the existing technology, knowledge, and competency resources of the firm (Barney 1991).

The framework and methodology presented here should be tested in more depth and in more organizations, as the work here is a preliminary step toward building a sound ECM strategy development methodology.

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Critical Success Factors in Enterprise Content Management: Toward a Framework for Readiness Assessment

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Abstract Enterprise content management (ECM) is an important enabler of information management, as it supports the creation, storage, retrieval, and retention processes of organizational documents and their content. The term "ECM" was coined in information management practice in the early 2000s, and it found its way into Information Systems (IS) research a few years later. While the level of research and publication activity in the field is increasing, we still see only a few academic reports on actual ECM practices. As yet, IS research provides little guidance to practitioners concerning the factors that drive or hinder ECM implementation. As a response, this chapter identifies a set of critical success factors for ECM and develops on that basis a framework that helps organizations assess their readiness for ECM. The framework was developed based on data collected in workshops with ECM project leaders and members of five companies. The expert opinions and experiences are combined with research results from the academic literature, and two illustrative cases show how the framework has been applied in practice.

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Introduction

The management of information with the help of information technology (IT) has always been a core topic for IS researchers, but it is more important today than ever. According to IDC's worldwide information growth ticker, the amount of digital information created and replicated in 2011 exceeded 1.8 zettabytes (IDC 2012). In the current version of their regular digital-universe report, IDC writes that enterprises have some responsibility for 80 percent of that information at some stage during its digital lifecycle (Gantz and Reinsel 2011). The huge amounts of digital information created and shared in and between enterprises come with many challenges (Munkvold et al. 2006; vom Brocke et al. 2011a, 2011b), most of which are not new, but they have taken on far greater significance in today's Internet age. For example, digital files are copied, modified, and distributed at such a rate that it becomes increasingly difficult for employees to find the information they need (e.g., Smith and McKeen 2003), especially when several versions of a file exist or several people work with it. It is also challenging for today's companies to keep the information they share with others, such as customers and suppliers, consistent and up-to-date (vom Brocke et al. 2010). For example, many marketing materials contain largely the same texts or images, and this content must be updated across all outlets once it has expired. For a multi-national, multi-product firm, this job is far from trivial, considering that a variety of documents or "content containers" (including product specifications, manuals, FAQ lists, marketing brochures, Web pages, and many more) must be maintained in several languages for every product that is or has been sold in the recent past (Rockley and Cooper 2012).

The flood of digital information has given rise to ECM, a holistic approach to information management. While earlier approaches, perhaps most notably document management, focused on similar challenges, driven by the pressing need to manage more information than ever before, ECM has become vital for most of today's companies. ECM has been defined as "the strategies, tools, processes and skills an organization needs to manage all its information assets (regardless of type) over their lifecycle" (Smith and McKeen 2003, p. 648), so it can be understood as a contemporary approach to the management of unstructured information at the firm level. While it took ECM some time to reach IS research (Tyrväinen et al. 2006), the number of academic publications in the field is increasing. However, recent literature reviews on ECM (e.g., Alalwan and Weistroffer 2012; Grahlmann et al. 2011; Rickenberg et al. 2012) suggest that the number of academic reports on ECM implementations remains comparably low, so IS research currently provides only some guidance to the planners and managers of ECM initiatives concerning the factors that drive or hinder ECM implementation. As a response, this chapter identifies and discusses a set of critical success factors for ECM and provides methodological support for organizations that wish to assess their ECM readiness. Such a readiness assessment can help organizations to get the best out of their ECM programs and avoid expensive project failures from

the beginning. The framework helps organizations to determine whether they are ready for ECM and, if they are not, to identify the actions required to be ready.

The section 'Enterprise Content Management' provides a background for this chapter by explaining what we already understand about ECM and organizational readiness. Then we give an overview of our study and describe how we identified the critical success factors that organizations should consider in their ECM programs. We suggest assessing an organization's readiness for ECM with the help of these factors and their respective information measures, which is illustrated using two examples. The paper concludes with a summary of the results and suggestions for future research.

Enterprise Content Management

The Association for Information and Image Management (AIIM) defines ECM as "the strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured information wherever that information exists" (AIIM 2012). This definition highlights why ECM is distinct from other approaches, such as document and records management (compare Simons and vom Brocke (2013) for a more detailed discussion). First, ECM is an enterprise-wide and process-oriented approach (e.g., vom Brocke et al. 2011a, 2011b), so it addresses the challenges related to the exchange of information across departmental and organizational borders. Second, ECM focuses on all types of unstructured information while also referring to the management of content components (e.g., texts and images embedded in documents) (e.g., Tyrväinen et al. 2006). Third, ECM vendors provide holistic software suites that offer several functionalities and components of earlier systems for document/content management while exceeding the scopes of these systems by providing additional features (Grahlmann et al. 2011). Fourth, unlike other approaches in the information management field, ECM acknowledges the necessity of managing information over its entire lifecycle, that is, from creation to deletion (Munkvold et al. 2006). As such, ECM is considered an integrated and contemporary approach to digital information management (Päivärinta and Munkvold 2005), and many authors see it as the next step in the evolution of earlier approaches in the field (Alalwan and Weistroffer 2012).

Given the holistic and integrative nature of the concept, it is not surprising that IS researchers have not been consistent in their descriptions of ECM. For example, Grahlmann et al.'s (2011) literature review on ECM indicates that no consensus on the ECM definition had yet emerged in IS research, and Alalwan and Weistroffer (2012) likewise denote "some confusion" around the term (p. 442). These reviews also show that IS researchers have taken very different approaches to studying ECM, with one major stream doing research from an enterprise/process perspective and another one from a content/technology perspective (Grahlmann et al.

2011; also compare Rickenberg et al. 2012). Only a few studies explore ECM from the viewpoint of all the relevant dimensions (Alalwan and Weistroffer 2012), and they also approach these dimensions differently. For example, some who take the content perspective include structured data in their ECM definitions, while others do not. Similarly, many studies that take the technology perspective focus on holistic ECM software suites, while others deal with solutions that focus on specific tasks, branches, or content types in order to address integration issues.

The above characterization of ECM suggests that all organizations do ECM at least to some extent, wittingly or unwittingly, systematically or not. Clearly, not all companies exploit the potentials of managing content to the fullest, but every company creates, distributes, and receives digital documents and content, and every company uses some strategies, methods, and tools to support these activities, even if they do so only on the departmental level, they take a tactical rather than strategic approach, or they do not systematically reuse content with the help of sophisticated content component systems but use copy and paste. The extent to which companies implement ECM is determined by the targets that companies pursue in using it (see, e.g., Päivärinta and Munkvold 2005).

In this chapter we understand ECM as a holistic, enterprise-wide approach to digital information management that refers to all types of unstructured information, all the lifecycle phases the information goes through, and a variety of software, hardware, and standards. Taking such a strategic approach to ECM requires considerable investments in IT infrastructure, user training and support, strategy development, and an ECM roadmap, among other things, which makes ECM a strategic program at the intersection of business and IT, rather than a single IT project. Accordingly, assessing an organization's ECM readiness helps it to justify and evaluate necessary investments in IT infrastructure and to implement required changes in how people work with content.

Readiness Assessment

Companies typically do readiness assessments in the context of change projects (see, e.g., Fixsen et al. 2005) to determine whether they are ready for the desired change. The higher the level of readiness for that change, the more likely is a successful outcome (Aziz and Yusof 2012). If the assessment determines that a company is not ready, it also helps the company to identify and plan required actions in order to proceed to higher readiness levels. In the IT innovation context, organizational readiness has been broadly defined as the "level of fit between new IT/S and the organization" (Snyder-Halpern 2001, p. 180). While organizational readiness has not yet received much attention in IS adoption (Aziz and Yusof 2012), instruments have been developed for IT innovation (Snyder-Halpern 2001), program change (Lehman et al. 2002), business process reengineering (Abdolvand et al. 2008), and B2B integration systems (Mouzakitis and Askounis 2010), among other purposes.

Instruments for readiness assessment often make use of critical success factors—"those few things that must go well to ensure success for a manager or an organization, and, therefore, they represent those managerial or enterprise areas that must be given special and continual attention to bring about high performance" (Boynton and Zmud 1984, p. 17). Critical success factors are especially helpful in revealing important areas of concern and in providing basic measures for these areas (Boynton and Zmud 1984). Therefore, readiness assessment on the basis of critical success factors requires evaluating the probability for success within each of these areas with the help of appropriate information measures.

IS researchers have explored critical success factors in several contexts (Williams and Ramaprasad 1996), many of which can be considered ECM-related, including knowledge management (e.g., Alazmi and Zairi 2003), business process management (e.g., Trkman 2010), customer relationship management (e.g., Mendoza et al. 2007), and enterprise resource planning (e.g., Ngai et al. 2008; Umble et al. 2003). However, while these studies produced important results that are relevant to ECM implementation, the concept of ECM has not been studied to its full extent from the viewpoint of critical success factors in IS research—there are a few exceptions, such as those in Haug (2012)—nor does IS research currently provide guidance for ECM readiness assessment.

What all this amounts to is that ECM readiness reflects the fit between the ECM program and the organization, and this fit is influenced by the probability of success in several areas based on critical success factors for ECM. Therefore, their identification and measurement is at the core of this paper. The idea is that organizations must determine their levels of readiness for all of the relevant ECM success factors in order to make a knowledgeable decision concerning whether to launch an ECM initiative (high level of readiness) or not (low level of readiness). In the latter case, such an assessment helps them to identify actions that are necessary to increase their ECM readiness and the probability that their ECM programs will succeed.

Framework for ECM Readiness Assessment

Overview

The results presented in the following are grounded in research work we did in a competence center on ECM that was founded in 2008. Competence centers have been proposed as a viable model for private–public research partnerships, including both one-to-one research projects between the university and a business partner and joint workshops with all partners (Cleven et al. 2010). They are institutionalized partnerships between industry and universities in which practitioners and academics work together on specific subject areas with the goal of increasing the relevance and rigor of research (Back et al. 2007).

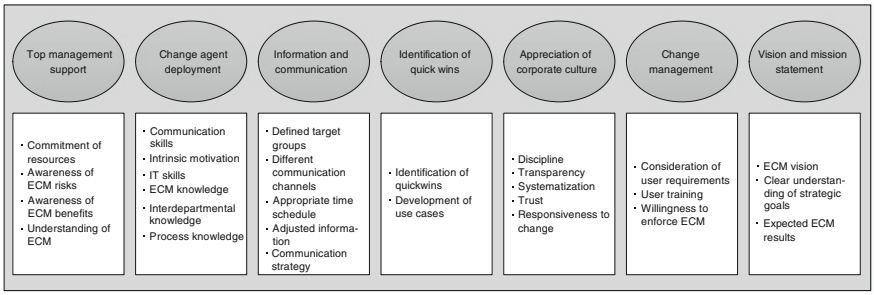

Fig. 1 Framework for ECM readiness assessment

In our case, we draw from data collected in six joint workshops with participants from five organizations from various industries. Each workshop lasted three hours, and the workshops took place from March 2010 to December 2011. While only two of these workshops were digitally recorded, we took notes in all the workshops to allow for detailed data analysis. The results of the workshops—the opinions and comments of all members—were consolidated in written protocols that were shared with all participants to encourage feedback and revisions. We also had the chance over the past four years to observe the ECM programs at the participating organizations and to contribute to the same, so we can also draw from experiences we gained in conducting case studies at these organizations.

Seven critical success factors were identified during the workshops: top management support, change agent deployment, information and communication, identification of quick wins, appreciation of corporate culture, change management, and vision and mission statement. The discussion of these factors resulted in a set of information measures for each. Figure 1 provides an overview in the form of a readiness assessment framework.

The following sections explain the seven ECM success factors and their measures.

Top Management Support

Top management support is likely an important factor in all kinds of IT projects. Generally, it describes the level of commitment by the top management to innovation, which includes top managers' involvement in the project and its willingness to allocate required resources (Holland and Light 1999).

All workshop participants identified top management support as a critical success factor for ECM because an ECM implementation typically causes significant, enterprise-wide changes in IT infrastructures, policies, and standards—put simply, in the way people work. Therefore, it is imperative for managers to convince employees that ECM is important for the company and the fulfillment of

their tasks. This task can be challenging, considering that some ECM drivers, such as complying with external regulations and standards, do not necessarily help employees to get their jobs done more efficiently, so employees have to see the benefits of ECM before implementation. Doing so requires establishing discipline in such things as the consistent definition and use of metadata, and communication and control is important in this effort. The participants said that, from the beginning, top managers have to make important decisions, including budgetary and scheduling decisions, develop and communicate strict rules and guidelines, and set an example by living the change themselves. Respondents said that risks related to information management, rather than the benefits of ECM (although they are important), provide the best arguments to convince top management to support ECM. Considering the elusive character of the concept, top managers must develop a solid and consistent understanding of ECM in order to identify both information management risks and the potential for improvement. Only then will top management understand, internalize, and communicate the value of ECM, which are prerequisites to building employees' commitment to the program.

Change Agent Deployment

Change agents are especially important in IT projects that significantly change users' daily routines (Wong and Tein 2003), so the deployment of change agents was identified as a major success factor for many types of IT projects (e.g., Nah et al. 2001; Wong and Tein 2003). Change agents are people who have an intrinsic motivation to do a project and to promote it among their colleagues. They tend to be strong leaders and can be either external or internal to the company. However, external change agents like consultants are often not as effective as internal change agents like end users (Zafeiropoulos et al. 2005).

The workshop participants also deployed (or suggested deploying) end users as change agents in ECM and concluded that change agents should have strong intrinsic motivation in order to convince their colleagues about the program. Therefore, they play an active role in an ECM roll-out by promoting the change and diminishing resistance. Characteristics of a good change agent include soft factors like communication skills, an enthusiastic and motivated nature, and a good reputation among the workforce. Hard factors include an appropriate skill set, such as professional competence in information management and existing IT infrastructures, knowledge about information management requirements in multiple departments and functions, and business process knowledge, especially regarding end-to-end processes that rely heavily on content. Therefore, change agents should receive training on how to use new ECM systems, as well as on how to convince and train their colleagues.

Information and Communication

Communication is important in IT projects in order to ensure that all levels of the organization are clearly and effectively informed before and during the initiative (Ngai et al. 2008). Communication should consider the users' requirements and reactions (Nah et al. 2001), it should happen at the departmental and interdepartmental levels, and in some cases it must also target external parties like business partners, suppliers, and customers (Remus 2007).

Workshop participants suggested an initial formal presentation for explaining the importance of ECM for the company and an ECM vision. In addition, a communication strategy should be developed to ensure all interested parties are continuously informed about the status and the success of the ECM program. The development of such a strategy should at least address the information to be communicated, the target groups, the communication channels, and a time schedule such that the information communicated is adjusted to different groups. Relevant target groups identified in the workshops were the ECM project team, the top management, the sponsor, people who are directly affected by the change, and, of course, the entire workforce. Possible communication channels are informational letters, e-mails, the Internet and the company's intranet, personal meetings, workshops, and screen savers. The participants in the workshops considered that these lists of channels and target groups, while not exhaustive, would provide a good framework for the development of an ECM communication strategy. Having such a strategy in place is important in implementing ECM because it helps to overcome resistance to change among the workforce, which the enterprise-wide scope of ECM and the many changes in the daily information work it often causes make critical.

Identification of Quick Wins

Quick wins are projects or initiatives that deliver fast results with little effort. They can help to demonstrate the benefits of an IT program early and contribute to the planning process by breaking the program down into pieces, such as single projects and activities (see, e.g., Wilson et al. 2002).

At the beginning of the workshops, the participants disagreed concerning whether quick wins can be realized in ECM at all because the realization of quick wins is a matter of perspective in ECM. While some of the benefits that ECM offers are important at the firm level (e.g., archiving and retention of records), others are predominantly relevant at the individual level (e.g., searching and creating information), the group level (e.g., collaboration and information sharing), and the market level (e.g., product documentation), and from these perspectives, ECM can have its drawbacks. At the individual level, for example, the reduction in search times is a benefit frequently mentioned in the ECM literature,

but it requires the definition and use of appropriate taxonomies and metadata; therefore, while some employees might save time in searching for information, others might lose it during the storage process. Such drawbacks become especially apparent at the beginning of an ECM program, when an organization is preparing to implement ECM. The digitization of paper records and archives to facilitate later electronic document management, for example, is an often costly endeavor that, depending on the branch of industry and its maturity level in information management, can take a company considerable time.

Workshop participants also found it difficult to measure the results of ECM since many of the impacts of ECM cannot be easily quantified in terms of time and costs because they concern qualitative, not quantitative issues (e.g., consistency, accuracy, and currency of information, branding in terms of presentation, and flexibility in collaboration). Measurement is even more challenging because ECM is an ongoing endeavor, a strategy or vision for digital information management, rather than a single IT project. Nevertheless, the workshop participants concluded that the identification and realization of quick wins is still important in spreading the word about the program across the company and in gaining support from the workforce. However, they found it difficult to tell precisely what is "won" (or lost) with ECM, and they believed that "quick wins" often do not happen very quickly. Among the most important quick wins they identified were automated archiving, improved and personalized search functions, global availability of content, and compliance. For demonstration purposes they suggested creating use cases for specific tasks and areas.

Appreciation of Corporate Culture

Organizational culture can generally be understood as the "character or personality of an organization" and "the way things are done" (Park et al. 2004, p. 107). Organizational culture reflects how people work together and how they react to change, so a successful change project requires the appreciation of cultural issues (see, e.g., Tan et al. 2009) and an organizational culture that is open to that change (Nah et al. 2001).

The workshops participants identified the set of cultural values that are beneficial for ECM as discipline, transparency, systematization, trust, and responsiveness to change (see Schmiedel and vom Brocke (2013) for a more detailed presentation). Discipline, which refers to the appreciation of being bound to defined rules and guidelines, is important because ECM establishes control over the creation and use of information assets like texts and images, even though these activities are often highly creative in nature. Closely related to control is transparency, which includes the availability of content and the traceability of its use. An organization that is receptive to discipline and transparency is likely to adopt ECM better than one that is not because, by serving as an organizational memory, ECM systems make many processes in which content is created and used

transparent in order to help organizations meet compliance standards and regulations. With systematization the workshop participants referred to the appreciation of logical patterns for structuring content, which plays an important role in content reuse. For example, implementing a systematic approach to content reuse requires that content be structured in a way that allows content components from existing documentation to be used and reassembled elsewhere (e.g., in product documentation). Trust mainly concerns content security, which requires the definition of user roles and access rights, while responsiveness to change describes the level of openness to new or modified processes and systems. The workshop participants contended that organizations that do not have these cultural values should rethink how ECM should be done in the organization or realign the organizational culture itself. Possible actions include cultural training or the deployment of change agents. After all, if users do not adhere to the rules and guidelines dictated by ECM, the program is likely to fail.

Change Management

Change management requires a detailed and structured program (Finney and Corbett 2007; Nah et al. 2001) to generate a positive attitude among the employees and acceptance of the project (Finney and Corbett 2007). To achieve user acceptance it is important to involve the user when designing and implementing new processes and their systems (Nah et al. 2001).

The workshop participants considered change management programs important in implementing ECM but also mentioned some challenges. They suggested that it is important to collect feedback from the users regarding their requirements and demands in change management programs, but doing so is not always possible in ECM. For example, many companies consider compliance a major driver of ECM, and the re-design of processes and systems in accordance with new regulations can mean that user needs are secondary. Compliance requires strict adherence to internal and external rules for information management, which often includes the definition of workflows, the use of metadata, and centralized storage, which can compromise employees' ability to work creatively (vom Brocke et al. 2010). For example, some employees believe they are most efficient in their daily work if they store the information they need or create on their local hard drives, and much of the creative work done in organizations is less structured and organized than the workflows dictated by an IT system. Therefore, user training, which the participants also identified as an important issue in change management, should help employees to recognize that some ECM components and processes must be designed to comply with internal and external documentation standards, even though doing so may limit employees' choices regarding document storage and retrieval. At some stage, if an intrinsic motivation for the new processes, systems, and standards cannot be established, an organization must have the will to enforce them.

Vision and Mission Statement

Having a clear vision, mission, and goals for a project is important throughout its lifecycle (Nah et al. 2001). Goals, which can be both strategic and tactical in nature, can be defined with the help of such a vision.

The workshop participants operated in several branches of trade, so their understanding of ECM differed to a certain extent, as did the objectives they pursued in their companies. However, they also discussed ECM objectives that are relevant at a more general level, such as compliance with internal and external regulations. Other goals they identified were improved organizational innovation (e.g., by collecting and disseminating organizational knowledge), improved storage of content assets, along with content structuring and integration (which can provide a basis for new business models), improved efficiency at the process level (including inter- and intradepartmental processes, but also entire supply chains), higher information quality (e.g., fewer errors and improved currency), and improved customer orientation (e.g., in terms of audits, professionalism, and service). While general, these goals provide a reference from which a company can identify a set of objectives that matches its individual context.

Doing so requires that the company develops a vision for ECM as the grounding for the entire program. ECM is a broad term, and there is no one-size-fits-all approach to it. In fact, organizations have to think carefully about what ECM means to them in order to determine what they want to gain from implementing it. The ECM programs at the companies that participated in the workshops differed widely regarding their scopes and objectives, as is likely for most other companies. Accordingly, defining a clear vision, a mission statement, and a set of challenging and achievable goals is prerequisite for ECM success.

Example Cases

We used the success factors the workshop participants identified to assess the ECM readiness of two of the organizations, in the following organization A and organization B, that participated in the workshops and that were running two large projects as part of their broader ECM programs at the time the assessment was conducted. The ECM project at organization A focused on storage and retrieval, including the implementation of a new intranet solution with collaboration support (e.g., in the form of virtual project rooms) and the development of respective guidelines and standards. The ECM project at organization B focused on product information management, including the implementation of new IT solutions and the re-design of affected processes. The first author had the chance to accompany both projects from their beginnings, participated in several meetings, and she also conducted the two final interviews in which the readiness assessment was done.

During the interviews the respondents were asked to rate the relevance of the success factors using the factors' respective measures for their individual

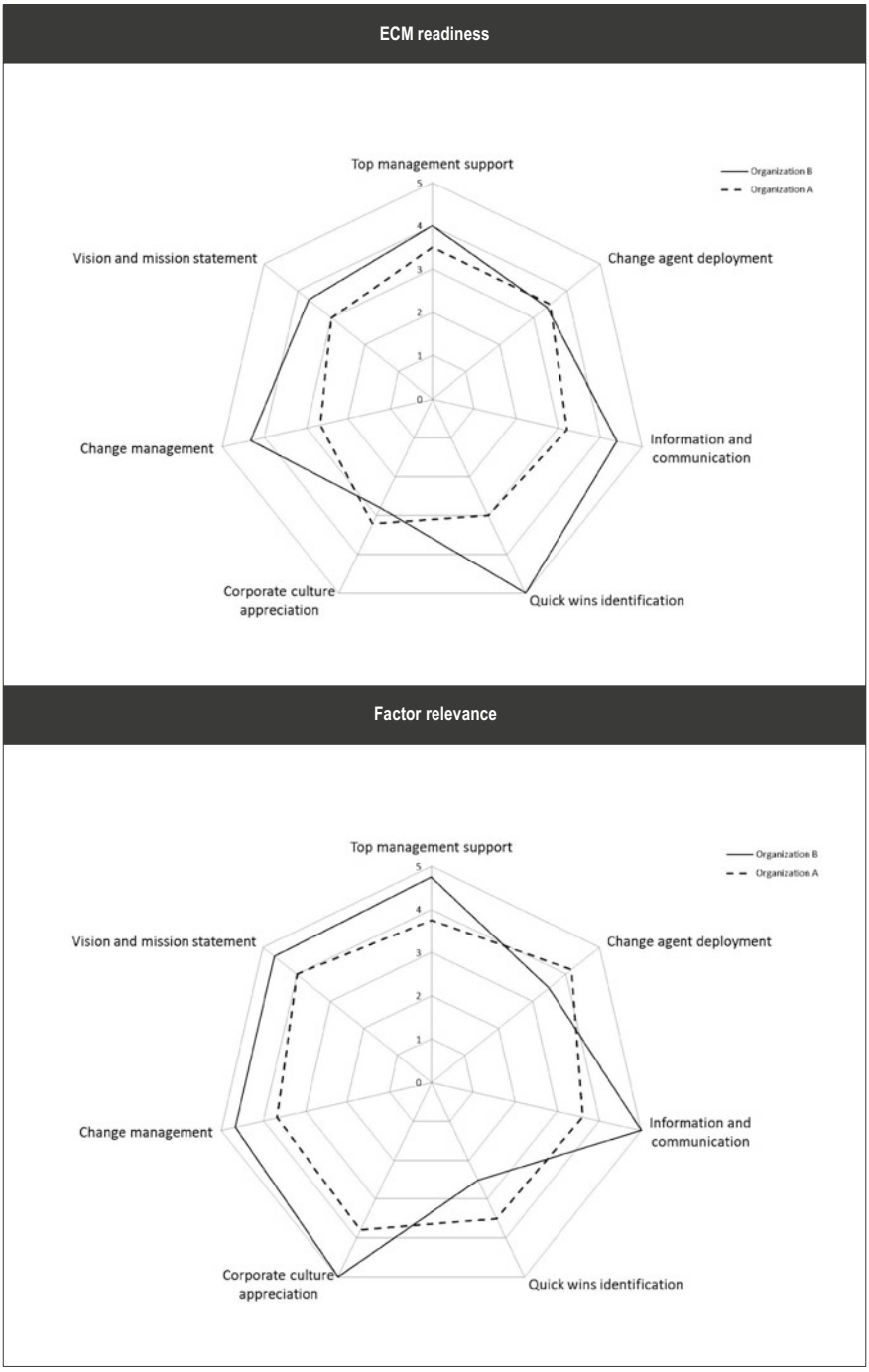

Fig. 2 Assessment of ECM readiness and factor relevance

projects on a scale from "not relevant" (1) to "extremely relevant" (5). Then the respondents were asked the extent to which they believed their organizations would be ready for the project change on a scale from "strongly disagree" (1) to "strongly agree" (5). The average relevance and readiness scores were calculated for each success factor. (We also calculated the weighted average readiness based on the relevance of all measures, and the results differed only slightly). Figure 2 shows the assessment results for both cases.

Organization A has a similar readiness level for all success factors, with the lowest factor being change management and the highest being change-agent deployment. Readiness and relevance are largely aligned, although the relevance scores of all factors are somewhat higher than the respective readiness values. The most relevant success factor (change agent deployment) also has the highest readiness level, and the factor considered the least important (identification of quick wins) has the second-lowest readiness level. These findings indicate that organization A is well-prepared for the ECM project, with some room for improvement. Organization B has a high readiness level for four of the seven success factors (change management, top management support, information and communication, and identification of quick wins), while two factors are mid-level (change agent deployment, vision and mission statement) and one factor has a comparatively low level (corporate culture appreciation). While corporate culture appreciation and information and communication are ranked the highest for relevance, quick wins were considered relatively irrelevant but the level of readiness for this factor was high. Therefore, there are gaps between the relevance and readiness of some of the success factors, so the assessment indicates areas where improvement is needed. For example, the company plans to increase the number of change agents as the project proceeds.

Summary and Limitations

In this chapter we presented a framework for ECM readiness assessment that is grounded in a set of critical success factors and information measures. IS research currently provides little guidance for practitioners on how to implement ECM, so we addressed a timely and important topic in information management research and practice. The factors and measures were collected in a series of workshops with five companies from different branches that are currently implementing ECM systems and related processes. While many of these factors are well-known from related studies, the experiences and opinions of the workshop participants provide valuable, fresh insights, including those related to benefits and pitfalls of ECM, measures of implementation, and issues in planning and monitoring. We used the framework to assess the ECM readiness of two of these companies to illustrate the framework's use in practice and shortcomings to be addressed in future research.

Among these shortcomings, the list of ECM success factors and information measures is grounded in data collected in only six workshops, so this list is not

exhaustive, although the readiness assessment conducted for the two ECM projects confirmed the relevance of the factors. Because this assessment was conducted with companies that also participated in the workshops, future research should assess the relevance of the factors for other companies and branches. A second shortcoming is that, even though the first author actively participated in the two projects, the assessment was conducted in only two qualitative interviews with ECM project members, so the respondents' personal attitudes play an important role in interpreting the results. For example, one respondent rated the relevance of many factors considerably higher than the other respondent did. While this difference in ratings may mean that the factors' relevance differs for the two projects, it may also reflect different preferences at the individual level. Further assessments with the project groups are planned to remedy this shortcoming.

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Content Management for Advisory Support Information Systems

Joachim Pfister and Gerhard Schwabe

Abstract This chapter demonstrates how advisory support information systems can benefit from Enterprise Content Management (ECM) support. It introduces that type of information system, elaborates on an architectural sketch, and shows how ECM can support advisory support information systems. Requirements like providing filters, supporting collaborative content management through several organizational levels, and aggregating content from different resources on an inter-organizational level to foster transparency and to adapt content items to a user's specific role are formulated. The challenge of information integration, which is inherent in all advisory support information systems, can be generalized to all workplaces in which information is aggregated from multiple sources. For this reason, the content architectural sketch may also be applicable to other settings in which content must be shared with and presented to different groups.

Introduction and Motivation

ECM helps organizations implement their information management strategies at an organization-wide level. ECM encompasses all of the strategies, methods, and tools needed to "capture, manage, store, preserve, and deliver content and documents related to organizational processes" (AIIM 2011). ECM components (e.g., scanning, indexing, records management, collaboration, search, and retrieval) provide the infrastructure for implementing services that rely on up-to-date

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and accurate information, such as product or service customization and purchases that take place during a service encounter. We define advisory support information systems as information systems that are used during a service encounter supporting the dialogue between a customer and an expert in which they will serve as an interface to access an organization's internal and external data sources.

This chapter focuses on determining how advisory support information systems can benefit from ECM technologies and services. First, we describe advisory support information systems and explain why these systems are useful in supporting the communication between a client and an expert during a service encounter. After we explain the communicative challenges associated with service encounters, we provide two examples of advisory support information systems and show how this type of information system contributes to improving service encounters. The second part of this chapter deals with the challenges when content for advisory support information systems has to be managed. ECM technologies are shown as viable and vital backend services and systems that help to manage and improve content quality and, in consequence, the result of service encounters.

Characterization of an Advisory Situation

People need consulting or advice by someone when their personal knowledge about an issue or process is insufficient. This information interchange is commonly performed in a communicative situation involving an expert and a layperson (cf. Jungermann 1999), known in sociology as a dyad. Advisory or counseling services like career counseling or supervision can be based on a social-psychology background, where a client works with his or her advisor to find a solution to a specific problem (cf. Warschburger 2009). Advisory services can also be provided by organizations that offer services or products designed to fulfill certain customer needs. Such advisory services can either be sales-dominated, such as financial advisory in banks (Nussbaumer et al. 2011) and travel counseling (Schmidt-Rauch and Nussbaumer 2011), or non-sales oriented, such as advice services provided to citizens by the government.

In a service encounter, a customer interacts with a service for a certain period of time (Shoestack 1985). This very broad definition encompasses the entire range of interactions a customer experiences with the variety of service elements offered by the provider, such as interpersonal interaction, media-supported customer self-service, or the physical facilities in which the encounter takes place. According to Solomon et al. (1985), a service encounter is a dyadic interaction between a customer and a service provider.

Three problems are common to all dyadic communication advisory situations (Novak 2009): (1) Information asymmetry between the participants may be caused by principal-agent conflicts (Eisenhardt 1985), leading the involved parties to act in a self-interested manner because they may have incongruent goals in situations with uncertainty. (2) The "burden of choice" phenomenon occurs when a client is

presented with too many alternatives, leading to information overload and to choosing "the standard" rather than a customized solution (Schwartz 2005). (3) Customers often experience difficulties in formulating an explicit information need, which is described as an "anomalous state of knowledge" (Belkin et al. 1982) or as "sticky information" for problem-solving situations (von Hippel 1994).

Bradley et al. (2010) propose a "service encounter needs theory" (SENT) and argue that the outcome of a service encounter depends on whether the participants' needs are satisfied. They identify a core set of eight needs (cognition, competence, control, justice, power, trust, respect, and pleasing relations) that are relevant to both the advisor and the client. Adequate technology that organizes, supports, and attends to the customer's needs contributes to a successful service encounter. Furthermore, Bradley et al. (2010) suggest that the importance of needs varies among participants in service encounters and among types of services (e.g., personal versus non-personal service).

Structure of an Advisory Process

The amount of structure an organization imposes on a service encounter is based on many factors, including the frequency with which such encounters occur and how often common patterns can be identified that eventually evolve into standards that can be used in every client-expert interaction. Structured processes for advisory services are common in the financial services industries (Credit Suisse 2006; UBS 2010), but they are lacking in the majority of service encounters in the public sector (Schwabe et al. 2010). Figure 1 shows the ideal process structure of a generic advisory process.

The three central phases of a service encounter are framed by the welcoming and greeting at the *start of the conversation* and the farewell at the *end of the conversation*. Obtaining a shared understanding of the client's situation, including

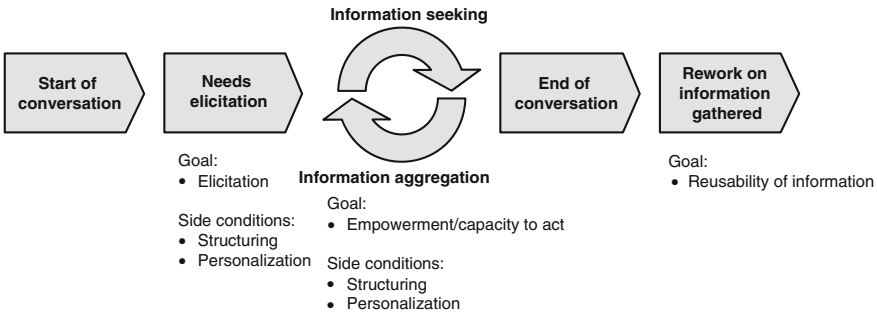

Fig. 1 Example of a generic, ideal, structured advisory process (Schwabe et al. 2010)

his or her needs, requests, and concerns, is part of the first phase, the purpose of which is to *elicit the client's information needs* by learning his or her problems and enabling him or her to formulate the questions in which he or she is particularly interested. Two side conditions apply: first, the results of the needs elicitation should be noted in a structured way so they can be reused in the next phase for an information search without forgetting or having to re-elicit the same needs. Second, the needs elicitation should be personalized; that is, it should be based on the individual's questions, rather than on a standardized script. Scripted communication processes tend to be rigid and to prescribe every step during the interaction, a process that can become highly formalized and inflexible. In the second and third phases of the advisory process, information seeking and information aggregation tasks alternate until the solution is found.

During *information seeking*, content from an organization's internal information sources, such as forms, brochures, and flyers, are collected, along with content from outside the organization, if necessary. In the *information aggregation* phase, the information fragments are put together to provide structure and personalization, according to the side conditions, so the customer is ultimately empowered with the means to act (Schwabe et al. 2010). After a service encounter, customers may have to *rework on the information gathered*. In doing so, they can benefit from the previous phase and from information structuring and personalization in particular.

Information systems can be used to increase the structure and comprehensibility of the jointly elaborated results in terms of information provision and to create an enjoyable advisory session. By introducing a technological artifact that is shared between a customer and an expert (Novak and Schwabe 2009), the service encounter can be improved. These socio-technical systems that support the dyadic communication between an expert and a customer are termed advisory support information systems. Before the advantages and underlying concepts of these systems are described, we present two examples of advisory support information systems that are currently part of ongoing development and research.

Advisory Support Information Systems in the Service Encounter

Service encounters that have traditionally been "high touch, low tech" have changed because of "technological infusion" (Bitner et al. 2000). Bitner et al. (2000) state that information technology support allows providers to offer services that respond to individual customer needs and requests (offering customization and flexibility), respond to failures in the service delivery system (offering service recovery), and create spontaneous delight by means of unprompted or unsolicited actions. While service encounters occur in many contexts, each of which has its own unique characteristics (e.g., person-to-person, self-service, cf. Glushko 2010), we focus on

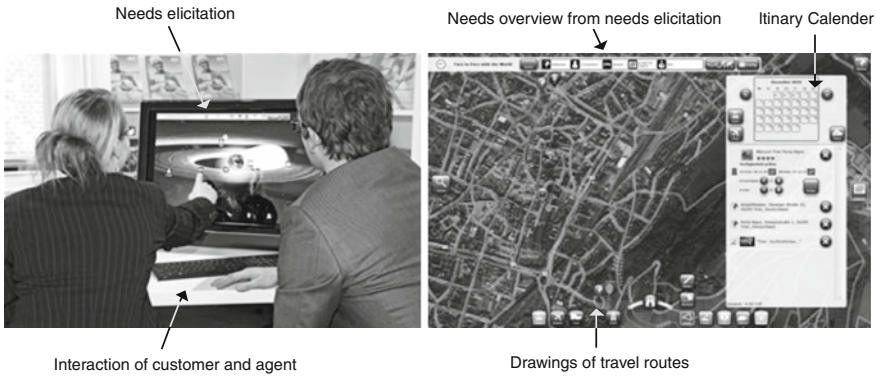

Fig. 2 SmartTravel prototype (images from Schmidt-Rauch and Nussbaumer 2011)

technology-enhanced person-to-person service encounters. Fitzsimmons and Fitzsimmons (2007) distinguish between "technology-assisted" (in which technology is used only by the frontline employee to enhance his or her capabilities) and "technology-facilitated" (in which both parties interact with the same technological artifact). The latter approach goes along with our notion of how to enable IT support for service encounters that emphasize advisory or consulting services.

Consider an example from the domain of travel counseling (Fig. 2). The customer and the travel agent sit in front of a touch-sensitive 25" display that is running the SmartTravel prototype (for a description of a prior prototype, see Novak et al. 2008). All the results of the needs elicitation—such as the type of trip, the destination and so on—are visualized and the customer and agent can move (in order to prioritize), modify, or create new icons and label them accordingly. The planning screen is arranged around a map that shows the desired destination area, and activity markers can be placed on the virtual map to facilitate the booking of organized excursions, define arrival and departure destinations, and identify means of transportation. The offer behind each activity marker is integrated from the travel agency's product database, or it originates from travel industry-specific backend systems. Moreover, content like photos (Flickr: http://www.flickr.com, Panoramio: http://www.panoramio.com), videos (YouTube: http://www.youtube.com), and hotel ratings (TripAdvisor: http://www.tripadvisor.com) from third-party sources is integrated in order to offer additional unfiltered information. All together, the customer enjoys a unique service experience.

Citizen advisory services delivered by public authorities provide another example. A 25" touch-sensitive display runs "Citizen Advice 2.0" (Fig. 3), a prototype developed to assist employees of citizen advice bureaus who are consulting people who are having a baby (Schwabe et al. 2010). During the needs-elicitation phase, memo stickers are used as a metaphor to capture topics of interest, each of which is associated with four dimensions—activities, locations, resources, and appointments—that are visualized on separate screens to which users can move by clicking on the corresponding icons (forms, map, web links, and

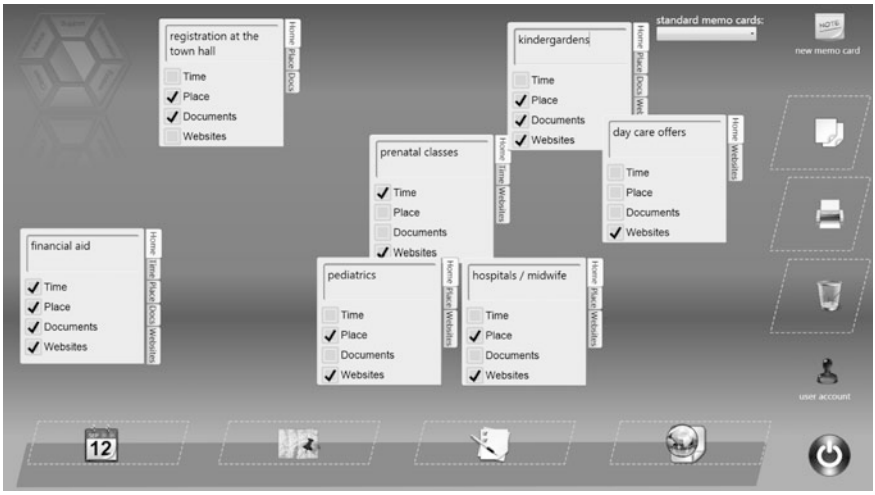

Fig. 3 Prototype of an advisory support information system for citizen advice

calendar). After the information search is complete, the results are documented and associated with the information needs on the memo. For instance, a map visualizes all points of interest, such as kindergartens and hospitals, and the addresses and other information for each selected point of interest is stored on the respective memo sticker. The personalized information items and structured memos (e.g., those arranged on a timeline as a to-do list) can be printed or sent via e-mail to the advice-seeking client. Tight integration with other backend systems—for instance, to execute transactions like registering for a kindergarten or aggregating information from several sources—are possible extensions of this scenario.

The above examples demonstrate how service encounters can benefit from information systems support. The next section explains the role of information systems in advisory situations more precisely, providing a rationale for advisory support information systems.

Rationale for Advisory Support Information Systems

Novak (2009) proposed that customers and experts can benefit from collaboration via a shared artifact. The visualization of the individual worlds of knowledge (the customer's problem space versus the agent's solution space) helps to establish a common understanding of the customer's needs and the agent's proposed solutions. Furthermore, information asymmetry can be alleviated if both parties have access to the same information, resolving the principal-agent conflicts that are inherent in nearly every advisory situation. Hidden actions can be mitigated

through the creation of social ties by joint interaction with the artifact, and opportunistic seller behavior can be restricted by the integration of external third-party information (e.g., forums). An expert can signal his or her trustworthiness by showing the customer the third-party information, presenting the entire solution space to the customer, and letting him or her engage in its exploration. The "burden of choice" problem is resolved by the expert's human intervention.

Advisory support information systems facilitate co-creation, a process in which a customer or client jointly participates with an organization (e.g., a government unit or company) in value-creation activities. This co-creation activity is one of the foundational premises of the service-dominant logic wherein service is regarded as the central process of value creation. Vargo and Lusch (2008) define services as "the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself" (p. 2).

An increasing number of economic activities is shifting toward services, like sales services and after-sales services. In post-industrialized countries, the tertiary service sector is predominant; for example, more than 70 % of the EU's GDP comes from the service sector (CIA 2011). Service-dominant logic provides an alternative perspective on how to capture the importance of service and its implications, and advisory support information systems provide the technological grounds on which co-production during a service encounter can be performed.

Prahalad and Ramaswamy (2004) focus on customers and their "co-creation experience" throughout all points of the interaction with a company, with each point offering the opportunity for value creation and extraction. They identify four building blocks of consumer-company interaction: *dialogue* to ensure joint and equal participation in problem solving processes with clearly defined rules of engagement (e.g., the feedback mechanisms on eBay); *access* and *transparency* to achieve a meaningful interaction without exploiting information asymmetry by hiding potentially valuable information; and a *risk-benefit assessment* that helps customers understand and estimate their personal risks associated with a certain decision, such as a change in medication. These building blocks are fundamental in the design of advisory support information systems and the content they deliver. To be readily accepted by the experts, the dialogue must be supported in a meaningful way, such as when the elicited needs are used for an information search and its results are attached to the needs. At the same time, information must be accessible and must be presented in an understandable manner in order to achieve transparency and create a positive experience for each customer.

A Content Ecosystem for Advisory Support Information Systems

Next, we present the types of content that can emerge in advisory support information systems, the stakeholders and their roles, and an architectural sketch of content management within advisory support information systems.

Ecosystem refers to an advisory support information system's embodiment in a social context in which several stakeholders are involved and to its aspects of data integration, as several types of content from different resources constitute the building blocks of the information to be delivered during an advisory session. Both factors—embodiment in a social system and data integration—must be taken into account for the advisory support information system to be successful.

Types of Content Used in Advisory Support Information Systems

In advisory sessions, a variety of content is directed either to advisors to support them and their tasks or to the clients. For example, a client receives printed materials from an organization, such as checklists, detailed how-to descriptions, brochures, catalogues about products and services, and forms to complete and submit with other documents. Product or service information is also brought to the customer via electronic media (e.g., the Internet) to enable transactions like product purchases. In addition to the content elements issued by organizations, user-generated content is now a rich source of information that many users consult. Forums, question-and-answer portals, opinion or rating portals, and social networks are used to exchange information. A content audit can be beneficial in identifying which content is available inside an organization and how it is used and/or reused and presented to different audiences (O'Callaghan and Smits 2005). Content elements do not necessarily consist of complete documents but can be much smaller, such as images and text passages, to facilitate reuse on a finer-grained level (The Rockley Group 2003). In the following sections we describe which content elements can occur in advisory support information systems, how we distinguish content items and support items and how content elements have to be adapted to a user's specific role.

Characterization of Content Elements

The content elements that are integrated into an advisory support information system can be characterized by their *type* (multimedia objects like videos, images, and plain text, and formatted text like HTML documents) or by the *amount of structure* they have (structured, factual data that originates from a relational database system or unstructured data like plain text; cf. Godinez et al. 2010). Content elements can also be distinguished by their *status* as either dynamic and still open for changes or static and more appropriate for preservation or archiving. Ideally, each content element is associated with *metadata* that describes the information item (e.g., the creation date). Moreover, the *provenance* or *intended*

use (internal or external) of a content element and its *format* (file format or print-only) are important dimensions in the context of advisory support information systems. Finally, the *mode of collaborative creation* must be considered because content can be developed on the basis of well-defined workflows or using the wisdom-of-the-crowd approach.

The origin or provenance of data is a useful type of content categorization, as the organization itself can create data with knowledge about how the information was gathered and what kind of quality might be expected, or third-party information can be acquired from external sources, which raises questions about how the data were generated and how to determine their quality. Data quality ranges from commercially created content from content integrators to freely available user-generated content, such as reviews on opinion portals and images posted on image-sharing sites. Not all information provided in an advisory support information system necessarily adheres to rigorous quality standards, but sometimes the "wisdom of the crowd" approach, with or without peer reviewing, is sufficient. In other contexts, formally defined quality-assurance processes are needed, for example when decisions are to be made based on financial data or on specific laws that are referred to during an advisory session.

Content Items and Support Items

We suggest that two main types of content used in advisory support information systems be distinguished: content items and support items. *Content items* refer to the content that is delivered via a certain medium, for instance, product specifications presented either in a brochure or on a web page. The content item can be directed either toward external usage (for the client) or toward internal usage (for the advisor or expert, such as detailed product specifications or service manuals). ECM components help to manage these content items by versioning or managing the required metadata.

Support items are those that are dedicated to enabling advisors to carry out advisory sessions. Support items describe how the entire advisory process should be performed, suggest when to use which content element in an advisory session, direct the advisor to others in the organization who have certain competencies, and/or point to reference materials (glossaries or other aids) that can be used to retrieve information and/or to determine which sources should be consulted.

ECM systems can be used to assist users in managing and sharing their (individual) support items as well as an organization's content items. For instance, an advisor individually creates a checklist and shares it with other members of his or her team, who add to the original checklist in order to improve it. In another example in the domain of travel consulting, the travel agents share links related to destinations in order to augment their shared knowledge. ECM components like Wikis help to categorize, index, and store these support items in repositories where they can be retrieved or syndicated throughout the organization, encouraging reuse.

Stakeholders and Roles

In order to be useful, the content elements for an advisory support information system must be adapted to a users' specific role. This is necessary because of the diverging needs of the different stakeholders in a technology-facilitated service encounter. Three main stakeholders can be identified: the *service organization*, the *contact personnel*, and the *customer* (Cook et al. 2002). Parasuraman and Grewal (2000) extend this triangle to a pyramid by adding technology, which serves as a mediator among the actors.

In addition, the service provider (contact personnel and the company itself) is structured according to the hierarchical levels that are assigned by the organization. For example, an individual advisor is assigned to a team that belongs to an organizational unit of a company that is just one line of business among many others in the firm. A profound understanding of where and in what context content elements originate will facilitate integrating them in an advisory support system. Godinez et al. (2010) suggest three scopes of integration: the *local scope*, where information is used only within a department or a line of business, as in a support ticket that is dealt with only in the support organization; the *enterprise-wide scope*, which encompasses data used throughout the entire enterprise, as in customer or product master data; and the *cross-enterprise scope*, which includes data exchanged across enterprises, such as supply-chain data.

Cross-boundary information integration proposes new possibilities for collaboration (e.g., B2B, B2C) through content reuse. Non-competing organizations in the public sector in particular are assumed to have a pre-established culture of sharing common organizational structures and information needs, whereas it is more difficult to start information sharing across profit-making firms (White and Lutters 2007). The idea of inter-organizational information integration is a key enabler in the domain of digital government (Pardo and Tayi 2007). ECM provides the basis for implementing higher-level services like the customer advisory support during service encounters that contributes to an organization's orientation to service-dominant logic. Information quality and content integration are essential to the acceptance and use of an advisory support information system.

Toward an Architecture for ECM-Based Advisory Support Information Systems

In their framework for ECM research, Tyrväinen et al. (2006) propose subdividing the content perspective into three views: the *user view*, the *information view*, and the *systems view*. We use this division as a basis on which to model a content architectural sketch for advisory support information systems (Fig. 4). We separated the user view according to the two major parties involved in a service encounter: the service provider and the customer. Further division based on the

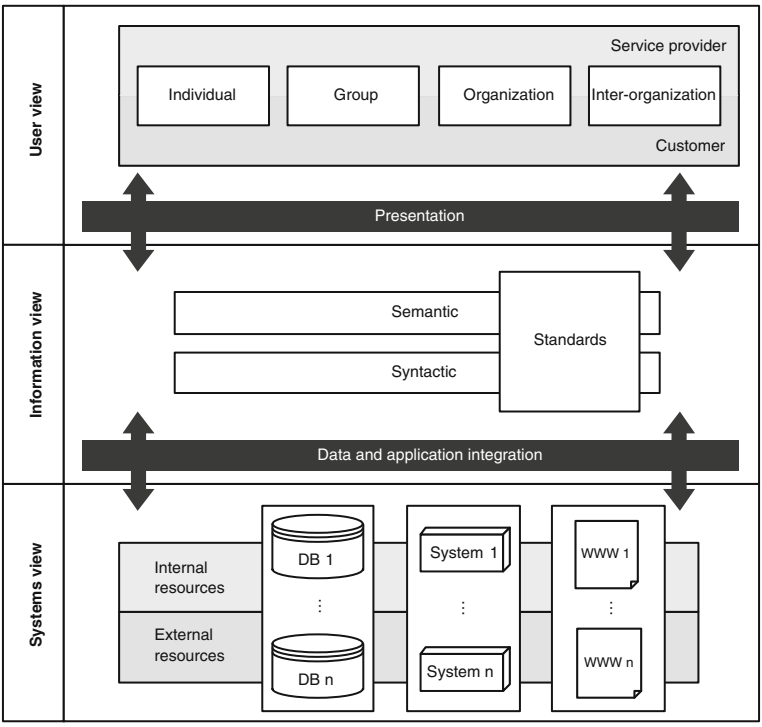

Fig. 4 Content architectural sketch for ECM-based advisory support information systems

entities involved in a knowledge management setting (cf. Nonaka and Takeuchi 1995) helps to differentiate the roles and spheres in which the service provider and the customer interact. Each of the views is a distinct layer that uses the data and services provided by the layers below. In the user view, content based on the aggregated content from the information view is presented to an individual (customer or service provider), and that information relies on the internal or external resources managed in the systems view.

Identifying Requirements for ECM-Based Advisory Support Information Systems

This section describes in detail the architectural sketch developed in the previous chapter, focusing on how ECM technologies can support an advisory support information system. Requirements are devised and summarized for each of the three views—user, information, and systems.

User View: Providing Adapted Information

The *user view* puts the user at the center of interest and addresses questions concerning how users may read or misread the content, how they retrieve the content, and how much a certain content item helps to satisfy an information need (Tyrväinen et al. 2006). From the perspective of an advisory support information system, it is beneficial to provide the right amount of information openly (requirement *uv1*) during a service encounter, thereby fostering transparency and relieving principal-agent conflicts. At the same time, filters (requirement *uv2*) help the user to drill down the size of a result set by, for example, using a faceted search.

Individual level—The service provider perspective: When an advisor works on an individual level with a customer, the expert may have to document the results of an advisory session or some other characteristics of the client (requirement *uv3*) using an advisory support or customer relationship management (CRM) system. In addition to the information the advisors are obliged to capture, they may also take some personal notes about products or about customers that they are not willing to share (requirement *uv4*) because the information was uttered confidentially. ECM provides the modules for this personal information management.

It may be desirable at times to consult additional expert information that is hidden or not shown as the default in the normal course of interaction with the system (requirement *uv5*). In the public administration domain, von Lucke (2006) introduced the idea of "main texts" and "additional texts." Ideally, only the "main texts" are presented as the default, and the "additional texts" with experts' knowledge are consulted only when needed. ECM modules help to manage this additional target-group-specific content, which contributes to satisfying some of the core needs expressed in the SENT-model Bradley et al. (2010) proposed. Thus, advisors maintain their aura of competence and still exert control by deciding when to show or consult certain content or support items.

Individual and group level—The customer perspective: The client expects individualized help and information tailored to his or her needs. Filters help the advisor select the relevant information during the information aggregation phase. If the customer interacts with the information system as well, an even higher level of ease of use must be achieved (requirement *uv6*); therefore, the ECM components used to retrieve information during the information aggregation phase must be equipped with an appropriate user interface and must support queries in the customer's vocabulary (requirement *uv7*). Customers also expect the advisory support information system to deliver up-to-date information (requirement *uv8*). ECM offers the option to set up processes and workflows that guarantee the currency of the content elements.

Group level—The service provider perspective: In this perspective, a team of advisors works together and shares information. For instance, advisors in travel agencies share link lists related to destinations in order to augment their mutual knowledge. The collaboration components of ECM systems help to capture, manage, store, preserve, and deliver these content items or support items (requirement *uv9*).

Organizational level—The service provider perspective: When content is provided by the organization via its custom software systems, such as transaction systems for flight bookings, product databases or CRM systems, ECM technologies facilitate reusing content elements that are adapted according to the channels to which they are delivered. Some information may have been formatted for the interaction in a dyadic, physical service encounter, while other elements of the same content item may be used on an organization's webpage or in its call center. Tailoring the content items to the specific channels or media (requirement *uv10*) to which they are delivered increases successful perception. For instance, call center agents need easily comprehensible, brief content or support items that can be looked up during a telephone call (Steinmetz 2011). ECM facilitates other issues, such as version control, improved credibility by applying user management services to allow only authorized changes or additions, and additional transparency by logging who added which part of information at what time.

Organization level—The customer perspective: In this perspective, after an advice-giving session, a client may receive links to websites with additional information or electronic forms he or she must complete, and ECM helps to manage the content associated with this information. For example, links and their descriptions are reused in a consistent manner that facilitates recognition (requirement *uv11*) of the customer's content items and on the public website of an organization. ECM workflow components also help to initiate workflows if customers can submit forms electronically.

Inter-organizational level—The service provider perspective: On this level, content is provided to and received from external partners by professional content integrators like GIATA (http://www.giata.de) in the travel domain. For example, in the domain of public administration, the currency of information like laws and rules is a decisive aspect of information quality. To add additional complexity, several levels of the public administration may contribute laws or rules that must be considered. Therefore, ECM systems are needed to support collaboration throughout several organizational levels (requirement *uv12*).

Inter-organizational level—The customer perspective: To increase transparency, an advisor can integrate third-party information like product reviews on opinion portals in the advisory session. The user view must provide access to content that is aggregated on an inter-organizational level (requirement *uv13*).

Information View: Semantic and Syntactic Data Integration

The *information view* concentrates on the content's semantics and on how the content will be represented and made accessible. The following sections detail the challenges associated with data integration, the roles of standards and content integrators, the problems of object identification, and the provision of appropriate content structure.

Challenges of Data Integration

Using metadata to describe and filter data items is a prerequisite for successful information integration, but agreeing on the standardized information structures that provide semantics to data is even more important (Tyrväinen et al. 2006). Capturing the *semantics of data* cannot be done by relying on structural or syntactic information like XML schemas but must include the application of widely accepted standards (requirement *iv1*) that contribute to the exchange and integration of information. In the domain of tourism, many standards, such as the IATA (International Air Transport Association) airport codes and the ACRISS (Association of Car Rental Industry Systems Standards) codes that identify the features of a car in the car rental industry, are used to offer consumers transparency and comparability. However, much of the tourism-related data is available only in unstructured or semantically unannotated formats like hotel descriptions in plain text or product opinions on websites.

Problems arise when data from different providers who use incompatible standards or no standards at all are integrated. In this case, ontologies can help to overcome the semantic heterogeneity (requirement *iv2*). In the travel domain, locally used description and classification systems like star ratings for accommodation are largely influenced by a country's specific culture or the laws governing such classifications, making different schemes or criteria difficult to compare (Comité Européen de Normalisation 2009). Standards that facilitate information sharing and cross-organizational reuse of data are about to evolve, much like the content management interoperability standard (CMIS). By using CMIS, content repositories can interchange metadata and content items via web services to offer new possibilities for content reuse.

The task of integrating several content resources on a syntactic and semantic level can be challenging and time-consuming, especially if high-quality data is demanded. *Content aggregators* specialize in these tasks and offer pre-processed and integrated data to their customers for a fee. For example, in the public service sector, the Service-BW portal (http://www.service-bw.de) serves as a content aggregator that offers information which is approved by the state and which is structured around life events aggregated across different levels of government. All of these content elements can be reused on the websites of cities and communal service providers, allowing them to benefit from the automatic updates and the accuracy and authoritativeness guaranteed by the state as issuer and maintainer of the content items. Thus, a content aggregator creates value for customers by alleviating the need to deal directly with problems of object identification.

A trend toward integrating data from various sources that are openly available in (enterprise) mashups is also currently observable. Linked data, first defined by Berners-Lee (2006), is one way to publish structured data on the public web or private intranet, thereby allowing one data source to be linked with another to build a rich information network (DBpedia is the most prominent example) (http://www.dbpedia.org). In advisory support information

systems, linked (open) data that originates either from external sources or from other units of the same organization can also be used. Exploiting the relations associated with the data can provide holistic information. For example, in the domain of citizen information, a mashup was created using publicly available linked data to create an integrated view of neighborhoods' local services, environmental information, and crime statistics (Omitola et al. 2010). ECM modules can consume linked data or help provide it by equipping the raw data with necessary metadata and adding versioning or provenance information in order to overcome some of the challenges related to the use of linked data (Sheridan and Tennison 2010).

Another problem related to the information view is that of guaranteeing up-to-date information. Referring to external data resources like web pages or user-generated content imposes challenges like broken links. Therefore, mechanisms designed to check the availability of the linked information must be established or, when appropriate ECM modules are available, to inform the content owner about the changes.

Challenges of Object Identification

The identification of an object (a flight, a hotel, a destination in general, events like guided tours, and so on) plays an important role in information integration, particularly in the domain of tourism. Because there are so many possible contributors (companies, governments, local authorities, and users) who use a plethora of platforms and manifold standardized or non-standardized ways to describe the entities (car rentals, hotels, events, etc.) involved in a journey, the different object-related pieces of information (requirement *iv3*) must be brought together in order to offer a customer a holistic view of a hotel during an advisory session.

On a technological level, the introduction and widespread use of object identifiers like uniform resource names (URNs) will be decisive if content is integrated from multiple sources. Most of the problems encountered in the prototype of the advisory support information system SmartTravel are due to object identification. GIATA, a content provider specializing in tourism data, offers hotel descriptions, among other content elements. Although GIATA is not a standardization body, its unique IDs that are widely accepted in the tourism industry, are used to commonly identify objects. In order to aggregate information for the same hotel from other sources, such as Wikitravel (http://www.wikitravel.com), or multimedia content from YouTube, one must often resort to parsing the address, which sometimes creates ambiguities (the same name for a city but in a different country) that require manual resolution. Unique object identifiers help to overcome these difficulties.

Challenges of Providing a Content Structure

Content must be equipped with an appropriate structure (requirement *iv4*) in order to assist users of an advisory support information system in locating the desired information. Some government portals on the Internet are already structured around the life-event metaphor (Tambouris and Tarabanis 2008), which helps citizens to find relevant content items associated with this event. However, in complex situations that touch multiple life events, such as expatriating to another country, additional structuring aids offer an advantage. Life events can be combined with a target-group perspective that is based on a requirements profile for a specific group (Böhm et al. 2010). In an advisory support information system, both the expert and the client can rely on such structures—along with other navigational aids, such as indices, directories, glossaries, and free-text search boxes—to help them navigate within the information space.

Appropriate structures are also essential to the integration of information. This is the case, for example, when a person enters the life event of "having a baby" and, thus, is entitled to obtain financial aid and now wants to collect information on this subject. The results of an information search can be improved if all information related to the topic is easily retrievable. Object identifiers can be used to achieve this goal; for example, URNs serve to uniquely identify content or support items that are associated with a life event. And this life event is also identified by an URN; thus, the content or support items are clearly identifiable. When several governmental levels (e.g., the city, county, or national level) are involved in creating content and support items, they can relate their information to identifiable life events. In addition, such information can be characterized as suitable to specific roles (requirement *iv5*), which are also identified by URNs.

Systems View: Overcoming Data Silos

The *systems view* focuses on the systems in which content is stored or made accessible to users. Especially in the case of advisory support information systems, content is distributed and located at different sources. Because of an organization's structure, key content elements may be trapped in silos, making effective mechanisms and methods necessary in order to integrate data and deliver unified content (Tyrväinen et al. 2006). In our architectural model, we divided the systems view according to the origin of the resources as internal or external. A data and application integration layer is used to access the internal or external resources, provide an interface for the advisory support information system and the information resources, and convert the sources' several data formats so they can be accessed by the advisory support information system. Such an integration layer can be realized by an enterprise service bus based on a service-oriented architecture (e.g., using web services) (requirement *sv1*).

Several internal content repositories relevant to advisors co-exist in most organizations that have evolved historically because of the introduction of new software tools that satisfy the specialized needs of certain organizational units. The repositories can range from simple file servers (perhaps with an agreed standard on how to set up the directory structure and naming conventions for files) to digital asset-management systems like picture databases, sophisticated content management systems, transaction-oriented backend systems, and enterprise 2.0 productivity tools like social networks, blogs, and wikis. In the classical database-oriented integration perspective, one solution to deal with this heterogeneity is to build a centralized data warehouse. The other perspective, especially useful in settings in which internally and externally distributed information sources are accessed within advisory support information systems, is to accept this heterogeneity and use methods that support distributed information access (requirement *sv2*).

Summary and Conclusion

Table 1 summarizes all requirements of advisory support information systems with regard to ECM. To instantiate these requirements, several ECM components can be used to integrate and provide access to content resources.

Research on advisory support information systems is only emerging and the same holds true for research on ECM, so the above requirements are not necessarily exhaustive. We assume that transferring existing approaches of advisory support information systems to other domains where content is managed in other ways and by other systems will result in additional or refined requirements.

Some of the requirements are interrelated; for instance, the ease of use (requirement *uv6*) is influenced by the information's currency (requirement *uv8*) and the amount of information that is usually presented to the user in order to create transparency (requirement *uv1*). Therefore, an advisory support information system's benefits can be exploited only if the requirements are taken wholly into account. Because of this interrelatedness, substantial effort has to be put into a test or evaluation design in order to discern which requirement or component contributes to the information system's success and to what extent.

With an appropriate information management strategy and its organization-wide implementation, benefits like the reuse of existing content and support items and their combination into new services and products add to an organization's business flexibility. Organizations are increasingly inclined to follow the service-dominant logic paradigm, and advisory support information systems are primary candidates to improve the service encounter, especially in service encounters where huge amounts of information are exchanged or several internal or external information sources must be consulted simultaneously.

ECM helps users and advisors cope with the multitude of tasks necessary to work effectively with new and existing content throughout an organization. The modules used to capture, manage, store, preserve, and deliver content provide the

Table 1 Requirements of advisory support information systems from the content perspective

User view:
1. Provide the right amount of information to foster transparency
2. Provide filters to ease searching, e.g., by drilling down a search result set's size via facets
3. Provide ways and methods to document results
4. Manage an advisor's personal content, such as by using notes about clients or products
5. Provide expert hints on demand
6. Focus on the tool's ease of use, especially when the customers use it themselves
7. Support search queries in the customer's vocabulary
8. Deliver up-to-date content
9. Provide ways and methods for collaborative information sharing
10. Tailor content to several channels to increase its perception and usage
11. Facilitate recognition of content items through the consistent use of document names and descriptions across distribution channels and media
12. Support collaborative content management throughout several organizational levels
13. Aggregate content from an inter-organizational level (e.g., to foster transparency)
Information view:
1. Rely on widely accepted standards
2. Overcome semantic heterogeneity if resources from different sources are integrated
3. Bring the same objects together (e.g., by using URNs)
4. Equip content with appropriate structures (e.g., "life events")
5. Adapt content items according to a user's role
Systems view:
1. Use a data and application integration layer (e.g., an enterprise service bus)
2. Rely on methods that allow distributed information search and access

infrastructure to build services and applications that rely on these mechanisms or the content governed by them. Advisory support information systems are built on this infrastructure in order to provide higher-level services to employees and customers; at the same time, they use certain ECM components like collaboration to contribute to an organization's information management. Generally speaking, with an appropriate infrastructure, new services that strengthen an organization's competitive position or contribute to its acceptance can be delivered. Advisory support information systems benefit from an appropriate and technologically sound infrastructure, but the approaches are also applicable in other information-rich areas, whether characterized by customer contact or not, where information is aggregated from various sources and consulted in a co-located setting, for example, by an advisor and a client.

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Make or Buy? Factors that Impact the Adoption of Cloud Computing on the Content Level

Ivo Gonzenbach, Christian Russ and Jan vom Brocke

Abstract The emergence of cloud computing has led enterprises to rethink fundamentally how they organize their content assets. In particular, IT managers are challenged to decide what content should be managed in the cloud and what should not. Grounded in the IS literature on IT outsourcing, this chapter presents a set of criteria that organizations can consider when making this decision. Because it is a make-or-buy decision, transaction cost theory (TCT) was used as a theoretical lens for the study. Accordingly, the chapter suggests specificity (e.g., degree of standardization of content management), frequency (e.g., frequency of usage), and uncertainty (e.g., legal situation) to impact the cloud computing decision.

Introduction

Cloud computing is a new paradigm for delivering information services to customers, offering various advantages over traditional IS (Information Systems) deployment models. Cloud computing is characterized by on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service (Mell and Grance 2011). Research has identified the benefits cloud computing offers to organizations: improved flexibility and speed of implementation, easy access, massive scalability, reasonable performance, and specifiable

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configurability (e.g., Armbrust et al. 2010; Kondo et al. 2009; Zhang et al. 2010). Because these benefits can often be realized at relatively low costs compared to the cost of dedicated infrastructures (Kondo et al. 2009), the emergence of cloud computing has had an enormous impact on the IT industry (Zhang et al. 2010). Gartner (2012) estimates the worldwide cloud services revenue at $109 billion in 2012 (a 19.6 % increase over 2011) and expects it to reach $206.6 billion in 2016. Therefore, it is not surprising that many authors consider cloud computing the next computing paradigm (e.g., Buyya et al. 2008; Gartner 2010; Weiss 2007; Zhang et al. 2010).

Foster et al. (2008) identify three factors in particular that have facilitated this development: First, hardware costs are decreasing, while both computing power and storage capacity are increasing. Second, data size is growing quickly; for example, an IDC study estimates the amount of digital information captured worldwide to reach 40 trillion gigabytes (GB), or 5,200 GB of data for every person on earth, by 2020 (50-fold growth from the beginning of 2010) (Gantz and Reinsel 2012). Third, service computing and Web 2.0 applications have already been widely adopted.

The implementation of cloud computing also comes with risks (e.g., Paquette et al. 2010; Svantesson and Clarke 2010) that can be categorized into policy and organizational risks, technical risks, and legal risks (ENISA 2009). Subashini and Kavitha (2011) also argue that cloud computing often causes security headaches, such as problems related to data access, protection, and privacy. Chen et al. (2010) agree, contending that "security has emerged as arguably the most significant barrier to faster and more widespread adoption of cloud computing" (p. 3). For example, extant research has shown that fears about cloud computing stem largely from the perceived loss of control over sensitive data (Chow et al. 2009), Svantesson and Clarke (2010) address a range of privacy and consumer risks, and Subashini and Kavitha (2011) identify the security issues that must be taken into account when adopting cloud computing.

Since the challenges that revolve around the implementation of cloud computing are both technological and managerial, cloud computing is also a relevant IS research topic (e.g., Armbrust et al. 2010; Buyya et al. 2009; Vaquero et al. 2009; Zhang et al. 2010). However, IS research is lacking when it comes to advice about how organizations should decide which content assets to put into the cloud and which not to. As a response, this paper develops a conceptual framework that identifies factors that impact this decision. As Chow et al. (2009) write, "When thinking about solutions to cloud computing's adoption problem, it is important to realize that many of the issues are essentially old problems in a new setting, although they may be more acute" (p. 85), so existing research on IT outsourcing essentially has informed the development of the framework.

The chapter proceeds as follows. Section 'Cloud Computing' explains the concept of cloud computing and provides the background for this research. Section 'The Role of Cloud Computing in IS Research' reviews related work from IS research, in particular cloud computing studies that informed the development of the proposed framework. Section 'Theoretical Foundation' describes the TCT

we used as a theoretical lens in the process of developing the framework. Section 'Conceptual Framework Development' then presents the framework and explains criteria that IT executives can use to characterize and analyze their content assets, thus supporting them in decisions about what to put into the cloud. Section 'Conclusion' concludes the chapter with a summary and an outlook to future research activities.

Cloud Computing

The IS literature offers several definitions of cloud computing (e.g., Armbrust et al. 2010; Foster et al. 2008; Vaquero et al. 2009; Youseff et al. 2008). Vaquero et al. (2009) study more than twenty definitions and conclude that many of them focus only on certain technological aspects of the concept but that a definition of cloud computing should also include scalability, pay-per-use utility model, and virtualization. The widely accepted definition from the National Institute of Standards and Technology (NIST) accepts this approach:

> Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. (Mell and Grance, 2011, p. 2)

Many researchers have found this definition to be appropriate, as it includes the five essential characteristics, three service models, and four deployment models (Sriram and Khajeh-Hosseini 2010; Zhang et al. 2010) that are the most common features of cloud computing. Mell and Grance (2011) describe the five cloud computing characteristics as follows:

- *On-demand self-service* refers to the cloud consumer's ability to access computing capabilities without requiring human interaction from the service provider.
- *Broad network access* refers to the ability to access a cloud service through standard mechanisms that promote the use of various platforms (e.g., mobile phones, laptops).
- *Resource pooling* means that the provider's computing resources are pooled to serve multiple consumers using a multi-tenant model.
- *Rapid elasticity* describes unlimited computing capabilities that can be purchased in any quantity and at any time rapidly and elastically.
- *Measured service* refers to the monitoring, controlling, and reporting of resource usage, which provides transparency for both the provider and the consumer.

The three cloud service models can be described as follows (Armbrust et al. 2010; Foster et al. 2008; IBM 2010; Mell and Grance 2011):

- *Cloud Software as a Service* (*SaaS*): The service provider offers applications as services that run on the provider's cloud infrastructure and are accessible from client devices through a web browser.
- *Cloud Platform as a Service* (*PaaS*): The service provider supplies consumer-created or acquired applications created using programming languages and tools as a service. The service also includes the management or control of the underlying cloud infrastructure, as the customer controls the deployed applications and may also control configuration of the application-hosting environment.
- *Cloud Infrastructure as a Service* (*IaaS*): The service provider supplies fundamental computing resources, such as processing, storage, and networks where the consumer can deploy and run arbitrary software, including operating systems and applications. The customer controls operating systems, storage, and deployed applications, and may have limited control over certain networking components (e.g., host firewalls).

Several cloud deployment models are discussed in the literature. Armbrust et al. (2010) and IBM (2010), for example, distinguish two primary cloud delivery models: the public cloud and the private cloud, while Mell and Grance (2011) further describe the hybrid cloud and the community cloud.

- *Private cloud:* In the private cloud, the consumers and the providers of these services are in the same organization. The cloud is managed either by the organization itself or a third party, and it may exist on or off the organization's premises.
- *Community cloud:* The cloud service infrastructure is shared among multiple organizations whose requirements are similar and that want to share an infrastructure in order to realize benefits, thus supporting a specific community. The service is managed either by the organizations themselves or by a cloud service provider.
- *Public cloud:* The public cloud is the most traditional deployment model. The cloud service infrastructure is shared among multiple customers, made available to the general public or a large industry group, and owned by an organization that sells cloud services.
- *Hybrid cloud:* A hybrid cloud combines elements of public and private clouds, including any combination of providers and consumers, and it may contain multiple layers of service.

The discussion that follows focuses primarily on public cloud services provided by remote suppliers who take responsibility for delivering the services to their customers. This focus was chosen because the benefits related to economies of scale can be realized in public clouds more easily through service to multiple customers on the same infrastructure (Fehling et al. 2010), and because the challenges and risks in sourcing software services are much greater in public clouds than they are in other deployment models. Because the question concerning whether content is managed in the cloud is most likely to be discussed in an SaaS context, we also focus on this particular type of service model.

The Role of Cloud Computing in IS Research

Although cloud computing has gained attention in academia, most of the research has focused on its technical aspects (e.g., Foster et al. 2008; Koehler et al. 2010; Youseff et al. 2008). Reviews of the academic literature in IS research have shown that frameworks and methods that support decision making during the adoption of cloud computing are all but nonexistent (Sriram and Khajeh-Hosseini 2010). An analysis of the AIS Senior Scholars' Basket of Journals, for example, suggests that only a few IS sources have focused on cloud computing (Table 1). (Most of these papers were published in a 2010 JMIS special issue on information systems in services.)

The above examples indicate that prior IS research has not sufficiently explored the adoption of cloud computing on the content level from a decision-making perspective. While several approaches have been proposed by consultancies (e.g., Accenture 2009; IBM 2010; Jenkins 2010), only few IS studies have sought to identify the characteristics of an adoption framework that would help decision-makers determine which content to put in the cloud. For example, Khajeh-Hosseini et al. (2010a) propose a cloud adoption toolkit to support decision makers in identifying their concerns and matching them to appropriate tools and techniques.

Table 1 Cloud computing articles in the AIS Senior Scholars' Basket of Journals

Reference	Contents
Bardhan et al. (2010)	The paper evaluates existing literatures, identifies current streams in research, and presents possible outcomes and directions in the future with respect to service-oriented technology and management and service science
Choudhary (2007)	The paper describes a model of endogenous software quality under perpetual licensing and subscription licensing (SaaS). The paper suggests that publishers who adopt the latter scheme will typically invest more in software quality compared to publishers who adopt the perpetual licensing scheme
Demirkan et al. (2010)	The paper examines the economic performance of an SaaS infrastructure under different coordination strategies involving information sharing between the ASP and the API. It explains the market dynamics in the burgeoning area of SaaS infrastructure providers
Schwarz et al. (2009)	Based on four organizational theories (TCT, resource-based view, resource-dependence view, knowledge-based view of the firm), the study suggests ten attributes that firms should consider when deciding upon outsourcing of applications
Susarla et al. (2009)	The paper argues that the contract design of SaaS provided by ASPs should address ex post transaction costs resulting from contractual incompleteness and opportunism. It further suggests that it is necessary to design governance structures in a way that they protect user firms from shirking and monitoring costs
Susarla et al. (2010)	The paper examines contract choices in the provision of SaaS. It draws upon agency theory and modularity theory and suggests that one of the central challenges in service disaggregation is that of knowledge interdependencies across client and provider organizations

Benlian (2009) develops a research model for assessing SaaS sourcing at the application level, demonstrating that uncertainty is the strongest factor for SaaS adoption, closely followed by application specificity. However, none of these approaches focuses on decision support from the viewpoint of content. Therefore, this chapter addresses this shortcoming with a conceptual framework of factors that influence the decision concerning what content to put into the cloud. The next section provides a theoretical foundation for the framework.

Theoretical Foundation

The TCT has been widely applied in the IS literature to analyze decision problems likes outsourcing and make-or-buy decisions. In the context of IT outsourcing decisions, the TCT is the most frequently applied theory (e.g., Aubert et al. 2004; Dibbern et al. 2004; Lacity and Hirschheim 1993; Lacity et al. 2009; Lacity and Willcocks 1995). Managers' main objective in IT outsourcing is to minimize total cost (service costs and transaction costs) and maximize total value (Ngwenyama and Bryson 1999). The decision concerning whether to manage content in the cloud can be considered an outsourcing decision, so the TCT was also used in this research.

According to the TCT, which was pioneered by Coase (1937) and developed by Williamson (1975, 1979, 1981, 1985), transaction costs are "comparative costs of planning, adapting, and monitoring task completion under alternative governance structures" (Williamson 1985, p. 2). These transaction costs can be separated into set-up and contracting costs, which include search-related costs to find a service provider and negotiation costs (ex ante). After a contract has been concluded, transaction costs like monitoring and coordinating costs and, in situations of failure or weak performance, switching costs accrue (ex post) (Ngwenyama and Bryson 1999). Hence, the TCT posits that organizations outsource a certain task when the internal governance costs are higher than the costs of using the market.

Williamson (1985) argues that the TCT has two underlying assumptions: bounded rationality and opportunism. While the first assumption acknowledges limits on cognitive competences, the second recognizes self-interest-seeking (Williamson 1985). Bounded rationality reflects individuals' inability to find and process all information and difficulties in assigning probability values to the occurrence of future events, so transactions are conducted with a certain level of uncertainty. Opportunism refers to incomplete or distorted disclosure of information with the intent to mislead, distort, disguise, obfuscate, or otherwise confuse (Williamson 1985). According to Aubert et al. (2004), the combination of these two assumptions results in information asymmetry: Because both parties in a transaction have the goal of maximizing their profits, they will not share all of the information they possess; sellers will hide the negative characteristics of their services, while buyers will not reveal how much they are willing to pay (Aubert

et al. 2004). Because both parties are aware of such opportunistic behaviors, they will seek information.

All of the actions described so far generate transaction costs. In addition to the two human-related factors (i.e., bounded rationality and opportunism), the TCT is based on three environmental factors: asset specificity, uncertainty, and frequency (Williamson 1985).

- According to Williamson (1989), *asset specificity* refers to "the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value" (p. 142). As such, it describes the investment that is necessary for certain transactions to occur. Specifically, Williamson (1985) distinguishes among four types of asset specificity: site specificity, physical asset specificity, human asset specificity, and dedicated assets (p. 55). In the context of cloud computing, asset specificity primarily refers to the knowledge, infrastructure, and location required to use and provide specific cloud services. The degree of specificity can be measured as the difference between the cost of the asset and the value of its second-best use (Williamson 1981). Prior IS studies have evaluated the extent to which the degree of asset specificity affects the outsourcing decision. While Nam et al. (1996) do not find significant dependencies between asset specificity and outsourcing, Aubert et al. (2004), Benlian (2009), and Dibbern et al. (2005) argue that asset specificity contributes significantly to the outsourcing decision. This leads to the following proposition: the more specific the assets required to manage enterprise content are, the higher are the transaction costs and the less beneficial is it to obtain the service from third parties.
- *Uncertainty* arises when the relevant contingencies surrounding an exchange are too unpredictable to be specified ex ante in a contract (Geyskens et al. 2006). Analogous to asset specificity, the environmental uncertainty in an outsourcing relationship is posited to be negatively associated with the degree of outsourcing (Williamson 1985), so more uncertainty and perceived risk lead to less outsourcing (Nam et al. 1996). Wang (2002) defines uncertainty in the context of IT outsourcing as "the inherent characteristics of specific software outsourced in terms of the difficulties of prescribing specifications, scheduling delivery dates and estimating costs at the contracting stage" (p. 161). This construct then reflects the extent of bounded rationality and, as such, the incompleteness of the contract. Dibbern (2004) separates environmental uncertainty in the IT outsourcing context into business-driven uncertainty and technology-driven uncertainty (pp. 53–54). Business-driven uncertainty refers to the extent to which the IT vendor may change the development of business-related issues over time in the course of the outsourcing relationship, while technology-driven uncertainty reflects the extent to which the IT vendor may change the required technical functions or features of the outsourced application over time. Prior empirical studies in IS research, such as Aubert et al. (2004), Benlian (2009), Nam et al. (1996), and Wang (2002), have shown that environmental uncertainty is the main deterrent of outsourcing on-demand IT applications. Benlian (2009)

finds that "environmental uncertainty emerges as the strongest factor for SaaS-based outsourcing" (p. 9). A high degree of uncertainty always negatively influences the outsourcing decision because, as Wang (2002) explains, uncertainty has a direct and positive impact on the opportunistic behaviors of the vender and the seller.

- The transaction cost framework also includes transaction *frequency*, although this construct has received little attention in the transaction cost literature (Geyskens et al. 2006), and far less in the empirical literature than asset specificity or uncertainty (Rindfleisch and Heide 1997). Transaction frequency refers to the extent to which certain transactions recur. Williamson (1985) argues that a high transaction frequency incents firms to employ hierarchical governance because the overhead costs of hierarchical governance are easier to recover for recurring transactions. In contrast, it would not pay for the firm to establish a specialized governance mechanism for transactions that occur rarely because doing so would involve significant set-up and maintenance costs, which are likely to exceed the potential losses from opportunism.

Conceptual Framework Development

Various IS researchers (e.g., Sambamurthy and Zmud 1999) have recognized the importance of establishing appropriate IT decision rights to manage and coordinate an organization's IT resources. Schwarz et al. (2009) argue that "executives are adaptive decision-makers, employing a complex processing strategy when assessing the attributes involved in making outsourcing decisions" (p. 754), and Dibbern et al. (2004) list attributes that influence the IT outsourcing decision. Accordingly, the conceptual framework presented in this section describes a set of criteria that organizations should consider when deciding what content should be managed in the cloud. Understanding the characteristics of content assets that are amenable to being hosted in the cloud can help IT professionals in content audits (O'Callaghan and Smits 2005). The content audit then produces an overview of an organization's content assets and their usage and reveals the potential benefits and pitfalls of putting these assets into the cloud. The criteria presented in what follows here are based on the TCT theory and grounded in the academic literature on IT outsourcing and cloud computing.

Asset Specificity

Generally, assets of low specificity can be used without difficulty, so they can easily be outsourced in the cloud. Less specific assets can be obtained from the market quickly and without difficulty. In contrast, it is difficult and often expensive to obtain assets that are highly specific to clients without considerable effort.

Because vendors are wary about making such client-specific investments, assets with high client specificity are not often contracted for use in the cloud, so they must often be developed in-house. In the context of a content assessment, the construct of asset specificity can be understood as *content specificity*, which describes the extent to which the content is related to the individual needs of a company. We can further separate content specificity into physical asset specificity, human asset specificity, and site specificity.

Physical Asset Specificity

Physical asset specificity refers to items like specialized production equipment and computer technology (Artz and Brush 2000). In the context of content management, physical asset specificity includes all of the specific investments made in order to manage enterprise content. The content-related criteria that affect such investments (e.g., complex computer software and systems designed for a single purpose) are *compliance requirements*, *data retention requirements*, and the *degree of standardization of content management* (Table 2). The more specific the physical assets related to the content are, and the larger the specific investments to manage the content are, the higher the transaction costs are and the less favorable it is to outsource them to the cloud.

Human Asset Specificity

Human asset specificity refers primarily to the knowledge and skills required to handle and manage content. Dibbern et al. (2005) list three criteria we use in what follows to determine whether to put content into the cloud: the unique business knowledge required, the unique software knowledge required, and the social collaboration skills required. *Unique business knowledge* includes all of the specific knowledge required to understand an organization's content management requirements. *Unique software knowledge* is affected by criteria like the content classification level, the skills needed to meet the requirements of content encryption, and knowledge of access restrictions. *Social collaboration skills* refer

Table 2 Criteria based on physical asset specificity

Criteria	Description
Degree of standardization of content management	Amount of specific investment needed to manage content in a content management system (e.g., dependent on content format, size)
Compliance requirements	Amount of specific investment needed to fulfill the compliance requirements related to content
Data retention requirements	Amount of specific investment needed to fulfill the data retention requirements of content

Table 3 Criteria based on human asset specificity

Criteria	Description	Source
Unique business knowledge	The understanding of business processes and specific knowledge of content management requirements that are unique to an organization	Dibbern et al. (2005), based on Ang and Cummings (1997) and Poppo and Zenger (1998)
Unique software knowledge	The knowledge of software systems developed specifically for an organization (e.g., encryption, access restrictions, privacy issues)	Dibbern et al. (2005), based on Ang and Cummings (1997) and Poppo and Zenger (1998)
Social collaboration skills	Social collaboration skills between IT workers and users (and among IT workers)	Dibbern et al. (2005), based on Pinto et al. (1993)

to the ability to have strong social/interpersonal working relationships between the IT personnel and the system users (and among the IT workers themselves) when doing the work for each of the IS functions (Table 3).

Where there is a high level of human asset specificity, high transaction costs can be expected. Accordingly, the main outsourcing question here concerns whether the company has the required knowledge in-house or not.

Site Specificity

Site specificity, which refers to the conditions at a location that are not changeable or are changeable only at great costs, combines all of the content management requirements that are location-specific. Location-specific requirements include jurisdiction and the applicable laws that are relevant to the management of content. According to Subashini and Kavitha (2011), the *legal jurisdiction* is an essential attribute in assessing content that should be considered in all cloud computing situations. It has to be clear under which jurisdiction the content is managed and, at the same time, it has to be safeguarded that the laws of the location where the cloud service supplier stores the data are at least as strong as the ones under the user's jurisdiction. For example, this was an issue for non-American organizations that hosted their content in the US because they came into conflict with the US Patriot Act. Pearson (2009) mentions that *applicable laws* that place geographic and other restrictions on the collection, processing, and transfer of personally identifiable and sensitive content limit the usage of cloud services (Table 4). Jaeger et al. (2009) emphasize the importance of locality by pointing out that cloud computing increases the governments' and corporations' control over resources. Examples of rules that increase site specificity also include internal corporate regulations that apply to the location where certain content assets are stored. Khajeh-Hosseini et al. (2010b) contend that "it is unlikely that these jurisdiction issues will stop the use of cloud services; however, they will have long-term implications that need to be considered by users" (p. 7). In summary, the more

Table 4 Criteria based on site specificity

Criteria	Description	Source
Legal jurisdiction	In legal cases that involve the cloud provider, where will the cases be adjudicated? How favorable is that jurisdiction to the cloud provider's interests?	Jaeger et al. (2009); Subashini and Kavitha (2011); Svantesson and Clarke (2010)
Applicable laws	The scope and complexity of laws and regulations that apply to the management of content	Joint et al. (2009); Khajeh-Hosseini et al. (2010b); Pearson (2009)

complex and specific the location requirements of content assets are, the greater is the location asset specificity. Hence, high transaction costs can be expected, and this kind of content should be managed in-house.

Uncertainty

Dibbern (2004) differentiates uncertainty into business-driven uncertainty and technical-driven uncertainty (pp. 53–54), a categorization that can also be applied to the context of cloud computing.

Business-Driven Uncertainty

Business-driven uncertainty refers to the extent to which the IT service provider may change business-related issues like pricing and processes over time in the course of the outsourcing relationship. Such changes include the *pricing*, the provider's *business model*, and developments and changes in *business requirements*. Another driver of business-driven uncertainty is the development of the *legal situation*, which remains complex in the context of cloud computing (Table 5).

Table 5 Criteria based on business-driven uncertainty

Criteria	Description	Source
Pricing	Uncertainty about price developments related to cloud services	Benlian (2009)
Business model	Uncertainty about changes in business models related to cloud providers	Smith and Kumar (2004)
Business requirements	Uncertainty about developments and changes in business requirements	Benlian (2009)
Legal situation	Uncertainty about developments in the legal situation	Svantesson and Clarke (2010)

Table 6 Criteria based on technical-driven uncertainty

Criteria	Description	Source
Features and functions	Uncertainty about developments of technical features and functions	Benlian (2009)
Data protection	Uncertainty about the level of data protection	Svantesson and Clarke (2010)
Reliability	Uncertainty about whether the content will be reliable or not	Clarke (2010)
Availability	Uncertainty about how long the content will be available	Clarke (2010); Ma et al. (2005); Smith and Kumar (2004); Zhang et al. (2010)
Continuity	Uncertainty about how long it will take to recover the content after a disaster scenario	Ma et al. (2005)
Connectivity	Uncertainty about how long the connection to content will be available	Khajeh-Hosseini et al. (2010a); Smith and Kumar (2004)

Technical-Driven Uncertainty

Technical-driven uncertainty describes the intensity with which content outsourcing is subject to technical difficulties in terms of *availability* and *reliability* and captures the extent to which the required technical *features and functions* of the outsourced application may change over time. An often mentioned uncertainty in the context of cloud computing is the level of *data protection* that lies beyond the control of recipients of cloud services. Other criteria, such as *continuity* and *connectivity*, affect the availability of content, and must also be considered (Table 6).

For both business-driven and technical-driven uncertainty, it can be assumed that a high level of uncertainty that is due to potential opportunistic behaviors by the IT service providers causes high transaction costs, so the outsourcer will prefer internal governance for highly risky content.

Frequency

The content characteristics that primarily affect the concept of frequency are the *number of applications* that access the content and the *number of content users* who access the content. Other criteria, such as the *frequency of content usage* by either applications or by users, and *user access points* also affect transaction costs. Another, but increasingly negligible factor is the *content size* (Table 7).

Dibbern (2004) argues that usage of an application system that requires many technical and human interfaces, skills and resources, and interactions will translate into increased coordination complexity between these entities. Hancox and

Table 7 Criteria based on frequency

Criteria	Description	Source
Number of content users	The number of users who have access to the content	Benlian (2009); Smith and Kumar (2004)
Number of applications	The number of applications that access the content	Benlian (2009); Smith and Kumar (2004)
Frequency of content usage	The frequency with which a user or an application accesses the content	Benlian (2009); Smith and Kumar (2004)
User access points	The number of user locations that access the content	Smith and Kumar (2004)
Content size	The size of the content	

Hackney (2000) conclude that frequency criteria are negatively associated with the use of the cloud, so high frequency leads to internal governance, rather than to outsourcing.

Additional Criteria

Another criterion often mentioned in the context of make-or-buy decisions is the level of *strategic importance*. Quinn and Hilmer (1994) mention that core competencies "for which the [outsourced] firm has neither a critical strategic need nor special capabilities" should be kept in-house (p. 43). Similarly, Lacity and Willcocks (2001) write, "Outsource commodity, keep strategic in-house" (p. 186). Closely related to strategic importance is *business criticality*, which describes the degree to which the content is critical to the existence and continuation of the business (Table 8). Westner and Strahringer (2008) mention that a high level of criticality makes an application less suitable for outsourcing because more effort has to be invested to ensure stable delivery. This guideline also applies to the outsourcing of content.

Table 8 Additional criteria

Criteria	Description	Source
Strategic importance	The level of strategic importance of content for the company	Lacity and Willcocks (2001); Quinn and Hilmer (1994)
Business criticality	The importance of content for fulfilling daily business operations	Westner and Strahringer (2008)

Conclusion

This chapter contributes to the cloud computing literature by offering a set of criteria for organizations to consider when deciding what content should be managed in the cloud. Grounded in the academic literature on IT outsourcing and cloud computing, the conceptual framework presented here was developed on the basis of the TCT. The discussion suggests that the higher the transaction costs are the more likely it is that content is stored on-premise. In contrast, low transaction costs might suggest putting content into cloud. The chapter further shows which criteria influence the transaction costs.

The results are relevant for researchers and practitioners alike. Researchers are provided with factors that can inform future empirical studies of cloud computing adoption, while practitioners can consider these factors in their own cloud computing projects.

However, the study has several limitations. First, the development of the framework was grounded in selected literature, so the list of criteria presented is not exhaustive. Second, only criteria from the TCT were considered, and the use of other theories might produce a more general and holistic model. Third, the framework has not yet been evaluated in practice.

Because of these limitations, the research presented in this chapter can be considered only a first step toward developing a decision framework for cloud computing. Future research should develop and evaluate the proposed framework and incorporate other theories (e.g., incomplete contracts or agency theory) in order to add insights into the factors that are relevant in the context of cloud computing.

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Fostering Comparability in Content Management Using Semantic Standardization

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Abstract This chapter addresses the lack of consistency and comparability in content management. We provide a solution to this problem and propose a conceptual specification of a generic portal structure that allows for semantic standardization of content. The structure and semantics of textual descriptions must be customized for given application scenarios, so we demonstrate such a customization for an exemplary research portal. In the example we address design science research and describe a research process that uses the customized portal definition. We conclude that our approach can increase the consistency and comparability of content in general through (1) an individually customizable system structure that reflects the nature of a specific application scenario better than generic structures can and (2) a semantic standardization of textual descriptions that forces the portal users to be precise and compact in their descriptions and to consistently apply the vocabulary of the domain.

Introduction

In a digital society in which increasing numbers of documents are digitally exchanged, companies need enterprise content management (ECM) in order to keep up with data volume and manage their data properly. ECM handles the whole

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lifecycle of digital assets and addresses their capture, organization, processing, and maintenance (Smith and McKeen 2003). For ECM, structuring and comparability of content is important, so this chapter proposes a method for structured content description. Used in addition to the classification of entries and free-text fields, this method can be used to describe content in content management systems (CMS). The structured content description is introduced for the example of research portals, which are a special type of CMS used in the university context. Research portals collect, structure, and present information about research, such as research results and the projects and organizations involved, so they have many properties in common with the general concept of ECM.

Similar to ECM systems research portals have different stakeholders with their own, typically diverse expectations, including researchers, research funders, and the general public. While researchers have to provide information about complementary and similar work in the field, advertise their research and findings, and look for potential partners for collaboration (Carayol and Matt 2004; Fox 1992; Krücken and Meier 2006), research funders need an overview of the field, to identify gaps in the current research, and to identify emerging and regressing topics in order to decide on a future funding policy (Schimank 2005). The general aim for most stakeholders is the retrieval of information, which is usually unstructured and located in multiple places. Therefore, stakeholders need ways to store and disseminate content in a structured manner and to search for them effectively. Research portals are IT portals that address this challenge and provide a way to disseminate research information.

An important challenge in the design and application of CMS is ensuring comparability and common understanding of content. This problem has to do with both the natural language and the structure of information. Although approaches like glossaries, tooltips, layout conventions, and description templates exist, they have not yet solved the problem (Becker et al. 2010b). Even if such description guidelines are present, users have to follow them, or the contents must be standardized by a moderator, which can be costly. Our empirical study of 813 research portals showed that roughly 90 % of the portals we analyzed rely solely on a textual description of the application domain (Becker et al. 2012).

ECM systems have very similar problems: context comparability and common understanding of content must also be ensured. Standardization enables content to be found and retrieved efficiently and helps entries to be interpreted correctly. Against this background, the topic of this chapter is semantic standardization of content. We propose an approach that allows for an individual context-specific definition of a research portal structure and a specification of semantic standardization conventions for these structures. The approach is capable of a semi-automatic enforcement of these conventions in research portals and other types of CMS. Thus, our approach fosters syntactic and semantic consistency of content in order to allow for more efficiency in content management.

The remainder of this chapter is structured as follows. Section ‘Research Background’ presents the research background and discusses approaches to the standardization of information. Section ‘Standardization in CMS at the Example

of Research Portals' presents the conceptual foundation of our approach. An application example for research that follows the design science paradigm is discussed in section 'Application Example'. Section 'Discussion and Outlook' concludes with a brief summary and an outlook for future research.

Research Background

Semantic Standardization of IT Artifacts

A unified approach to knowledge representation has been a research problem for the last few decades. Approaches that have been proposed to resolve the ambiguous representation of knowledge in various areas of application can be classified into two categories: those that deal with the problem prior to the explication of knowledge (ex ante) and those that deal with the problem after the explication of knowledge (ex post). Ex post approaches address the problem by analyzing existing knowledge representations, identifying ambiguities, and trying to solve them. Ex ante approaches prevent the emergence of ambiguities by guiding the author. As our chapter deals with content management, we focus on the explication of knowledge with the help of software like CMS, wikis, databases, and conceptual models.

Popular ex post approaches that originate from the 1980s and 1990s address the resolution of ambiguities in IT artifacts that are related to the problem of database schema-matching (cf. Rahm and Bernstein (2001) for an overview). They analyze given schemas and identify fragments that may match. Other approaches do not take single terms into consideration, as it is common in schema-matching approaches, but so-called *concepts* (e.g., Ehrig et al. 2007; Höfferer 2007; Sabetzadeh et al. 2007). These concepts, which consist of interrelated terms that are part of a domain ontology (Guarino 1998), have in common that existing IT artifacts (in this case: conceptual models) are connected to a domain ontology.

On the other hand, ex ante approaches focus on avoiding semantic ambiguities during the creation of contents. Ex ante approaches usually use conventions to limit the likelihood that ambiguous terminology will be used during the construction. Naming conventions are usually provided as written glossaries or ontologies that are suitable for the domain.

An ontology is a declarative formalization of a set of objects that represent the universe of discourse (Gruber 1993). This set of objects and the relationships among them are the vocabulary used to describe the entities of a specific domain. Applied to the description of knowledge with the help of an ontology, the terms allowed in describing the knowledge are objects in the ontology and have a defined meaning. Ahlemann et al. (2006) provide a general explanation of how to annotate

IT artifacts with ontological concepts. Several approaches adopt terms or concepts from ontologies to use in conceptual models (Abramowicz et al. 2007; Born et al. 2007; Greco et al. 2004; Hepp and Roman 2007; Thomas and Fellmann 2009).

Approaches related to linguistics provide standardized phrase structures as a way to generate unambiguous denotations. Approaches related to conceptual modeling are presented by Rosemann (1996), Kugeler (2000), Nüttgens and Zimmermann (1998) and Delfmann et al. (2009). Ortner (1997) proposes a method related to requirements engineering, while Fliedl et al. (2005) generate conceptual models automatically from descriptions of natural language requirements.

To achieve semantic unambiguity, compliance with semantic standards defined either in an ontology or linguistically must be enforced. Therefore, it must be assured that users follow the standards while entering content into the system. The semantic standards must also consider not only single terms, but combinations of terms since the meaning of sentences whose order of terms differs may also differ.

The idea of our approach is to regard a CMS as an IT tool with a structure that can be semantically standardized, analogous to a conceptual model. Therefore, we combine the idea of content management with that of semantic standardization of conceptual models. In particular, we favor the linguistic approach, as it is necessary to provide a way to express syntactically correct sentences that describe content rather than simple labels and describing dimensions. Therefore, we reuse an approach that provides the user with a domain vocabulary and syntactic conventions that restrict the possibilities for formulating sentences.

In our approach, conventions for the vocabulary and syntax of textual descriptions must be specified ex ante while defining the structure of the CMS, that is, before any content is entered. During the process of entering content, the user is guided by a software wizard that ensures compliance with the conventions (Delfmann et al. 2009). Textual descriptions are parsed in the background and validated against specified conventions, and the grammatical structure and vocabulary are analyzed. If the description provided is considered valid, it is accepted by the system and the content can be persisted. Otherwise, the system informs the user about the violation, and the user has to adjust the input. Exception-handling routines are available so content can be saved temporarily in case conventions are insufficient.

ECM and Research Portals

Research portals support the creation of virtual communities of practice (Palmisano 2009; Wenger and Snyder 2000) in research settings. In addition to supporting internal communication in the community (Yu et al. 2010) and content management for research, research portals focus on reaching external stakeholders and fostering the knowledge transfer between practitioners and academics (Rynes et al. 2001) .

ECM and information portals have much in common (see Scheepers 2006), and it is the same with research portals, but they also differ in some important ways. The differences between the two approaches can be explained using Tyrväinen et al. (2006) research framework for ECM, which distinguishes four perspectives: the *enterprise context*, *content*, *processes*, and *technologies*. First, while ECM is typically implemented in an enterprise context (Munkvold et al. 2003), research portals are implemented in the university or research context. In the dimension of *content*, unlike enterprise/corporate/knowledge portals (Benbya et al. 2004; Daniel and Ward 2005; Zhang and Li 2006), research portals do not act as repositories for accumulating accessible knowledge on a topic but point to original sources that makes them similar to knowledge maps (Vail 1999; Wexler 2001). Furthermore, research portals structure metadata on the referenced contents, while ECM systems focus on the storage of predominantly unstructured data. Differences between these two types of systems also exist in the covered *process* steps of the content lifecycle. The concept of ECM covers all phases, from creating and capturing to storing and retrieving, editing and reviewing, and retaining and deleting the information (Smith and McKeen 2003), whereas research portals primarily cover the storage and retrieval of contents. Research portals can significantly reduce the effort required in the search for knowledge assets because of structured–often visual–representation (Eppler and Burkhard 2007). The *technology* dimension of ECM is also very wide and covers many types of systems (Grahlmann et al. 2010), while research portal technologies are primarily covered by (web) content management and some collaboration features (Becker et al. 2012). Research portals provide a general overview of the involved parties, research topics, and achieved results in an effort to emphasize existing mutual relationships that can be geographic, organizational, financial, or causal.

Concluding, information portals play an important role in ECM in general, and research portals are one particular type of information portals.

yourResearchPortal.com

Like in ECM, research portals have a wide range of systems with various sets of functionalities and approaches to structuring and storing the content entries. The example in this chapter is based on yourResearchPortal.com, a platform capable of generating and maintaining arbitrary research portals. Using this platform reduces the effort and overhead required in creating domain-specific research portals, as all are set up on the same foundation (Becker et al. 2010a). The central entity of the platform is the *research result* (Table 1), which describes the research and represents the content that is documented in the portal.

The problem of comparability of contents in the system is solved by introducing ideas from the area of business intelligence. In particular, these ideas help to define the dimensions for the classification of entities in the portal. The application of a single classification schema throughout a portal allows multi-dimensional analyses

Table 1 Attributes of an exemplary *research result*

Attribute	Type	Cardinality
Internal identifier	String	One
URI	String	One
Result title	Multi-language string	One per language
Result description	Multi-language string	One per language
Topic specific dimensions	Various types	One
Publication	Typed link	Many per type
Organization	Typed link	Many per type
Project	Typed link	Many per type
Person	Typed link	Many per type

of the research information gained in the portal to be conducted. However, yourResearchPortal.com also includes large, unstructured text fields to be used in the description of research results, projects, and organizations, which descriptions are prone to semantic ambiguities that are expensive to eliminate. The approach presented in this chapter can be seen as a development that augments those large, unstructured textual descriptions through the use of semantic standards.

Standardization in CMS at the Example of Research Portals

This section presents the conceptual specification of our approach as the concept of semantic standardization is applied to a research portal. However, research portals are only one application scenario, and the approach introduced here can also be applied to similar ECM scenarios. The approach consists of two main concepts: the research portal structure definition and the semantic standardization definition, which are linked (Fig. 1). These two concepts allow for an individual definition of a concrete portal structure that is based on a given application scenario and for a context-based specification of semantic standardization conventions.

Figure 1 illustrates the suggested structure in form of an entity relationship model (ERM) (Chen 1976). The central element of the conceptual basis for the specification of the research portal structure is the *Research Entity*, which subsumes core entities that represent the research environment (e.g., *Researcher*, *Project*, and *Organization*) and the result entities that cover the outcomes of research activities (e.g., *Publication* and *Research Result*). Research entities may also represent other concepts (e.g., patents, products, goals, missions, and topics). In general, it is important to group similar items, where each of these groups contains one type of entity. As the semantic standardization aims to describe content, each defined entity type (e.g., *Project*) has its own semantically standardized properties. Research entities can be linked together to build an *Entity*

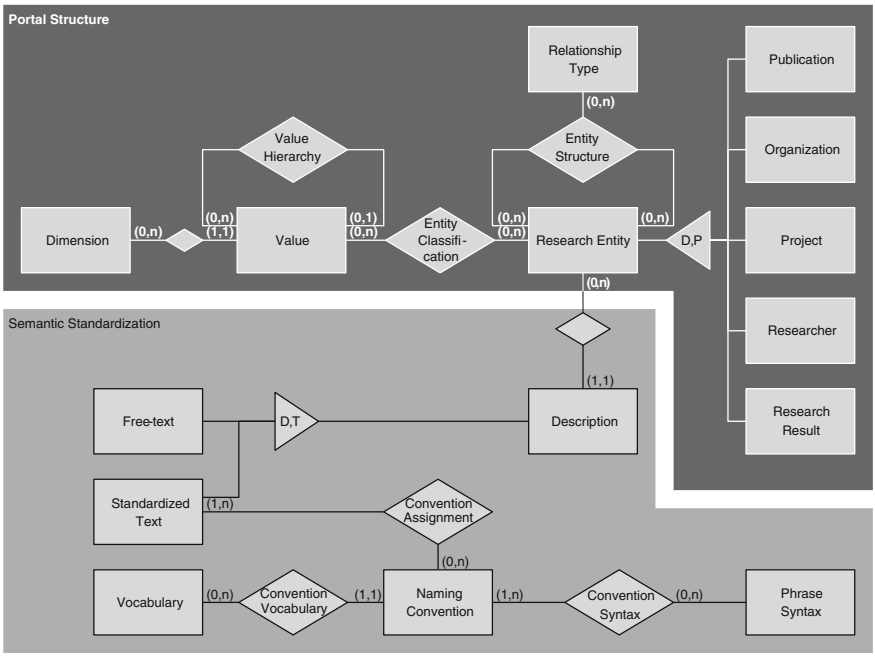

Fig. 1 Conceptual specification of the approach. It is displayed by an ERM with entities and their relationships. Rectangles represent entities and rhombuses their relationships. Entities can be specialized or generalized, which is indicated by a triangular shape.

Structure, and every relationship has a concrete *Relationship Type*, such as "is author of," "is part of," and/or "is result of".

We also borrow from Knackstedt et al. (2009) the concept of *Entity Classification*. Multiple *Dimensions* (e.g., type of project) can be defined that subsume the *Values* (e.g., type: funded research project) aligned in *Value Hierarchies* (e.g., funded research project > locally funded research project). The classification of research entities occurs by linking an entity to one or more values of a dimension. The definition of such dimensions allows the contents to be filtered while conducting multidimensional analyses of information accumulated in research entities and their structures.

It is important that a research portal provides research entities with textual *Descriptions* (e.g., "state the aim of the project") that represent natural-language research information. Our approach provides a way to standardize (or restrict) the semantics of these descriptions. For this purpose, we introduce the concept of a *Standardized Text* (Fig. 1) as a specialized description. As we contend that not every description can be semantically standardized, we also provide the construct of a *Free-text* for a semantically unrestricted description. The semantic standardization of a description is carried out by assigning one or more *Naming*

Conventions to a description. The convention itself consists of two main components: a specific *Vocabulary* and one or more definitions of the *Phrase Syntax*. Thus, we are able to restrict the applicable grammar of a description by controlling its main components' lexicon and syntax. (See Delfmann et al. (2009) for details on this semantic standardization approach in the context of conceptual models.) Here, we make the phrase syntax specification flexible in order to allow for both highly concrete, but also more general specifications. An example of the former is "<verb, present simple> <noun, singular> ," and examples of the latter are "nominal phrase" and "affirmative present tense phrase." These phrase-structure specifications must be compatible to the linguistic parsers/taggers applied in the validation process. Linguistic parsers and taggers split the user input into single phrases and analyze its grammar. Based on this analysis, the phrase is tested to determine whether it complies with the defined rules for the given input field. We use syntax restrictions to control the granularity of descriptions. For example, if a goal must be stated as a single nominal phrase, the goal must be precisely explicated.

The conceptual foundation of our approach must be individually customized based on a specific application scenario of the research portal to be developed. This effort includes the concrete definition of existing research entities, allowed relationships, and their types. The same applies to transferring the approach to ECM, as the relevant entities must be identified. If needed, additional data fields, dimensions for classification, and values must be specified as well. These dimensions and fields must fit the entities in order to provide a suitable description of the underlying contents and to make these contents traceable. For example, we suggest that the reference model for research portals (Knackstedt et al. 2009) may be a good starting point for this task.

For the purposes of semantic standardization, a portal customization includes the definition of one or more applicable vocabularies (i.e., repositories of allowed terms, accompanied by meta-information) and the definition of allowable phrase structures. Both must fit the contents of the portal. For vocabularies, general-purpose repositories like WordNet (Fellbaum 1998) or the literature of the academic discipline might be a good starting point, depending on the concreteness of a standardized text. For allowable phrase structures, basic natural-language phrase definitions could be a basis on which to build.

Application Example

We demonstrate the application of our approach using the example of design science information systems research (March and Smith 1995). A specific research portal for collecting research results that follow the design science paradigm (a process for developing IT) is designed. As all contents in this portal have in common that they are design science, all entities are of the same type. Therefore, the portal can be customized to this type of content, and semantically standardized

descriptions of the contents can take design science into consideration. The goal of this example is to show that, given a specific scenario, customization of a research portal's structure and semantic standardization for this scenario are feasible. We analyze a research process proposed for design science research and derive the structure and semantic standardization of a portal that addresses research that follows this paradigm. Thus, we configure a research portal that suits the needs of the design science research dissemination more than a general-purpose research portal would. The research portal is customized to fit this specific context and to hold contents of only this type, showing the possibilities of semantic standardization. We choose this research paradigm as an example, but analogous customizations are feasible for other application scenarios (e.g., paradigms and disciplines) and types of content.

Peffers et al. 's (2007) design science research process (in the following, DSRP) used in this example for semantic standardization is a reference process model. It was inspired by a number of influential literature positions on design science from the past twenty-five years (e.g. Archer 1984; Hevner et al. 2004; Nunamaker et al. 1990). In contrast to exploratory research, the central purpose of which is to explore and explain phenomena (Nunamaker et al. 1990), design science is a research approach that seeks to solve problems in science by designing and evaluating IT solutions. We argue that the DSRP is a good example of process documentation, as it can be clearly structured in a variety of activities, each represented as an entity.

Based upon the structure and discussion of the DSRP activities, we derive research entities and their descriptions in both standardized and free-text form, showing exemplarily the design and fitting process for a portal customized to its contents based on an existing model. This customization is done similarly in all other contexts. Figure 2 shows how research entities are linked to the corresponding concepts of DSRP and how we associate descriptions to research entities.

One goal of developing the DSRP was to "provide a mental model for presenting and evaluating design science research in information systems" (Peffers et al. 2007). The model is meant to give design science researchers a predefined structure and guidelines to follow, so they can structure their publications and presentations accordingly. Thus, we establish the research entity *Research Process* as a central result construct in the portal structure. When researchers present their design science research, they talk about the research process, and this entity acts as a container for the more detailed entities that are linked to that container. The DSRP consists of six activities, each of which we analyze in order to determine which research entities with which descriptions would document these activities appropriately.

From the activity of problem identification and motivation, we derive the research entity *Problem Definition*. Here, researchers define the problem (Description) and motivation (Importance) using free text. As "it may be useful to atomize the problem conceptually" (Peffers et al. 2007), these descriptions may each have its own structure, so we do not seek to restrict researchers too much by introducing semantic standardization for this research entity. In our opinion, a

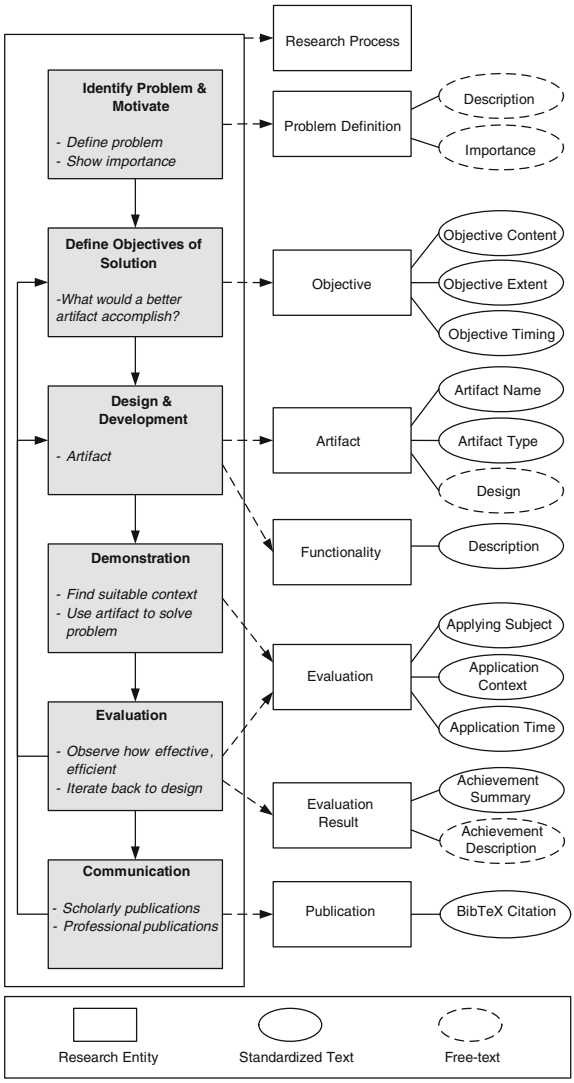

Fig. 2 Deriving research portal structure and semantic standardization from the DSRP

DSRP has exactly one problem definition, although it is possible that the same problem definition triggers more than one research process, as multiple solutions can address the same issue.

The research entity *Objective* documents the activity "Define Objectives of a Solution"; that is, it represents a desired property (state) of a solution that is to be achieved in the DSRP. Based on goal management in controlling literature, we divide the objective into three main components, which we think can be semantically standardized. First, *Objective Content* states what exactly is to be achieved, using nominal phases (e.g., "Increase of performance") or affirmative present-

tense statements (e.g., "Wireless communication is possible"). The phases and statements are defined using the *Naming Convention* for *Standardized Texts* introduced in Fig. 1. Then, *Objective Extent* describes how much of the goal content is to be achieved. This information is explicated using a list of adjectives that represent the extent. Finally, *Objective Timing* states when the goal is to be achieved. This description field can be standardized to include date/time values.

Based on the activity of artifact design and development, we derive two interrelated research entities, *Artifact* and *Functionality*. An artifact is characterized by an identifying *Artifact Name*, standardized as a nominal phrase, that supports its autonomous character. Farther on, artifacts are identified as a concrete *Artifact Type*, a description that can also be semantically standardized. For example, Hevner et al. (2004) restrict the artifact type list to four: construct, model, method, and instantiation. Thus, this field is realized as a single-choice selection list. Finally, for each artifact, the *Artifact Design* is described in terms of its inner structure (architecture). As research portals do not accumulate all accessible knowledge but point instead to original sources (Vail 1999; Wexler 2001), the design description should have an aggregated rather than an extensive form. Nevertheless, we do not see a semantic standardization as feasible for this issue. Therefore, the description of the artifact design is modeled as free text.

Each artifact is further characterized by at least one research entity, *Functionality*, the dynamic counterpart to the more structural aspect of an artifact design (architecture). The desired features of the artifact should contribute to achieving the objectives. We believe functionality descriptions can be semantically standardized based on nominal phrases.

From the two activities of demonstration and evaluation, we derive only one research entity, *Evaluation*, as neither activity is autonomous and as each depends on the other. A demonstration of an artifact application with no critical analysis of its contribution to the objectives merely shows that an artifact *can* be applied but not that it solves the problem by reaching the objectives. Evaluation without a demonstration is not possible, as without the knowledge that an artifact achieves the objective content, we cannot measure the extent of objective achievement. If more than one artifact is developed in a DSRP, each must be demonstrated and evaluated, although simultaneous evaluation can be conducted for multiple artifacts (Fig. 3).

The research entity *Evaluation* is characterized by three semantically standardized descriptions: The *Applying Subject* is a single nominal phrase that denotes the person or group of persons who applies the artifact. *Application Context* describes the particular purpose of the application (i.e., it answers the question "why does the subject apply the artifact?") by means of a single nominal phrase; thus, the application context is a concrete instantiation of the general problem definition that the applying subject faces. *Application Time* denotes when the application took place.

Based on the evaluation, we derive the entity *Evaluation Result*, which is directly related to one of the previously defined objectives and to a concrete evaluation. An evaluation result describes to what extent an objective was

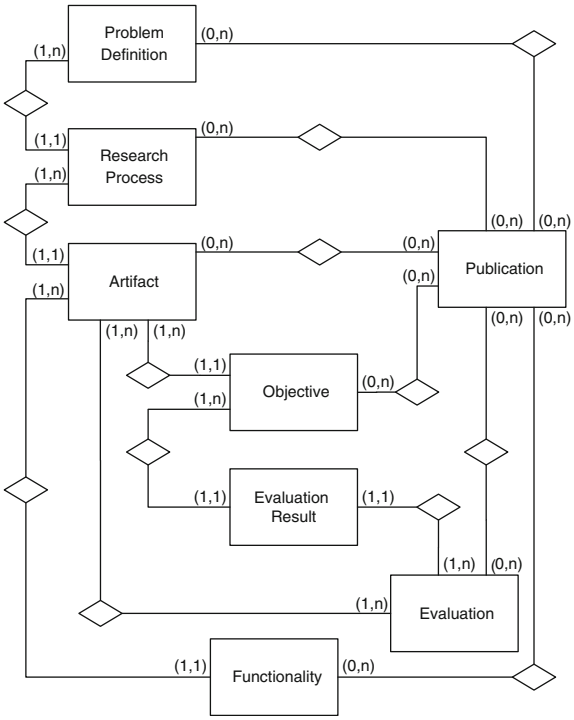

Fig. 3 Relations between research entities based on DSRP

achieved in the evaluation using two characterizing descriptions: a semantically standardized *Achievement Summary*, which is a brief statement about the extent of objective achievement, and a free-text *Achievement Description* for additional explanations.

The last activity in the nominal DSRP is communication of the conducted research to the research and professional communities. From this activity, we derive the research entity *Publication*, whose description is standardized using a *BibTeX Citation* (Patashnik 1988). We chose BibTeX, as its use is widespread in the research community, and it can be mapped to other notations using accessible tools. BibText is a standardized textual format for exchanging information on publications, and with the help of BibTex, information like Title, Authors, Editors, and Publishers can be encoded and exchanged. Researchers are prompted to communicate "the problem and its importance, the artifact, its utility and novelty, the rigor of its design, and its effectiveness" (Peffers et al. 2007), that is, the DSRP as a whole and the outcomes of individual activities. To this end, we allow publications to be related to all derived research entities (Fig. 3).

To improve comprehensibility, we present the structure of the entities we have derived separately in Fig. 3. The ERM also represents the design science research process, that is, our example case. It is an alternative perspective of the contents described in Fig. 2, and it helps to clarify the relationships between the entities.

This presentation also shows how such a customized portal could be implemented. In the model we refrain from depicting concrete *Relationship Types* (i.e., their names), as presenting them would reduce the model's readability. For the sake of clarity and focused presentation, we also refrain from deriving dimensions and defining general vocabulary.

Semantically Standardized Entries

To demonstrate the practical feasibility of this derived research portal structure and semantic standardization, we apply the derived structure to describe an exemplary instance of design science research. The following discussion describes one entry of such a portal and shows how this entry would appear in the customized portal. The goal is to describe every item (in this case, fitting design science research projects) in the demonstrated way in order to find and compare the contents and use the captured knowledge. For the purpose of such an exemplary demonstration, we picked up the research process used in designing *yourResearchPortal.com* based on Becker et al. (2010a). (The authors of this chapter also participated in that research process.) See Table 2 for details.

The example shows the practical applicability of the structure and semantic restrictions derived from DSRP. All descriptions (except those that reference time) could be found in the source publication (Becker et al. 2010a) and are expressed using the given structure. Deciding on semantically standardized descriptions like objectives and functionalities was challenging, as one has to build a mental model of the conducted research based on the accessible documentation and memorized experiences. However, in our opinion, doing so enhanced the quality of representation, as statements should be precise and should comply with semantic restrictions. Even though the phrase structure specifications are largely unrestrictive (e.g., "nominal phrase"), they allow the granularity of descriptions to be controlled. For example, the process of specifying the objectives as single affirmative present-tense statements, along with their expected extent in the form of adjectives, seems to be flexible enough to allow convenient description but is restrictive enough to impact the granularity and quality. In this example, we do not make excessive use of lexical conventions, as we cannot identify a domain vocabulary for design science research, although identification of such a vocabulary should be possible for research portals that are organized around a certain narrow topic (e.g., medical science, biology, or business intelligence).

Summarizing, the derived portal definition forces the description of the content item to be structured, explicit, and compact, and a direct relationship to the nominal DSRP process could be established. However, the derived structure and restrictions made the task of describing a research process more time-consuming, as simple data reuse techniques (e.g., copy and paste) are generally not applicable.

Table 2 Standardized description of the DSRP of the item *yourResearchPortal.com* (Descriptions that are not semantically standardized are written in italics.)

Research entity/ description	Contents (phrase syntax)
Problem definition	
Description	*Research portals help to countervail the disadvantages of specialization in research. The creation and maintenance of a research portal requires not only domain knowledge but also thorough IT skills.*
Importance	*Enabling IT-unskilled researchers to create functional research portals is required for a widespread application of research portals.*
Objective 1	
Objective content	Researchers are able to generate research portals. (*affirmative present-tense statement*)
Objective extent	Easy, fast (*list of adjectives*)
Objective timing	N/a (*date/time value*)
Objective 2	
Objective content	Generated research portals realize five introduced core functions. (*affirmative present-tense statement*)
Objective extent	Full (*list of adjectives*)
Objective timing	N/a (*date/time value*)
Artifact	
Artifact name	yourResearchPortal.com (*nominal phrase*)
Artifact type	Instantiation (*noun; restricted selection*)
Design	*The system consists of two main components. The data administration component is realized using the CMS Drupal. The data analysis component is realized using the OLAP engine Mondrian. Both components operate on the same database structure and are integrated in one GUI.*
Functionality 1	
Description	Easy and fast generation of research portals (*nominal phrase*)
Functionality 2	
Description	Maintenance of multiple portals on one site (*nominal phrase*)
Functionality 3	
Description	Multidimensional analyses (*nominal phrase*)
Evaluation	
Applying subject	Authors (*nominal phrase*)
Application context	Creation and maintenance of a research portal for service science (*nominal phrase*)
Application time	N/a (*date/time value*)
Evaluation result 1	
Achievement summary	Full (*adjective; restricted selection*)
Achievement Description	*Easy and fast generation of research portals is possible "at the push of a button"*
Evaluation result 2	
Achievement summary	Partial (*adjective; restricted selection*)
Achievement description	*The core functions one to four are fully supported. The fifth core function is partially supported. Better discussion support is needed.*

(continued)

Table 2 (continued)

Research entity/ description	Contents (phrase syntax)
Publication	

BibTeX citation	`@inproceedings{Becker2010,`
	`author = {Becker, J. and Knackstedt, R. and Lis, L. and Stein, A.},`
	`title = {Entwicklung und Anwendung eines Internetwerkzeugs zur Generierung von Forschungsportalen},`
	`year = {2010},`
	`booktitle = {Multikonferenz Wirtschaftsinformatik (MKWI 2010)},`
	`note = {Göttingen}`
	`}`

Discussion and Outlook

The work presented in this chapter addresses the problem of ensuring consistency and comparability of content. We seek to solve this problem in the context of research content using portals customized to individual application scenarios. To this end, we propose a conceptual specification of a generic portal structure with an enhancement that allows for semantic standardization of textual contents. This conceptual basis must be customized for a given application scenario by defining the specific portal structure and concrete semantic standardization restrictions. We demonstrate such a customization for a research portal that focuses on design science and show how research information could be represented in this customized portal by describing an exemplary research process.

We conclude that our approach has the potential to increase the consistency and comparability of research dissemination with research portals. This approach can be realized by an individually customizable portal structure that reflects the nature of a specific application scenario better than generic structures do, and a semantic standardization of textual descriptions that forces them to be precise and compact and to use the vocabulary of the domain. Using consistent descriptions and enabling stored contents to be compared, our approach is also appropriate and similarly advantageous for use in the context of ECM.

On the other hand, our approach requires more effort in the design phase of a portal and during the description of research entities than generic ones do. We argue that these higher costs result in a higher-quality content representation, but this assumption requires thorough evaluation. Therefore, we are currently working on an implementation of the presented approach in a system. We base the system on a common CMS that supports a flexible definition of content types (research entities and descriptions). We extend the system by allowing semantically standardized

fields to be specified and binding linguistic tools for on-the-fly data validation. Finally, with a completed implementation we will be able to conduct empirical analysis on the cost-benefit ratio of our approach in real life portal settings. We expect the presented concept also to be applicable to ECM, as we have already used a generic CMS for the prototypical implementation. As long as the context can be grouped into homogeneous groups, the fields for a semantic description can be identified for each type of content. The other differences between ECM and research portals—like the scope on the enterprise level, the covering of the whole content lifecycle, and the technologies used—should make no difference.

Future research should investigate the compatibility of our work with automated data collection approaches like data harvesting (Arms et al. 2003; Ortyl and Pfingstl 2004). This effort might be particularly advantageous as it relates to the bibliographic aspect of the approach. Another promising research effort would be the semantic standardization of large textual fields, incorporating multiple sentences.

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Part III
Examples and Cases

The Knowledge Garden and Content Management at J.D. Edwards

Judy E. Scott

Abstract From 1995 to 2003, J.D. Edwards instituted three innovative approaches to managing knowledge and content. The evolution of each started with a grass-roots team effort and grew to become an institutionalized enterprise application. With limited resources, J.D. Edwards built a global website community, a sophisticated intranet/extranet called the Knowledge Garden®, and a content management application (called Content Manager) that enabled the company to reuse multilingual technical documents drawn from a "single source" location.

Knowledge Management Efforts at J.D. Edwards, 1995–2003

In 2003, J.D. Edwards & Company (JDE), based in Denver, Colorado, had been in business for twenty-five years and nearly 5,000 employees served more than 6,000 customers in seventy-eight sales and consulting offices around the world. Annual revenues from enterprise software licenses and integration services totaled roughly $1 billion. JDE's software and services enabled companies to conduct collaborative commerce with their suppliers, customers and other business partners. In August 2003, JDE merged with PeopleSoft, which was acquired by Oracle in 2005.

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The Beginning, 1995

In 1995, JDE's 2,500 employees in forty global locations were finding it increasingly difficult to stay current on product lines, corporate policies, benefit information, key competitive issues, job openings, and company news. Hardcopy employee resource manuals, which were often out of date soon after publication because they took 30–45 days to assemble and distribute, were not standardized and often existed in multiple versions, so locating the latest and official corporate answer to an issue or policy was cumbersome. In short, the company needed new, faster, and more efficient ways to communicate with its employees and customers in order to keep pace with the continual changes in JDE and its competitive environment. Around that time, innovative organizations like JDE became aware of the Internet and its potential as a marketing channel and as a means to house organizational knowledge (Scott 1998).

The Conclusion, 2003

By 2003, JDE had three full-blown knowledge management (KM) systems:

- The Knowledge Garden, JDE's intranet/extranet, contained 1.3 million documents, and some 140 people published 250 new documents every day. The system contained 85 custom-built applications, providing global access to more than 6,000 customers, more than 2,000 business partners, and nearly 5,000 employees.
- Content Manager, part of JDE's five collaborative enterprise solutions, permitted the company to release its ninety internal manuals simultaneously in multiple languages. Some ninety customers also used Content Manager to create custom training and documentation.
- Its global website community, consisting of www.jdedwards.com and JDE international websites, rolled out new versions in December 2001, powered by content management software. By February 2002, the websites were attracting more than million page visits per month.

While few organizations have been able to assess the impact of investing in tools for managing organizational knowledge, JDE has ascertained that its Knowledge Garden reaped an 1,800 % return on investment over three years, that its Content Manager increased revenues by over $10 million dollars per year, and that its global website community generated thousands of sales leads and more than million page impressions per month. By 2003 the three KM efforts shared an enterprise vision and common taxonomy.

The Challenges in the Middle Years, from 1995–2003

JDE achieved these improvements even though its content management goals had been undefined for years, its KM teams were under-staffed, and the company lacked a clear direction for its KM efforts. Some projects had been abandoned because of lack of enterprise buy-in and funding. Others survived only because of a team's perseverance such as when the Knowledge Garden team gained approval in 1998 to build Knowledge Garden 2.0 using Microsoft's SiteServer 3.0. On the other hand, the web team spent four years drafting multiple business cases for purchasing a content management tool for the new international websites and for Knowledge Garden 3.0. Seen as progressive, the web team encountered organizational resistance to change. The team struggled to introduce new ways of writing, editing, and designing content and reaching customers and business partners, yet it had no authority to enforce content lifecycle management. As a result, it developed an organizational structure that encouraged more than 140 employees to take ownership of their own content, which required training and motivating both the authors and their managers to shoulder new responsibilities. Human Resources had to be educated about hybrid job roles and as to why web-based responsibilities should be included in job descriptions and compensation plans.

The Knowledge Garden, which contained 1.3 million documents by 2003, needed continual weeding, and searches often yielded poor hits, as no one was accountable for content quality or for deleting old content, so renegade sites developed quickly. Because there were no metadata standards that published items had to use and no enterprise vision for web content, the websites' designs were inconsistent, and they all "felt" different. As a result, publishing policies, taxonomy design, and website architecture became battlegrounds for organizational and political conflicts.

In the next sections, we analyze how these challenges were met.

JDE's Knowledge Management Initiatives

We summarize the technical and organizational evolutions of the KM initiatives at JDE using Damsgaard and Scheepers' (1999, 2000) four-stage interpretation of the Nolan Stage Model as the framework (Nolan 1973, 1979). Although we extend Damsgaard and Scheepers' model from intranets to websites, portals, and business software applications, we do not attempt to validate the model; we simply use it as a framework.

The four stages of the model are initiation, contagion, control and integration. During the *initiation* stage, champions begin a project and look for a sponsor to provide resources and organizational support. If a sponsor is found, the project proceeds to the *contagion* stage, during which the technology experiences

widespread adoption. However, a crisis develops if the technology spreads out of control, so during the *control* stage, the focus is on bringing the technology under control. An example of such control is when management improves an intranet's search capability by limiting the number of documents and deleting out-of-date information. During the *integration* stage, the technology becomes institutionalized.

Table 1 shows that, technically, JDE's three projects tracked fairly closely with the predictions in the stage model. All three projects initially focused on publishing, with early efforts involving static web pages built with HTML and manual editing processes. However, the result was a "branding and promotion bottleneck" in which, for example, it took the four-person web team three months to "re-skin" a single dot-com website with a new look and feel. (Eight years later, re-skinning up to fifteen websites could be accomplished in less than a month via template-based publishing.) Early on, as predicted by the model, the solutions were not integrated, but by 2003 the technologies had been significantly updated and integrated. For example, JDE built central controls for website design for all fifteen local websites that shared six sets of common templates, had disaster recovery, and dispersed server farms, mirroring, offsite storage, and caching for increased speed of web page delivery.

Table 2 shows that, organizationally, all three projects also tracked model predictions, with all beginning as grassroots efforts and eventually gaining executive sponsorship after "technology evangelists" communicated their vision. JDE

Table 1 Evolution of KM technologies at JDE

Stages	Initiation	Contagion	Control	Integration
Web	HTML Netscape	HTML and Java Microsoft FrontPage Netscape and Internet Explorer Microsoft Windows NT Server 4.0	Microsoft FrontPage Windows NT Server, replication, staging and production environment Annuncio	V6.04 Vignette (customized) Autonomy search Aprimo
Knowledge Garden	HTML Netscape	Microsoft FrontPage, Internet Explorer, Microsoft Windows NT Server 4.0	Microsoft FrontPage Site Server 3.0, SQL Server, System Management Server, Visual Studio, Windows NT Server 4.0, Internet Information Server	V6.04 Vignette (customized) Tivoli Autonomy search Centralized control of design via common templates
Content Manager	Interleaf 2 RS6000 AIX IBM servers	Content Manager™ Windows NT SQL repository Client server	Content Manager Customer released as V1.0	Content Manager Shared taxonomy enables information passing to Knowledge Garden V3.0

Table 2 Evolution of the KM organization at JDE

Stages	Initiation	Contagion	Control	Integration
Web	Executive support 4-person web team Effort begins in marketing Outreach to subject matter experts	International offices 8-person web team Search for new content management strategy	Business case for content management tool approved 12-member cross-functional team spent 6 months designing system and taxonomy standards	4-member core team with decentralized publishing (20 + domestic and international) Dedicated maintenance team
Knowledge Garden	Grassroots effort gained executive support One-day training for users and knowledge authors Evangelism effort in field offices	Initial design standards developed and enforced Governance via author roles, coordinators, KRAs IT challenges	System crash motivates budget approval and plans for new governance structure	Top-down cross-functional executive team defined strategy and selected core team to drive adoption New web governance framework
Content Manager	35 technical authors Only professional authors can use the tool Output is static (.pdf)	Non-technical authors adopt Customer demand for customizable, web-based solution	Content can be decentralized for custom training development and for consultancies Output is customizable	Becomes a profitable, revenue-generating product 90 customers have the product

was an early adopter of many new commercial knowledge-enabling technologies, but management believes success came from the team structure and governance models as well as the tools. The cross-functional teams struggled to maintain control of content by assigning process owners, setting standards, and institutionalizing roles.

Lessons Learned

By combining the predictions from the stage models with JDE's managerial actions, we arrived at twelve lessons related to managing the evolution of KM initiatives. Table 3 summarizes these lessons by stage.

Table 3 Lessons learned

Stage	JDE's actions	Lessons for other organizations
Initiation	An individual with a vision for web-based KM hired personnel for a web team and gained management support	1. Gain executive support. A technology evangelist or champion needs to find sponsorship
	Implemented a single source strategy for technical documentation, which evolved into Content Manager	2. Reuse technical documentation. Implement a single source strategy
Contagion	Established author roles to define content ownership and facilitate content growth	3. Establish content ownership early. Clear roles for managing content are the key to quality and are needed to support growth
	Developed user enthusiasm by addressing user requirements via "storyboards"	4. Align each technical initiative to revenue-generating business processes. Encourage widespread user adoption
	Established design standards for meta-data, document templates, interaction design and navigation taxonomy	5. Establish and leverage standards. Plan for sustainability
Control	Needed perseverance with business cases, as sponsorship varied with champion and top management turnover	6. Persevere to keep resources available. Sponsorship needs to be ongoing
	Implemented a new technology infra-structure to automate version control, content expiration and workflow	7. Replace outgrown technology. Growth in content volume requires control
	Created a new web governance framework (see Fig. 1)	8. Replace outgrown governance. Editorial workflow ensures quality content; control mechanisms require continual updating
Integration	10 senior managers representing all departments defined enterprise vision and strategy	9. Develop and operationalize an enterprise vision. Use a cross-functional executive team
	Collaborated across KM projects to transfer knowledge and experience, and to take advantage of commonality across projects	10. Reuse and extend organizational knowledge. Transfer knowledge, expertise and experience across KM projects
	Updated the metadata for Web, Knowledge Garden, and Content Manager dynamically, numerically, and at the enterprise level	11. Replace static with dynamic metadata. Enterprise vision and numeric metadata are needed because of constantly changing terminology
	Certified authors to publish, with formal job description to be benchmarked by human resources	12. Certify authors and formalize job descriptions. These processes will help to institutionalize KM

Lessons for the Initiation Stage

Two lessons apply to the initiation stage: gain executive support and reuse technical documentation.

Lesson 1: Gain Executive Support

In September 1995, with the support of company founder and CEO Ed McVaney, a technology evangelist in marketing hired the initial "web team" of four members. Three months later, the team used static HTML to launch JDE's first external website. It was developed as a marketing tool with three goals in mind: to sell software, support customers, and recruit staff. An eight-person Knowledge Resources Strategies team was assembled in the marketing group (including original dot-com team members) that, working with HTML, rolled out the first intranet, Knowledge Garden 1.0, in November 1996. Like many early internal websites, initial versions of the Knowledge Garden were designed around corporate departmental structures. Later, the Web team learned the importance of designing site content around user needs.

Early on, the Knowledge Garden provided access via a static home page to ten information categories: people, careers and benefits, industry, products and solutions, events, news, library, worldwide customer support, departments and area offices. Using this simple taxonomy, employees could access all company information online, including product updates, technical messages and issues, training sessions, calendars, job descriptions and postings, competitive information and analyst reports, product information and business forms.

In the initiation stage, the champions for each project found an executive sponsor who gave them the top-level support they needed for broad adoption. However, there was no enterprise vision for managing content, which resulted in duplicate efforts, extra cost, and morale issues that reduced productivity. Over time, though, these issues were resolved through perseverance and improved coordination.

Lesson 2: Reuse Documentation with a Single Source Strategy

In 1995 VP of Global Content Management Ben Martin launched a single-source strategy for technical publications. Sentences and paragraphs used in technical publications were treated as "objects" that reside in one place and can be dynamically assembled. This implementation was the forerunner of Content Manager, which was launched in 2000. Until the early 1990s, technical documentation was only in printed form or help files, but by 1992 small, frequent text changes were triggering multilingual content management nightmares that spanned software modules and versions across all delivery channels. JDE needed a

cost-effective way to write documentation once and reuse it many times, in many languages and forms distributed via many channels—help files, CD-ROMs, web-based documentation, training guides, and user guides.

In November 1992, JDE released a Request for Information for a publications application and in 1995 installed Interleaf, a commercial document management system for a total of $2.9 million, for hardware, software and consulting. In the following year, International Data Corporation assessed the system and uncovered a 270 % ROI in Interleaf's first year of use, despite the system's heavy customization. The study found that the number of manuals had increased 175 %, while JDE's staff grew by only 87 %, resulting in a $2.1 million savings from employment of twenty-one fewer people (Campbell 1997). Another benefit was the decreased development time, as IS time fell from 10 % to 0, for a savings of $873,600. In addition, JDE saved $1.7 million because translation could be completed in-house, for a total savings of $4.7 million.

In 1998 JDE decided to develop its own toolset for internal use and to give customers a tool to reduce costs when translating content into different languages. The result, Content Manager, contained 70 user guides and end-user training material that was "chunked" for reuse. This single-source tool gave customers a knowledge base they could customize by blending their own processes into the generic documents and even into the software. By early 2003, ninety customers had purchased Content Manager, generating revenue of $7.1 million for JDE. Web-based training tools and courseware added another $7.4 million. Savings also included $300,000 a year in internal costs for infrastructure, licensing savings, and Open Solution savings. The in-house cost to translate and produce a book was $13,000, versus an outsourced cost of $65,000. The total in-house cost for thirty books in seven languages was $2,730,000, versus $13,650,000 if the work had been outsourced. Turnaround time dropped from 12–16 weeks to 4–6 weeks, and the cost to translate one source for all three deliverables (book, help, and training materials) was $75,000 versus $135,000 for independent translations.

Lessons for the Contagion Stage

Three lessons apply to the contagion stage: establish content ownership early, align each technical initiative to revenue-generating business processes, and establish and leverage standards.

Lesson 3: Establish Content Ownership Early

By 1998 the web team had developed and adopted new best practices. They developed new versions on a regular schedule using a software development methodology and a single-stage editorial workflow based on a new staff structure. The staff included knowledge resource coordinators, who had editorial approval of

content; analysts, who were chosen for their story-telling ability; and knowledge authors, who handled day-to-day publishing. A knowledge strategies group acted as the liaison among the staff and the IT support groups. This workflow ensured both content ownership and strong editorial control.

Lesson 4: Align Technical Initiative to a Revenue-Generating Business Process

JDE's main revenue source was selling licensed software, so the sales cycle was the logical starting place to look for process improvements. In creating profiles of key sales staff in 1997, JDE learned that the personnel responsible for taking a prospect from a qualified lead to a closed sale needed four types of information every day: information on positioning, alliances, schedules, and win/loss.

To match user needs to an information key to revenue and growth, other areas in the company adopted this research methodology, which technique came to be called a "knowledge storyboard." It positioned staff roles against information cycles, decision points, key processes, and specific documents.

The combination of user profiles, storyboards, and business processes was so successful that three employees wrote a book on the approach (Applehans et al. 1998). Several articles and case studies were also published about the Knowledge Garden in the late 1990s (e.g., Gittlen 1998; Greengard 1999; Montague Institute Review 1999; Murphy 1997; Walker 1998; Woods and Sheina 1999).

An intranet ROI case study by analyst firm IDC (Campbell 1997) concluded that the Knowledge Garden was widely used. Conservative estimates of time savings in searching for information ($4.28 million annually) and elimination of printing costs ($990,000 per year) led to an ROI of 1,811 % over three years for the Knowledge Garden alone. Other benefits included a central information repository accessed through an enterprise portal, an employee communication tool, easier access to information on demand, faster delivery of critical information to new employees, improved productivity, and online distribution that cut document delivery time in half, which resulted in the competitive advantages of faster speed to market, compressed sales cycles, faster low cost change management, enhanced corporate culture, and improved staff satisfaction.

Lesson 5: Establish and Leverage Standards

Standards accelerate development, reduce costs, and take advantage of others' work. Initial design standards were developed, leveraged and enforced to plan for future growth and to avoid having to "reinvent the wheel" in technology platforms, software, processes, metadata, document templates, support, interaction design, and navigation taxonomy. Metadata design is difficult because the design objectives for information retrieval are rarely sufficiently clear for those who implement the systems, but JDE had learned the importance of establishing and

managing enterprise-wide metadata standards to describe published information. These standards ensured consistent descriptions of data and improved the ease of browsing and retrieval.

While the three initiatives became widely adopted, they evolved by leveraging new technologies and adapting new business processes that reconciled the importance of people and culture. However, a crisis often develops in the contagion stage when the systems grow out of control. At JDE, scalability was a major problem, and the growth of new documents and the inability to purge old ones slowed the Knowledge Garden's search speed. The external websites also grew so fast that the small web team struggled to cope with its editorial tasks, and the Interleaf system that was used to manage the technical publications became inadequate. Document growth was not the only challenge. The Web and Knowledge Garden project champions had no role models, few tools, and no established best practices to follow, and few, if any, software solutions on the market fit their needs. In spring 2000, JDE launched version 4 of their external and international websites as an interim measure until they could implement a more sophisticated content management solution. The web team began work on Knowledge Garden version 2.0, which would include an extranet for business partners and more online self-help for customers. Finally, JDE began development of Content Manager.

Lessons for the Control Stage

Three lessons apply to the control stage: persevere to keep resources available, replace outgrown technology, and replace outgrown governance.

Lesson 6: Persevere to Keep Resources Available

The control stage for the KM projects at JDE occurred between 2000 and 2002. Management acknowledged that not being able to identify and purge obsolete information, along with other maintenance issues, led to the deterioration of the Knowledge Garden. The Knowledge Garden's technology infrastructure and governance structure had to be updated, which meant making further investments. In 2001, the web team resubmitted the 1997 business case for a dynamic content management tool, and four years after the originally submission, management was finally receptive; the case was approved in July. Version 5 of the external website was powered by a customized version of Vignette, launched in December 2001. Nearly twenty international websites were implemented in 2002, and by spring 2003 these websites were generating an average of sixty marketing qualified leads per month, with almost ninety in March 2003.

Lesson 7: Replace Outgrown Technology

Even while the Knowledge Garden received awards and recognition, the volume of documents and high demand from users quickly exceeded capabilities. The "My Knowledge Garden" customization was impaired by an "8:00 am bottleneck," as large numbers of users logged on simultaneously to begin their workdays. Searching was slow and frustrated users took to calling it "knowledge weed patch" and the "knowledge jungle." A system crash in 2001 established once and for all that the Knowledge Garden had outgrown its technology infrastructure. Since the crash supported the web team's business case, management approved investment in a dynamic content management tool to replace the outdated infrastructure.

Lesson 8: Replace Outgrown Governance

According to a JDE senior manager, a governance framework ensures that the organization can meet its project objectives for content and maintain them over time. Although the initial hierarchical editorial structure for the Knowledge Garden was effective in the early years, it became outmoded when the Knowledge Garden grew out of control: Knowledge resource authors submitted content to knowledge resource analysts, who checked the content and submitted it to the knowledge resource coordinators, who ensured the content was appropriate and not a duplicate of already published material and submitted it to the manager of web communications.

The initial governance model was replaced in 2002/2003 by an enterprise governance model consisting of five roles, as illustrated in Fig. 1. The new model promoted effective maintenance because the subject matter experts and content owners adhered to a periodic content review process. The web council, the decision-making body for escalation, communicated departmental goals and objectives

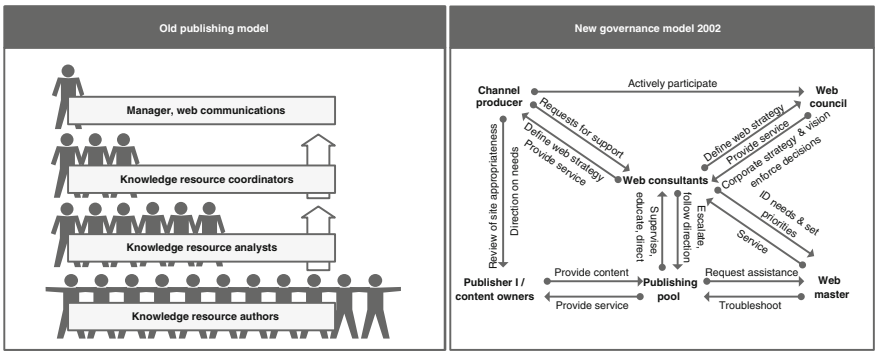

Fig. 1 Evolution of governance structure

for enterprise decisions. Channel producers who understood and represented user needs and communicated regularly with web consultants and with their target audience; web consultants researched and educated channel producers on best practices and corporate standards, understood channel producers' objectives, and identified mechanisms to support them; subject matter experts and content owners documented appropriate content based on subject matter expertise, adhered to a periodic content review process, and submitted content to a defined publisher; and web publishers submitted, tagged, and tested content for display and were responsible for online forms development, and web programming, as required.

Lessons for the Integration Stage

Four lessons apply to the integration stage: develop and operationalize an enterprise vision, reuse and extend organizational knowledge, replace static metadata with dynamic metadata, and certify authors and formalize job descriptions by HR.

Lesson 9: Develop and Operationalize an Enterprise Vision

A top-down strategy for the Knowledge Garden began when ten senior decision makers who represented each department defined the strategy, vision, and tasks, and selected a core team of forty people to set goals and drive adoption. The core team tested and helped evaluate the newest iteration of the Knowledge Garden. In this manner, the vision was made operational through continual work to ensure that people, processes, and technology were aligned in support of the vision.

Lesson 10: Reuse and Extend Organizational Knowledge

The expertise and experience the web team gained in customizing and implementing the Vignette content management package for the external.com website was reused for the internal Knowledge Garden 3.0 portal. Collaboration helped to transfer organizational knowledge and take advantage of the commonality between the two projects, including leadership, staff roles, templates, design standards, editorial processes, and metadata.

Lesson 11: Replace Static Metadata with Dynamic Metadata

Static metadata is tied one-to-one with the content it describes. A change like a new product release or a new marketing promotion launch requires a manual step to update all instances of the metadata across a website. In contrast, dynamic metadata has been abstracted one layer; since a number is used to represent a term,

when the term changes, the number does not have to change, giving the metadata a longer shelf life, providing greater flexibility, and easing the burden of site maintenance. JDE adopted this new dynamic numeric metadata approach and centralized the metadata for all three initiatives so all three drew from the same definitions and could be repurposed quickly. According to an interviewee:

> Corporate marketing terminologies ("Activera portal," "the portal," "the OneWorld® portal") are moving targets, and you cannot base static metadata on volatile corporate terminology. J.D. Edwards is less dependent on static metadata today because we use metadata now, not search, to drive personalization. We are not just dumping information into buckets as fast as we can; instead, we are trying to create something that builds in value over time. All our metadata is numeric—there's no text—so metadata can be re-purposed instantly in any language and for any audience. With only one place for content to be managed, the productivity gains can be tremendous.

A JDE senior manager explained the dynamic metadata advantage as a pre-caching personalization strategy in observing, "IT makes multiple crawls with the Autonomy search engine to create different user roles, which we cache before visitors come to the home page, and then we can dynamically assemble web pages on the fly very quickly."

Lesson 12: Certify Authors and Formalize Job Descriptions by HR to Institutionalize KM

Authors had to be certified to publish on the web and Knowledge Garden. Human Resources benchmarked certification, which became part of formal job descriptions. This process helped institutionalize KM roles in the organization. From a user's perspective, enterprise content management became seamless with the partial convergence of the Knowledge Garden, the dot-com external website, and Content Manager. Any customer who logged on to the Knowledge Garden could also access the public website in order to schedule training and then return to the extranet without needing to logon again. The customer version of the Knowledge Garden also had translation documentation created by Content Manager. Giving customers the ability to access all three in one online session strengthened JDE's brand image, built trust, and increased credibility.

Conclusion

JDE received many awards and citations for its KM best practices, which included using beta release Microsoft technology for productivity gains across its enterprise more effectively than any other organization, best use of intranet technology in the United States (both sources no longer available online); and Intranet Best Practices from Ovum Consulting (Woods and Sheina 1999). Among others, the Knowledge

Garden won the Smithsonian Laureate Award and the KMWorld Best Practice Award (Computerworld Honors 2000; Saia 1999). The JDE website won the Software Marketing Award for Best Web Marketing, the Rocky Mountains News Award in 1997, and U.S. West Web Champions Gold in 1999. Content Manager also had recognition from IDC and for best practices from the Center for Information-Development Management.

Innovative, robust taxonomy and meta-tagging in the Knowledge Garden, Web content management, and Content Manager produced the following significant savings and efficiencies:

- Savings of $4 million a year from reduced employees' search time, saving thirty minutes per week per employee.
- Average savings of $167 per support request by providing more effective online self-service to customers.
- Reduced overtime server support costs of $700/month and support hours by 40 % and increased uptime to 99+ %.
- Shortened publishing time by roughly 25 % for seventy authors.
- Reduced broken links across the site, by using dynamic content management.
- Reduced manual audit activities up to 75 % by automating workflow.
- Reduced author training time.

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Lessons Learned from Implementing Enterprise Content Management at the National Public Administration in Liechtenstein

Alexander Simons, Jan vom Brocke, Sven Lässer and Andrea Herbst

Abstract The objective of this chapter is to summarize the experiences gained from an enterprise content management (ECM) initiative at the National Public Administration (NPA) in Liechtenstein. The results are grounded in the academic literature on ECM and in qualitative data, including observations, document analyses, and semi-structured interviews, collected over a period of 19 months (March 2009 to October 2010). The chapter presents and discusses fifteen important lessons the project group learned during the implementation and customization of an ECM software package in one of the NPA's departments. These lessons include informing those who will be affected about the pros and cons of ECM early in the process, defining a transition strategy from paper to digital records, performing a content audit, and establishing ownership along the content lifecycle. The results are limited in that they were determined from a single implementation project of ECM. Nevertheless, they can assist researchers in future studies on ECM adoption, also in contexts other than public administration. In addition, public administrators are provided with ECM success factors at the organizational and departmental levels that can assist them in planning, executing, and evaluating their own ECM initiatives. The study contributes to information systems (IS) research by investigating in some depth the adoption of ECM in the public administration context.

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Introduction

Today's organizations are challenged to manage efficiently the digital information flood that is drowning their employees' desktops, email inboxes, and hard disks (Smith and McKeen 2003, p. 648). Among the emerging business challenges are the need to reduce search times, fulfill compliance requirements, and improve information quality (vom Brocke et al. 2011a, p. 475). Researchers have addressed these and related challenges in studies on document management, knowledge management, records management, and information resource management, to name but a few (Munkvold et al. 2006, pp. 86–93).

ECM, which only recently emerged in information management practice (Smith and McKeen 2003, p. 648), has been described as "integrated enterprise-wide management of the life cycles of all forms of recorded information content and their metadata, organized according to corporate taxonomies, and supported by appropriate technological and administrative infrastructures" (Munkvold et al. 2006, p. 69). As such, ECM is considered an integrated and modern approach to information management (Päivärinta and Munkvold 2005, p. 1) under which are subsumed many related concepts (vom Brocke et al. 2010, p. 2). Because content carries knowledge (Nordheim and Päivärinta 2006, p. 649), ECM also plays an important role in the establishment of organizational knowledge management. With their focus on the explicit, codified dimension of knowledge, ECM systems can substantially improve knowledge management in organizations. For example, based on Alavi and Leidner's (2001) knowledge management framework, Munkvold et al. (2006, p. 90) write that ECM can leverage an organization's knowledge storage and retrieval processes to facilitate the efficient dissemination of knowledge. However, because the human-centric processes of knowledge creation and application are not in the scope of ECM systems (Munkvold et al. 2006, p. 90), some would see the contribution of ECM as just the tip of the "knowledge iceberg." Nevertheless, with the ongoing digitization of information, this formerly small part of organizational knowledge is growing at such a rate that even the management of the iceberg's tip is difficult.

As a consequence, ECM is gaining significant attention from information and knowledge workers from various branches of trade (Päivärinta and Munkvold 2005, p. 1). However, though it has been argued that ECM is a relevant research topic (Tyrväinen et al. 2006, p. 628), empirical studies on enterprise-wide content management initiatives are lacking (Munkvold et al. 2006, p. 71). In particular, the adoption of ECM in the public administration sector has received little attention, which is surprising in view of the many challenges that governments face in the area of information and knowledge management. Patterson and Sprehe (2002) identify issues in the management of electronic records in federal agencies, including e-mail management, systems integration, and business process reengineering (pp. 308–312). Since dealing with these and related challenges has become imperative to the success of any e-Government initiative (Layne and Lee 2001, p. 122), ECM systems are increasingly finding their way into the public

administration sector. However, the challenges of ECM implementation in public administration have not been investigated in sufficient depth. As a response, this chapter summarizes and discusses the experiences gained during an ECM implementation project at the NPA in Liechtenstein. The results are grounded in the academic literature on ECM and in qualitative data, including observations, document analyses, and semi-structured interviews with project members and ECM end users, collected over a period of 19 months.

The remainder of the chapter is structured as follows. Section 'Research Background and Gap' provides the background for the research and explains the meaning of ECM in the public administration context. Section 'Study Overview' gives an overview of the study and summarizes the procedures for data collection and analysis. Section 'ECM at the NPA in Liechtenstein' presents the lessons that the NPA in Liechtenstein learned during the ECM project, which are subsequently discussed in section 'Discussion'. Section 'Summary and Outlook' concludes the chapter with a short summary, provides an outlook on the future of the ECM initiative at the NPA in Liechtenstein, and acknowledges limitations.

Research Background and Gap

The notion of ECM emerged with the new millennium (Blair 2004, p. 65). The ECM Association defines ECM as "the strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured information, wherever that information exists." (AIIM 2011). ECM is receiving considerable attention from the industry, but researchers from related disciplines have rarely explored the concept. Munkvold et al. (2003, p. 1364) claim that the academic discipline of IS "has practically ignored the concept of ECM" and Päivärinta and Munkvold (2005, p. 1) add, "beyond the current hype, few sources have reported research on actual ECM practices in organizations." Only a few studies report on the experiences gained during the implementation of ECM in a business context, and the adoption of ECM in the public administration sector has received even less attention.

It has often been claimed that government departments have little motivation to meet, much less outperform, the expectations of their customers because citizens have no real alternatives for getting the public services they need (Evans and Yen 2006, p. 208). Consequently, administrative efficiency has been seen for some time as a core issue of public administration, as has the relatively low level of service quality it offers compared to that of businesses that must deal with competition (Dinsdale 1997, p. 371). Because of increasing pressure to make government departments more sensitive to the demands of their customers and more efficient in their work practices (Pethe and Lalvani 2006, p. 635), numerous governments have significantly redesigned their structures and services over the past few years. The new opportunities provided by modern IT have played an important role in this

development, as expressed, for example, in the emergence of e-government (Mnjama and Wamukoya 2007, p. 274). It has been argued that e-government can increase the quality of government services and reduce the costs of delivering them at the same time (Evans and Yen 2006, p. 208).

With e-government, an increasing amount of information is digitized and processed by public administrations, but this advance poses new challenges in the management of electronic documents, records, and their content (e.g., text documents, forms, spreadsheets, and websites) (Johnston and Bowen 2005, p. 131). The digital information assets that federal agencies have to manage have grown not only in number but also in diversity and complexity (United States General Accounting Office 2002, p. 10). Challenges in the management of digital information in the public administration sector relate particularly to information quality (Gil-García and Pardo 2005, p. 190), storage and retrieval (Mnjama and Wamukoya 2007, p. 278), and data security (Layne and Lee 2001, p. 129). In addition, federal agencies have to comply with various legal regulations and standards (e.g., preservation)—perhaps even more than industry sectors do—because their work relies heavily on records that are required to preserve the rule of law (e.g., legislative, court, police, and prison records) (Mnjama and Wamukoya 2007, p. 275). The United States General Accounting Office (2002, p. 10) puts it as follows:

> The challenge of managing and preserving vast and rapidly growing volumes of electronic records produced by modern organizations is placing pressure on the archival community and on the information industry to develop a cost-effective long-term preservation strategy that would free electronic records of the straitjacket of proprietary file formats and software and hardware dependencies.

Because these and related problems are not completely new, they have been recognized by researchers in the contexts of document management (e.g., storage and retrieval of documents) (Klischewski 2003), content management (e.g., producing content for Web sites) (Eschenfelder 2004), and records management (e.g., preserving records) (Mnjama and Wamukoya 2007). These challenges also indicate why knowledge management, such as the sharing of codified knowledge in the pursuit of high-quality government services (Kim and Lee 2006, p. 370), is increasingly coming to the attention of public administrators (Wiig 2002, p. 224). Therefore, according to Apostolou et al. (2009), "This sector inevitably requires better management of continually changing knowledge so that public servants can effectively handle administrative tasks and deliver services to citizens" (p. 20). However, the adoption of ECM has not been investigated in sufficient depth in non-profit or governmental contexts (except for a few examples, e.g., Iverson and Burkart 2007). Studying these challenges from the viewpoint of the entire organization and assessing how they relate to and impact each other is essential in order to guide public administrators in their efforts of improving their information management capabilities. ECM presents an integrated perspective on knowledge management, information resource management, and electronic document management (Munkvold et al. 2006), and as such, it covers and extends many of the issues raised by the ongoing digitization of information. Päivärinta and Munkvold

(2005, p. 1) suggest that ECM "integrates the major issues covered in these areas [knowledge management, information resource management, and electronic document management], while also going beyond their individual and collective scopes," and Munkvold et al. (2006, p. 95) observe, "While most of the issues related to ECM initiatives can be traced back to established research areas when studied individually, the ECM concept integrates these issues in a new manner." Against this background, this chapter describes the experiences gained from an ECM implementation project at the NPA in Liechtenstein. The next section describes the procedures for data collection and analysis.

Study Overview

Field data was collected at the NPA in Liechtenstein (http://www.llv.li).[1] With an estimated population of around 35,000, the Principality of Liechtenstein is an alpine microstate in Central Europe, bordered by Switzerland and Austria (Wikipedia 2011). The capital is Vaduz, but with around 5,800 inhabitants, the biggest town in Liechtenstein is Schaan. Liechtenstein, which has the highest gross domestic product per person in the world when adjusted by purchasing power parity, is a constitutional monarchy divided into eleven municipalities (Wikipedia 2011). The NPA in Liechtenstein is organized into more than forty departments, including the Office of Environmental Protection, the Office for Foreign Affairs, the National Audit Office, and the Building and Fire Authority, that all together employ approximately 960 people (National Public Administration Liechtenstein 2012a). Many of these departments are further divided into special divisions. For example, the Office of Social Affairs operates, among others, divisions for Internal Services, Children and Youth, and Therapeutic Services (National Public Administration Liechtenstein 2012b). The NPA established e-government early, and today their electronic services are among the leaders in Europe. In 2012, Liechtenstein was ranked 14th among the world e-government development leaders in the United Nations E-Government Survey (United Nations 2012, p. 11). All of their forms and templates, which are standardized across the various departments, can be filled out electronically, and nearly 75 % of them can be handed in electronically—around the clock and online (National Public Administration Liechtenstein 2012c). In addition, application handling is efficient. For example, a request for a driver's license is usually processed within a day. The Office of Human and Administrative Resources (OHAR) is responsible for

[1] Note that this study reports the state of the ECM project at the NPA in Liechtenstein in January, 2011. Between the time that the study was conducted and when this report was written and published, some departments and offices of the NPA in Liechtenstein have been reorganized. For example, since 2012, the OHAR is no longer responsible for e-government and ECM; instead, a new dedicated department of e-Government was established for that purpose ("Fachstelle E-Government").

coordinating the development of e-government at the national level (National Public Administration Liechtenstein 2012d), so they also took the lead on the national ECM project that the researchers were allowed to observe for 19 months (March 2009 to October 2010). During that time, the researchers studied the implementation and customization of an ECM software suite at one of the NPA's offices, which was undertaken as proof of concept for a possible ECM roll-out across all departments. Multiple data sources were used in this study, including observations of workshops and meetings, document analyses (e.g., project documentation, software manuals), and semi-structured interviews. Table 1 provides an overview of the data sources.

The study began with informal interviews and meetings with stakeholders in order to set the frame for the research project. For example, in an initial meeting in March 2009 and a 90 min presentation in May 2009, the ECM project board provided the researchers with information about the ECM initiative, and the vendor introduced the ECM software to be implemented in a meeting held in July 2009. Based on these meetings, topical semi-structured interviews were conducted. During October 2009, twelve people were interviewed in interviews lasting an average of one hour. The interviewees, who were selected by the ECM project board, either belonged to the ECM project group or were ECM end users. As such, the respondents were actively involved and experienced in implementing or using an ECM system in a public administration context. The interviews covered open-ended questions on the ECM project, such as questions regarding its drivers, objectives, difficulties, and outcomes. All interviews were audio-taped and fully

Table 1 Data sources

Date	Type of data	Approximate length
2009-03-17	Initial interview with ECM project board	90 min
2009-05-27	Presentation (project overview)	90 min
2009-07-30	ECM software training	60 min
2009-10-09	Interview (project member)	60 min
2009-10-22	Five interviews (office managers, officers)	60 min each
2009-10-23	Two interviews (officers)	60 min each
2009-10-27	Four interviews (project members, office director)	60 min each
2009-11-13	Workshop (ECM project board)	90 min
2009-12-17	Presentation of interview results	150 min
2010-01-20	Workshop (alternative courses of action)	180 min
2010-03-03	Presentation (project progress)	60 min
2010-03-09	Workshop (ECM project board)	120 min
2010-04-15	Workshop (ECM project board)	120 min
2010-05-07	Workshop (ECM project board)	120 min
2010-08-19	Workshop (ECM project board)	60 min
2010-10-12	Interview (project member)	30 min
2010-10-13	Interview (project member)	30 min
2010-10-29	Interview (office director)	30 min
2010-10-20	Interview (project member)	30 min

transcribed to allow for detailed qualitative data analysis. The transcripts were sent back to the informants for approval. The software tool NVivo was used to analyze and code the data, and the informants' experiences and viewpoints were summarized and categorized by the researchers and presented to them in December 2009. On the basis of these interviews, the ECM project board and the researchers met in workshops held from January to August 2010 to develop jointly a set of guidelines on how to implement ECM in other departments in Liechtenstein. (These guidelines are not in the focus of this chapter and will be presented elsewhere.) Finally, the relevance and usefulness of the lessons learned and the guidelines were evaluated in a second interview round in October 2010. These interviews, each of which lasted approximately 30 min, were not fully transcribed, but the researchers took notes where appropriate.

ECM at the NPA in Liechtenstein

Project Summary

This section summarizes the course of the ECM project at the NPA in Liechtenstein from its initiation in early 2004 to the first implementation of an ECM software suite at one of NPA's departments during 2009 and 2010. At the most basic level, the project work can be organized into four main phases: the preliminary study, prototyping, vendor selection, and the first implementation project. The activities undertaken and the results the project team achieved during these phases are summarized in the following paragraphs.

Preliminary study. The main objective of the preliminary study was to assess the relevance of ECM for the NPA. An initial project team included representatives from the OHAR, from the department where the ECM system was later implemented, and from other offices that were selected for their strong international orientation, their close relationship to government, and their responsibilities for archiving and data security, among other criteria. In addition, external ECM consultants brought their expertise into the preliminary study, which delivered a set of information management challenges the NPA in Liechtenstein faced at that time and which were expected to be addressed by an ECM implementation. Among the project group's conclusions was that the existing IT infrastructure was fragmented, with several departments running their own systems for document and content management. While these systems had been designed to meet the departments' individual needs, they were not sufficiently integrated with each other and they caused unnecessary expenditures. In addition, standardized guidelines for the storage and retrieval of digital documents and records were not available at that time.

Prototyping. As a result, the decision was made to develop an initial ECM prototype in one of the divisions of the department that was later selected for the

first ECM implementation. The objectives were to acquire a more profound understanding of ECM, to gather first practical experiences, and to identify software requirements to support later evaluation of ECM vendors. These efforts led the project group to determine a set of potential ECM benefits for the NPA in Liechtenstein, among which were improved service quality, improved traceability and accountability, disaster recovery, savings in time and money, and location-independent, real time access to information.

Vendor selection. Building upon the results of the first two phases, particularly the identified software requirements, the ECM project board then published an international call for tenders for an ECM software package. The goals of implementing ECM at the NPA were defined and compared to the service portfolios of potential ECM vendors. These ECM objectives included improving the efficiency of information and knowledge work, increasing the transparency in working procedures, supporting the reconstruction of prior business cases and transactions, simplifying the accountability of digital information processing, identifying and eliminating weaknesses in the execution of processes, safeguarding a consistently good and secure sharing of records among departments, and improving the quality of data processing and archiving.

Implementation. After deciding on an ECM software platform, the government of Liechtenstein approved a first implementation in the division in which the prototyping had been done. The researchers were allowed to accompany this project phase in order to identify lessons at the organizational and department levels to be addressed in further ECM implementation projects in other departments. While lessons at the organizational level concern the ECM initiative as a whole, those at the department level refer to the implementation of ECM in specific departments. The lessons learned are summarized in the next section, where the informants' viewpoints and experiences are combined with the academic literature on the subject to create an overview that is grounded in both prior ECM research and current ECM practice.

Lessons Learned

Organizational-Level Lessons

At the organizational level, seven important lessons can be distinguished: develop and follow a vision for ECM; design and implement an ECM strategy; identify and monitor the objectives of ECM; develop an ECM project portfolio; clearly define and communicate the subject, scope, and purpose of the ECM initiative; continually evaluate and improve the overall ECM initiative; and establish an ECM steering board that takes care of these tasks.

Develop and follow a vision for ECM. Given the many ECM-related approaches that are currently discussed in the public administration sector (e.g., document management, records management, Web content management), the development

of an integrative vision for ECM is important to the success of any ECM initiative. A vision is generally understood as a clear and challenging picture of the future (Kaplan and Norton 2008, p. 40) that is meaningful, understandable, and inspiring (Nolan 1997, p. 123). In order for a vision to be understandable, it must be unambiguous, coherent, and clear (Nonaka 1998, p. 186). The case of the NPA in Liechtenstein made clear that an ECM vision must be both challenging and achievable, as many respondents believed that continuing calls for the entirely "paperless office" would remain unanswered in the foreseeable future. If an ECM vision is also aligned with the overall IT and e-government strategy, it has the potential to create consensus among executives, to spread positive energy to the officers, and to serve as the starting point for the overall ECM implementation.

Design and implement an ECM strategy. While it has been argued that many organizations are still taking a more tactical than strategic approach to implementing ECM (although the latter would make for more efficient processing of information) (Smith and McKeen 2003, p. 651), from the beginning, the NPA in Liechtenstein considered the implementation of ECM a long-term, strategic endeavor that would go beyond technological issues. ECM strategy development requires many capabilities and activities, including the ability to audit content, specify ECM needs, and analyze the value, cost, and effort of implementation (O'Callaghan and Smits 2005, p. 1275). The data suggest that, in particular, the evaluation and justification of ECM investments is an important (but challenging) task in ECM strategy development. While project members found it difficult to assess comprehensively the financial pros and cons of the ECM implementation, particularly at an organizational level, it was considered important to do so in order to gain governmental support and to plan and coordinate required personnel resources. The respondents also mentioned that the definition of ECM objectives was another necessary but challenging subtask of ECM strategy development.

Identify and monitor the objectives of ECM. According to vom Brocke et al. (2011b), "the understanding is still vague as to what organizations strive to gain through implementing ECM systems and what results they can expect from the same" (p. 966). Indeed, there are a great many objectives that ECM-adopting organizations can pursue, including complying with legal regulations, reducing search times, enhancing information quality, and improving communication and collaboration processes (Päivärinta and Munkvold 2005, pp. 2–3). Given this broad range of potentially relevant ECM targets, the identification of an appropriate set of ECM objectives is an important task in ECM implementation. In particular, the data suggest that the definition of ECM objectives is important to ensure that departmental ECM projects are properly aligned with the overall ECM initiative. Obviously, setting ECM objectives at an organization-wide level avoids conflicting goals among the departments, but departments have diverse task assignments and diverse needs and requirements concerning information and knowledge management. Accordingly, they should be provided with enough freedom to refine ECM objectives in a way that best matches their individual contexts. The definition of ECM objectives is also important in clarifying and operationalizing what the implementation of ECM means and does not mean for a

particular department. As such, clearly defining ECM objectives helps organizations to control expectations that may not be fulfilled in the end. Finally, respondents said that clear and balanced ECM objectives provide the ground for monitoring project progress by, for example, making it possible to break them down into key performance indicators that can be measured during the run-time of the project.

Develop an ECM project portfolio. Government departments, like business divisions in an enterprise context, have diverse information needs and working procedures, and they create and receive diverse types of documents and records. As a result, the impact of ECM implementation can differ among them significantly. In particular, it proved important at the NPA in Liechtenstein to assess both the value (i.e., expected outcomes) and the feasibility (i.e., complexity of implementation) of ECM implementation for different organizational units. To support decision-making at an organization-wide level, these measures can be used to arrange departments in an ECM project portfolio as a roadmap to the overall ECM implementation. Early ECM implementations in departments that offer high potential for optimization and low implementation complexity provide the opportunity to communicate project success early and maximize the project's acceptance among ECM end users.

Clearly define and communicate the subject, scope, and purpose of the ECM initiative. In the practice of ECM, there is a significant confusion around the meaning and boundaries of the concept. It is only recently that Hooper (2009), for example, called for an elaborate and insightful ECM definition (p. 56). In fact, given the many ECM-related concepts available in both research and practice, organizations are increasingly confused about which terminology to use (Smith and McKeen 2003, pp. 648, 657). Such confusion could also be observed in this study, where the understanding of ECM widely differed among the respondents. Such confusion can easily become an obstacle to the project work because different understandings are likely to raise different expectations that, if unfulfilled, can lead to resistance against the project. Therefore, the ECM project team in Liechtenstein conducted several seminars and workshops in which they regularly informed users about the subject, scope, and purpose of the ECM initiative.

Continually evaluate and improve the overall ECM initiative. Discussions with ECM project members from the NPA in Liechtenstein suggest that project progress should be continually monitored in order to identify and evaluate potential improvements. As such, ECM should not be considered a single implementation project but an ongoing strategic endeavor. The exchange of experiences among the different departments and the assessment of their ECM maturity appear to be important to improving the success of the overall ECM initiative. For that purpose, workshops with representatives from all departments should be conducted regularly.

Establish an ECM steering board. The tasks summarized above must be addressed at a department-independent level, for example, in the form of an ECM steering board. Representatives with both managerial and technological backgrounds and from a variety of departments should be part of an ECM steering

board that takes responsibility for supporting departments in their endeavor to implement ECM. At the NPA in Liechtenstein, representatives from government, as well as office directors, were also considered important members of an ECM steering board in order to align the ECM project with related initiatives (e.g., e-government).

Departmental-Level Lessons

Another eight lessons were categorized at the department level: gain and maintain executive support, define a strategy to transition from paper to digital records, inform users about the pros and cons of ECM, evaluate and provide required resources, perform a content audit, establish content ownership, train ECM users and champions, and establish a project group that takes care of these tasks.

Gain and maintain executive support. Top management support is probably a critical success factor for all types of IT projects (e.g., Brown and Vessey 2003, p. 66). The case of the NPA in Liechtenstein suggests that, in order to convince the top management of ECM's value, it is essential to communicate clearly its scope, objectives, benefits, and possible challenges of the ECM initiative. Committed executives can then persuade officers of the relevance and need for ECM and encourage them to use the new system in the pursuit of project milestones. As such, executive support appears to be an important precondition for successful change management in the context of ECM implementation.

Define a strategy to transition from paper to digital records. "The implementation of ECM … often represents a massive attempt to collect and digitize content (Smith and McKeen 2003)" (vom Brocke et al. 2011b, p. 971). For many government departments ECM implementation involves a change from paper to digital records. The case of the NPA in Liechtenstein confirmed the prevalence of this change and that, because some records have to be maintained for a long time (e.g., a person's dossier from his or her birth to death), managing the transition from paper to digital dossiers efficiently is particularly challenging for government departments. At the most basic level, which records will be retained in paper format and which ones will be scanned into a digital format must be determined. It is similarly important to determine who is responsible for the digitization of paper records, including the scanning and disposal of paper files and the assignment of required metadata. Even the effort required in removing paper clips can be significant in the scanning of documents. These and similar issues should be considered when assessing the necessity, practicability, and efficiency of digitizing paper records and implementing the processes required.

Inform users about the pros and cons of ECM. According to Rockley et al. (2003), "people are unwilling to change unless there is a very good reason for that change and they can see the benefits" (p. 402). In the course of the interviews, it became clear that not all the benefits that ECM promises are immediately useful to every person. For example, digitizing their paper archives can save departments storage room and money, but it may also mean an extra effort for the officers who

have to scan the paper records. If these officers cannot see the benefits of ECM, they are likely to resist the project. The data suggest that informing them about the drawbacks of ECM is as important as communicating the benefits of ECM, as knowledge of both can positively impact the acceptance of ECM. Project group members also suggested that success stories from other departments can improve the end users' perceptions of ECM's usefulness.

Evaluate and provide required resources. The implementation of ECM does not necessarily reduce workload; in fact, in some cases, it leads to extra work (e.g., scanning paper documents or defining required metadata). Therefore, additional personnel expenditures that result from an ECM implementation, such as the time required to eliminate paper archives, must be estimated properly. The implementation of ECM can also necessitate additional investments in infrastructure. For example, officers at the department under study needed a second screen to operate the new ECM system efficiently. Therefore, required personnel and infrastructure resources must be committed early to promote the staff's acceptance of ECM.

Perform a content audit. The implementation and customization of an ECM software system requires organizations to analyze the content their employees create and use as well as how they work with it (vom Brocke et al. 2011a, p. 485). In the NPA case it became apparent that government departments have diverse information needs and working procedures and that they create and receive very different types of documents and records. Therefore, it is important to determine which IT infrastructures they use to fulfill which tasks and what documents are involved in this process. In other words, a content audit (e.g., Rockley et al. 2003, p. 104) must be conducted. In particular, the data suggest that an ECM system must be properly aligned with existing working procedures because officers will not feel comfortable using it otherwise. For example, at the beginning of the ECM roll-out at the NPA in Liechtenstein, officers were unaccustomed to the system's terminology and the implemented workflows. Accordingly, software customization regarding these and similar aspects of the process is an important factor in the successful establishment of ECM.

Establish content ownership. One of the more noteworthy outcomes of a content audit is that of content ownership. Päivärinta and Munkvold (2005, p. 5) frame content ownership as "general-level understanding of who should be in charge of what in the enterprise." Smith and McKeen (2003, p. 651) see the stewardship of content as being closely connected to the content lifecycle, which "involves all of the activities required to manage the different forms of organizational content." The collected data support both conceptualizations, suggesting that content ownership in the public administration sector refers in particular to the implementation of the content lifecycle activities, such as content creation (e.g., who opens a new record), capturing (e.g., who scans the records), maintaining (e.g., who enters the required metadata), retrieving (e.g., who has the permission to access content), and retaining (e.g., who is responsible for the archiving of records). Establishing content ownership along the content lifecycle is particularly important in ensuring that officers operate the ECM system in accordance with its designated use.

Train ECM end users and champions. The success of IT systems is influenced by the usefulness and ease of use that end users perceive (Davis 1989, p. 320). Software training of end users in how to use the new software is important to enhancing their perceived ease of use, but it can also influence the employees' perception of the new system's usefulness. The study of the NPA case showed, for example, that in an effective approach to ECM user training the training manager should use department-specific records and working procedures as guiding examples and illustrate the benefits of the new ECM system throughout the training course. In addition, it was suggested that the training be conducted as close to a test phase as possible so the officers can apply the newly acquired knowledge in practice as soon as possible. Some of the officers were trained more intensively than others, which allowed them to assist and advise their colleagues in the practical use of the new ECM system. These officers, who were called "ECM super users" or "ECM champions" at the NPA, were selected because of their high intrinsic motivation to embrace ECM, among other reasons. However, ECM champions also served as counterparts for their colleagues, spread the word about ECM, and explained the benefits of the new system to the workforce. This role is in line with Burn and Robins (2003), who explain that IT champions generally "keep the project momentum going and … enthuse other members of the organization to come on board" (p. 27).

Establish a project group. Finally, the experiences gained at the NPA in Liechtenstein suggest that the implementation of ECM in different departments and the required tasks should be coordinated and executed by individuals from the departments themselves. Different departments have differing task assignments, working procedures, and information needs, and the use of the departments' individual knowledge is critical in accounting for these differences. Departmental officers have specific knowledge about their information-related tasks and workflows, which is essential when it comes to the customization of an ECM system. The involvement of departmental officers can also help to build confidence in the project and overcome resistance among the workforce. Accordingly, the ECM project team that was established in the office under study was comprised primarily of departmental employees, although it also included representatives from the ECM steering board (e.g., project managers from the OHAR) and the software vendor, as well as external ECM consultants. Respondents suggested also involving ECM champions from prior ECM implementations in other departments in order to benefit from organizational learning.

Discussion

The study revealed fifteen lessons learned from implementing ECM at the NPA in Liechtenstein, which we organized at an organizational and departmental level. As such, the study complements related studies on ECM adoption, most notably Munkvold et al. (2006), Nordheim and Päivärinta (2006), and Scott et al. (2004).

However, the results presented differ in three ways from those of related studies. First, many studies, including Munkvold et al. (2006), Nordheim and Päivärinta (2006), and Scott et al. (2004), explore the adoption of ECM in a business environment, whereas our study has been done in a government context. Second, many of the lessons we identified are strategic in nature, while related studies tend to focus on the tactical level of ECM implementation (although the three studies listed above are exceptions). Third, even though the duration of our study was substantial, we reported only on a first implementation project of ECM at a single government department, while some other ECM studies are longitudinal in nature. However, as ECM is an ongoing, strategic endeavor that takes place at an organizational level, rather than a single implementation project, some related studies were able to present only preliminary results of implementation, too. For example, in their study of ECM systems customization, Nordheim and Päivärinta (2004) analyze the customization challenges and needs anticipated only by ECM champions and IT experts from Statoil (p. 2). We contend that it is mainly for these three reasons that many of the lessons we learned differ from those of related studies.

We also share results with other studies. Both user training and executive support, for example, are recognized as ECM success factors in the present study, but they are also recognized in the two case studies of Statoil and J.D. Edwards. In particular, the Statoil experience suggests that a lack of user training can result in low acceptance levels among the workforce (Munkvold et al. 2006, p. 83), and the J.D. Edwards case highlights the need for gaining and maintaining executive support during project initiation (Scott et al. 2004, pp. 41–42). In addition, Scott et al. (2004, p. 42) identify the establishment of content ownership and the transfer of knowledge, expertise, and experience across ECM projects as important success factors, and Munkvold et al. (2006, p. 77) confirm the need for justifying and evaluating ECM investments and establishing a support/service organization for ECM. (We conceptualized establishing a support/service organization as an ECM steering board.) However, both studies also discuss factors that were notably absent from this study. Content reuse and single source publishing, for example, are often considered important ECM success factors (e.g., Scott et al. 2004, p. 43), and a systematic (i.e., preferably automatic) approach to the reuse of enterprise content is particularly beneficial when content is embedded in various documents (e.g., when product-related content is included in Web pages, marketing brochures, company flyers, product manuals, and sales presentations). If the content is edited, all of these documents must be updated, which often proves to be time- and cost-intensive. Content management technologies can help organizations to improve the speed in which these materials are created and to ensure that they are kept consistent wherever they are stored (Rockley et al. 2003, p. 25). However, the reuse of content did not play a major role in the present study, perhaps because of its organizational context (a government department), where content is seldom reused.

In addition, the NPA case revealed some factors that have not been accentuated in prior ECM research. One such example is the development of a transition strategy from paper to digital records. Even though many companies still create and process documents in paper format, this factor is particularly relevant in a

government context, where records are often retained for long periods. Federal agencies have to comply with legal regulations and standards, perhaps even more than industry sectors do, because their work relies heavily on records that are required to preserve the rule of law (Mnjama and Wamukoya 2007, p. 275). Accordingly, many government departments have huge paper archives, increasing the effort required for digitization. Our study also showed that it is beneficial to communicate the pros and cons of ECM clearly because some of its benefits are more relevant at the organizational level than at the level of the individual employee. For example, digitizing their paper archives can save departments storage space and money, but it may also mean extra effort for the officers who have to scan the records. These officers should be informed about the extra work, along with the benefits of doing it. It is likely that they resist the project otherwise.

Summary and Outlook

In this chapter, we presented fifteen lessons learned from implementing ECM at the NPA in Liechtenstein. We explained these factors at the organizational level (e.g., develop an ECM project portfolio and define and communicate the subject, scope, and purpose of ECM) and at the departmental level (e.g., develop a transition strategy from paper to digital records and establish content ownership). The study complements related studies on ECM implementation, which were conducted primarily in the industry sector, because it was conducted in a government context; therefore, the study goes beyond the scope of related works. While some of the factors identified in the chapter confirm prior research, we also identified factors that have not been accentuated in earlier studies, thereby making a useful contribution to the existing body of ECM knowledge.

Some limitations to the present study must be acknowledged. Most notably, the NPA in Liechtenstein—and the studied department specifically—are characterized by highly specific organizational structures and working procedures, so the results may not be generalizable to all government environments. In addition, the study covered only a first implementation project of ECM at a single department; even though the study proceeded for 19 months, it is likely that some factors remained unexposed in this research.

In 2012, the researchers were updated about the current status of the ECM initiative at the NPA in Liechtenstein. The first implementation project of the ECM software was considered a success. The digitization of the paper archives has nearly been completed, and software-related queries and change requests are the exception, not the rule. The ECM software will be implemented stepwise in additional departments. (The software is currently being rolled out in three other departments.) The researchers plan to accompany the further implementation of ECM at the NPA in Liechtenstein in order to address the limitations of this study.

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Exploring Two Approaches to Information Management: Two Swedish Municipalities as Examples

Proscovia Svärd

Abstract This chapter explores the differences and similarities between records management and enterprise content management (ECM). The need to manage information effectively as a key asset is central to the delivery of quality service, and information management determines the efficiency level of business operations. Information systems are deployed to facilitate the effective creation, capture, organization, management, and dissemination of information, so a proactive and holistic approach to information management is critical if information is to be leveraged in a manner that gives organizations a competitive edge. Records management, a field of management that controls the systematic management of records, enables organizations to comply with the regulations governing corporate or government information. It also serves broad societal purposes like the promotion of government accountability and transparency and the societal memory. While records management focuses on records that carry the evidentiary value of business transactions, other types of information resources such as documents, audio files, video clips, and desktop information have proliferated in governments. This type of information is unstructured and highly relevant to the day-to-day business operations, but often it is kept in multiple places and in duplicate, which complicates the task of finding it. This development has led to new ways of managing information such as ECM. ECM is variably defined as a technology, an initiative, a framework or a set of skills that organizations employ to manage their unstructured information resources.

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Introduction

Proponents of ECM claim that integrated records management is part of their strategy (Iverson and Burkart 2007; MacMillan and Huff 2009), yet they seldom discuss in detail what records management stands for. It is important to explore the differences and similarities in the two information management approaches—ECM and records management—in order to help organizations make an informed choice. MacMillan and Huff (2009) argue that records management helps organizations meet compliance requirements, but it also plays an important role in society. ECM is a relatively new information management concept (Smith and McKeen 2003) that requires additional investigation.

Both ECM and records management are deployed to help organizations with the management of their information resources. Information is one of the key assets in an organization, and if well-leveraged, it facilitates efficient business operations. All organizations need to capture, manage, organize and retrieve information in an efficient and timely manner so information can be reliable, complete and usable. Feldman and Villars (2006) argue that information has become so valuable and therefore of major concern to organizations.

Records management is an established field of research and practice that has traditionally been employed to help organizations in the private and public sector to manage their records systematically (Shepherd and Yeo 2003). Records management has enabled organizations to meet compliance requirements that govern information, but it also serves broad societal purposes of accountability and transparency in democratic societies and enhances the societal memory. McKemmish (1997) articulates the broad role that records management plays in democratic societies as that of facilitating the documentation of governmental, organizational, and individual actions, and allowing the maintenance and accessibility of reliable, authentic and useable records of action to function contemporaneously and over time, thereby enhancing corporate and democratic accountability and cultural heritage (p. 1). Records management focuses on records as evidence of transactions that are undertaken by individuals, governments or organizations.

In addition to records that carry evidence, organizations are experiencing a proliferation of unstructured data. Capturing unstructured content facilitates the collection and conversion of information into valuable knowledge (Iverson and Burkart 2007). Bantin (2008) and MacMillan and Huff (2009) argue that the recognition that unstructured data is as important for business operations as structured data has led to the need to manage it more effectively. Unstructured content has given rise to new information management approaches such as ECM. ECM is variably defined as a technology, an initiative, a framework, and skills that organizations embrace to manage their information resources (de Carvalho 2007; Munkvold et al. 2006; vom Brocke et al. 2011). ECM focuses on unstructured content which includes documents, web pages, reports, audio files, video clips, and desktop information. MacMillan and Huff (2009) state that 80 % of an

organization's information is unstructured. This type of information is kept in multiple places and often in duplicate, which complicates the task of finding it.

Managing both structured and unstructured information requires a proactive and holistic approach that emphasizes information planning prior to the acquisition of information systems (Borglund 2006). Planning how to manage information is essential to creating an information management infrastructure that will manage the information and records' continuum and promote the reuse of information. This chapter examines differences and similarities in ECM and records management using two local administrations as illustrative examples and building on data collected during the first two years of the author's Ph.D. work. The chapter proceeds with a short presentation of the two approaches of ECM and records management; a description of the research method, including the techniques that were applied for data collection and analysis; the research findings, based on both the literature review and the empirical data gathered at the two municipalities; a discussion of these findings; and, finally, a summary of the major differences and similarities in ECM and records management.

Research Background

Records Management

Records differ from other information assets because of the inherent transactional characteristics that make them reliable and authentic (Reed 2005a). According to ISO 15489-1 (2001), a record is "information created, received, and maintained as evidence and information by an organization or person in pursuance of legal obligations or in the transaction of business" (p. 7). Therefore, records attest the transactions that take place in an organization, and it is their evidentiary value that makes them different from other forms of documents. A record must have the following characteristics (ISO 15489-1 2001, p. 11):

- *Authenticity*: A record must be what it purports to be: it must have been created or sent by the person who is supposed to have created it or sent it, and it must have been created or sent at the purported date.
- *Reliability*: The content of a record must be a full representation of what it purports to be and should be created at the time of the transaction.
- *Integrity*: The record must be complete and unaltered.
- *Usability*: The record must be easy to locate, retrieve, present and interpret.

The provenance of the records is central to establishing their authenticity; the principle of provenance enables the records to be the traced to their original source and refers to "'the office of origin' of records, or that office, administrative entity, person, family, firm, from which records, personal papers or manuscripts originate" (Hofman 2005; Winget 2004, p. 1). Provenance is also referred to as

"respect des fonds," and InterPARES defines provenance as "the relationships between records and the organizations or individuals that created, accumulated and/or maintained and used them in the conduct of personal or corporate activity" (Duranti and Preston 2008, p. 831). The principle of provenance is crucial in the digital networked environment because it establishes the authenticity of information and records and points out which organizations are responsible for the management of their entire continuation. Upward (2009) argues that it is essential for electronic records to be identified and managed in a manner that will make them accessible for as long as they are of value (p. 2).

According to ISO 15489-1 (2001), records management is a "field of management responsible for the efficient and systematic control of the creation, receipt, maintenance, use and disposition of records, including processes for capturing and maintaining evidence of and information about business activities and transactions in the form of records" (p. 7). The archival science perspective also emphasizes the context, provenance, integrity, and authenticity of the records (Yeo 2007, p. 318). There are two approaches to the theory and practice of records management, namely lifecycle and continuum. The lifecycle model, which emanates from North America, assumes that records live through current, semi-current and non-current phases during which they should be either retained or disposed of (Bantin 2008, p. 12). It demarcates records management from archives management. Developed by Australian theoreticians, the continuum model provides a framework for the continuum of records management responsibilities (McKemmish 1997). It challenges the traditional view that separates archives and records as distinct entities, instead offering a framework for thinking and practice related to records and archives (McKemmish 2001). It is defined as "a consistent and coherent regime of management processes from the time of the creation of records (and before creation, in the design of records keeping systems), through to the preservation and use of records as archives" (Chachage and Ngulube 2006, p. 5) and considers records to be always in the process of "becoming" since they can be recalled to be used in other contexts (McKemmish 1997; Reed 2005b). The model can be used as a basis of analysis and as a tool to communicate records management issues with all of the records creators in an organization. It highlights the need to

- develop interconnected methods for document creation,
- establish and maintain the routines within which documents are captured as records, and
- control the different processes involved in organizing documents and records as an archive (Upward 2001).

In the continuum model, the stages that the records undergo are recurring and reverberating activities that fall both within archives and records management (Upward 2001).

Records management systems endeavor to maintain records related to statutory, regulatory, fiscal, operational, and historic activities for a specified period of time or long-term, while document systems focus on maintaining as many documents as

possible for the purpose of organizational reference (Emery 2003). Harries (2009) argues that electronic document and records management has stressed compliance and continuity and has enhanced the reliability of corporate memories. However, it has failed to act as a knowledge base with which to guide future action.

Enterprise Content Management

ECM focuses on content, a term used to cover a broad range of digital assets, including web content management, document management, knowledge management, and content management, (Gilbane 2000). MacMillan and Huff (2009) argue that content can be structured or unstructured. Unstructured information is often stored in duplicate, including project spaces, shared disk drives, and desktops, which makes it very difficult to find it. Also, the accuracy of unstructured information can suffer from redundant storage since it is difficult to differentiate recent versions from superseded ones, and it may also create content silos. Structured information contains highly organized data that is used by organizational applications, including lists of employees, customers, products, orders, inventories and purchases. Structured data can be stored in a relational database with a defined structure.

Tyrväinen et al. (2006) refer to the content of assets like documents, websites, intranets, and extranets in their ECM study. Kampffmeyer (2004) goes further in dividing content into three categories (p. 31):

- *Structured content*: data delivered in a standardized layout from database-supported systems (e.g., formatted data sets from a database)
- *Weakly structured content*: information and documents that may include layout and metadata, but that are not standardized (e.g., word processing files)
- *Unstructured content*: any kind of information objects whose contents cannot be directly referenced and which lack a separation of content, layout, and metadata (e.g., images, GIFs, video, faxes).

ECM is an overarching term that refers to a number of different technologies used in the management of especially unstructured content (Iverson and Burkart 2007, p. 407). ECM is used to deal with the issue of vertical applications and island architectures, and it serves as a unified repository for all types of content (Kampffmeyer 2004). Bantin (2008) postulates that ECM emerged around 2000 as an application "that combines the functionality of enterprise document management systems with service of content management application" (p. 139). This point of view is further confirmed by Kemp (2006) who states that ECM systems are comparatively new and are believed to be advancements of electronic document management systems. Iverson and Burkart (2007) claim that ECM began as a mechanism for staging and publishing web material.

ECM is defined variously but Munkvold et al. (2006) define it as "integrated enterprise-wide management of the life cycles of all forms of recorded information content and their metadata, organized according to corporate taxonomies, and supported by appropriate technological and administrative infrastructures" (p. 69). According to Kemp (2006), ECM is "an aspiration that an enterprise's intellectual assets (content) and document systems can be effectively linked to business processes for effective utilizations" (p. 3), so ECM developments are driven by four factors (Kemp 2006, p. 19):

- Finding existing content
- Reducing content duplication
- Increasing networking
- Using workflow technologies to speed up business processes.

ECM has evolved to address business needs at an enterprise level and to integrate traditionally independent content management technologies like document management, enterprise collaboration, knowledge management, email management, archiving, records management, and web content management, all in an unified platform. ECM is variably defined as a technology, an initiative, a framework, and skills (Glazer et al. 2005; MacMillan and Huff 2009; Nordheim and Päivärinta 2004; Smith and McKeen 2003). MacMillan and Huff (2009) argue that ECM is about the people in an organization, the context and content, and lastly about the technology.

McNally (2010) observes that ECM systems have been criticized for reducing the skills of workers and for encouraging the sub-division, routinization, and automation of workflow processes (pp. 357–363). He contends that ECM empowers management since it facilitates the surveillance of workers and offers possibilities to audit job performance. Therefore, McNally (2010) sees ECM systems as management tools with security controls that can restrict document access, editing, and auditing applications since ECM systems enable management to track minute changes in a document's history. This process restricts workers' access to a broad knowledge base of the institution's work.

Research Method

The chapter builds on the licentiate research that the author conducted from 2009 to 2011. It draws on a review of articles on ECM and records management and on empirical data collected at two Swedish municipalities.

Merriam (1988) states that all research should take into consideration previous work in the area of investigation, and she posits that a literature review facilitates an understanding of the area of interest by presenting the state of the art. The literature review in this study served two main purposes: understanding and describing ECM and records management and distinguishing between the two

concepts. Therefore, databases like Google Scholar, Emerald, Libris, JSTOR, and ScienceDirect were consulted for articles and books written by researchers and practitioners alike. The use of search terms like *content*, *record*, *information*, *structured and unstructured information*, *records management* and *content management* led to scientific and practitioner literature in the fields of records management and content management.

Establishing what ECM means required analysis of the literature because it had not been implemented at the two municipalities under study. Accordingly, the ECM-related results presented here emanate primarily from the literature review. The review produced important characteristics, features and components of ECM, in the following categorized as: enterprise architecture, business process management, collaboration, knowledge management, system integration, information lifecycle management, and repurposing of information. These factors provided the ground for analyzing the two case studies not only from the viewpoint of records management but also from an ECM perspective.

Case studies were used because they enable the researcher to carry out empirical inquiries, and they facilitate the investigation of a contemporary phenomenon in its real-life context using multiple sources of evidence (Baharein and Noor 2008; Yin 2009). The case study approach, which helps to clarify the dynamics of a single setting, entails data collection methods like interviews, questionnaires, document analyses, and observations (Eisenhardt 2002, p. 8; Ritchie and Spencer 2002). The empirical data highlighted the problems experienced by the two organizations that were espousing records management to manage their information resources. A total of fifty-two interviews were conducted at the two municipalities.

Research Findings

Results from the Literature Review

Overview

Table 1 summarizes the characteristics of both approaches to information management, records management and ECM, while the discussion here emphasizes only those characteristics that are central to each approach.

Records management is a discipline and a practice that has occupied records managers/archivists for some time, while ECM is a relatively new area of research that has engaged primarily information systems researchers and the technology industry. Records management is driven by legislative requirements, which explains why ECM proponents claim to have integrated it in their strategy. Records management focuses on records and their evidentiary value, while the focus of ECM is on unstructured content. ECM has an enterprise-wide view and

Table 1 Characteristics of ECM and records management

	ECM	Records management
Discipline	An emerging discipline and practice; a subfield of information systems for the computing disciplines	Established scientific discipline and practice
	Engages information systems researchers and the IT industry	Engages records managers and archivists, and the IT industry
	Endeavors to bring all of an organization's unstructured content into a managed environment in order to promote information sharing, controlled access, retrievability, and archiving	Aims to control the creation, receipt, maintenance, use and disposition of records efficiently and systematically
	Defined as an integrated approach (an initiative) to managing all of an organization's information content	
Systems	Facilitate access to all the relevant information in an organization	Used to manage records effectively by maintaining their authenticity, reliability, integrity and usability and to improve the quality and coherence of processes
Drivers	Driven by the need to meet the global collaboration needs of an organization's employees, customers and partners through digital information content	Driven by legislative requirements; underpins government accountability, freedom of information and privacy legislation, protection of people's rights and entitlements, and the quality of the archival heritage
	A convergence of document management, web content management and digital asset management	Addresses the records' integrity, reliability, authenticity, retention, disposition and transparency
	Claims to improve business process management, collaboration, change management, repurposing of information, knowledge management, system integration, enterprise architecture, and the management of information throughout its lifecycle	Takes care of risk management, knowledge sharing and organizational efficiency
Focus	Focuses on unstructured content	Focuses on records that are differentiated from other types of information because of their evidentiary value
Approach	Lifecycle view: active, semi-active and retention or destruction	Has a lifecycle and a continuum perspective, and a view to long-term preservation
Orientation	Technology-oriented	Both technology-oriented and analogue

(continued)

Table 1 (continued)

	ECM	Records management
Standards	Is based on quality assurance standards ISO 9001 and ISO 17025	Guided by international standards and best practices, including: • ISO 15489.1: 2002 records management—General • ISO 15489.2: 2002 records management—Guidelines • Open archival information system (OAIS ISO 14721: 2002) • Standard for metadata ISO 23081 • Technical report on work process analysis for records ISO/TR 26122: 2008 • ISO 30300: 2011 management system for records

prescribes enterprise architecture, business process management, collaboration, knowledge management, system integration, information lifecycle management, and repurposing of information. Records management is based on international standards that should promote good records management practice, while no ECM standards are extant. Records management systems have been used to maintain the quality of a record, that is, its authenticity, reliability, integrity and usability, while ECM systems endeavor to manage and facilitate access to all the relevant information in an organization.

Several ECM factors were identified through the literature review as necessary for the successful implementation of ECM (Glazer et al. 2005; Jenkins et al. 2006; MacMillan and Huff 2009; vom Brocke et al. 2011): enterprise architecture, business process management; change management; collaboration; knowledge management; system integration; information lifecycle management; and repurposing of information. These factors are further described in what follows.

Enterprise Architecture

The successful deployment of information systems should be based on an enterprise architecture because it enables good decision making processes regarding information systems and how they fit the existing IT environment (Johnson and Ekstedt 2007). Enterprise architecture models include applications, business processes, information and the organization's IT infrastructure. Enterprise architecture has become increasingly important to organizations as it helps them to understand the impact of technology investments on overall operations and to achieve legislative compliance. It also provides the essential framework for the communication, interpretation, and implementation of corporate objectives through a well aligned IT environment (Butler Group 2004).

Business Process Management

The analysis of business processes facilitates the ability to identify where records and information are created and received and helps organizations to improve business operations in their entirety focusing on the input, the output, the customer, and the value of the output (Hammer and Champy 1995; ISO/TR 26122 2008; Ljungberg and Larsson 2008).

Change Management

Change is inevitable in today's business world but it is important that the reasons for change are effectively communicated (Rockley et al. 2003). Flexibility and responsiveness are key to implementing change successfully, but change also requires capabilities like strong leadership, the ability to change the organizational culture and values, and a focus on customer service (Sundberg 2006). McGreevy (2003) points out that difficulties in managing organizations through a transition should not to be underestimated because individual reaction can vary. The line managers play a central role in implementing change by providing relevant explanations and information to those affected.

Collaboration

Collaboration is central to ECM; it enables employees to work dynamically toward a common goal while capturing, storing, and archiving the content they produce. Conceptually, collaboration implies awareness, motivation, self-synchronization, participation, mediation, reciprocity, reflection, and engagement (AIIM Market Intelligence 2009). In short, though, collaboration is about openness and knowledge sharing. According to Hockman (2009), collaboration involves:

- Awareness of documents that are shared between departments
- Communicating internal knowledge and experience
- Coming up with a common search terminology that will be meaningful to different departments as indexing terms
- A shared vision for process improvement
- Input from every department to encourage buy-in.

Knowledge Management

ECM and knowledge management, which is of increasing importance in modern organizations, are linked. ECM implementation in organizations is underpinned by the idea and practice of information sharing, which enhances the capture and transfer of knowledge. In the past, knowledge was retained in the minds of the

employees, but ECM can help organizations to retain it even if employees leave (Butler Group 2004; MacMillan and Huff 2009). Alavi and Leidner (2001) write that knowledge management "refers to identifying and leveraging the collective knowledge in an organization to help an organization to compete" and argue that it promotes innovativeness and responsiveness (p. 113).

System Integration

System integration allows systems to "talk" to each other and eliminates information silos (Rockley et al. 2003). The management of information systems is central to business operations, and access to accurate and timely information depends on how well aligned these information systems are with business operations. According to Themistocleous et al. (2004), the real value of information systems derives from the integration of disparate applications so they can support processes across the whole value chain.

Information Lifecycle Management

The lifecycle of information and records has to be managed from its creation, management, and review to its distribution, storage, and eventual disposition (MacMillan and Huff 2009). ECM applies a lifecycle model to the management of information. Munkvold et al.'s (2006) research confirms that Statoil's ECM strategy focused on the entire lifecycle of the content—that is, from capture/creation to long-term preservation or disposal.

Repurposing of Information

Repurposing content saves money (Iverson and Burkart 2007) and enables organizations to avoid "reinventing the wheel." Rockley et al. (2003) recommend a unified content repository where information would be readily available for use and reuse. Currently, there is considerable emphasis on the reuse of government information at the national and European levels through the public sector information (psi) directive (European Union 2003). Reuse or repurposing promotes the development of new services from existing governmental data sets.

Results from the Case Studies

This section presents the empirical findings from the two case studies.

Swedish municipalities engage in a complex web of processes that facilitate the delivery of services to citizens. The services they deliver include education

services, community and welfare services such as child care and care of the elderly, cultural and recreational services, and housing. They also provide infrastructure and utilities, such as water and electricity, and are responsible for local and regional transport, municipal planning, and environmental planning (Larsson and Bäck 2008). The two municipalities in this study made some e-services available to citizens and are actively working toward improving their workflows in order to be more effective. The municipal activities generate a significant amount of information in keeping with the archival law and the Swedish constitution (Bohlin 2010).

The municipalities use records management since both organizations deal with public information that is regulated by law. The empirical data revealed that the municipalities were not aware of ECM, but that they addressed some of the ECM factors in their records management initiatives nevertheless. These include change management, business process management, collaboration, repurposing of information, knowledge management, and system integration. Table 2 depicts the activities pursued by municipalities A and B in terms of the ECM factors.

The municipalities undertook change management whenever new systems were implemented because they recognized that, without training for the staff, there would be a high risk of under-utilization or rejection of the new system. The training also enabled the employees to acquire the necessary skills required in the new environment. The municipalities were further involved in the analysis of their business processes, although this effort was pursued at differing levels of maturity; municipality A had done much more than municipality B. However, a complication ensued in municipality A, since there was no common definition of what business process management was. In municipality B process analysis was still premature but there was awareness of its importance. Collaboration around information management issues was emerging, and municipality A had even engaged in information modeling in order to identify information needs. However, this information modeling was not done at an organization-wide level. Information was being reused by consulting old documents or the archives, so this area needed further development, but the fact that the municipalities did not have digital archives complicated the proper reuse of information.

Both municipalities faced the challenge of knowledge management. There was no systematic way of managing the knowledge accumulated by long-term employees who developed specialized knowledge. However, there was awareness of the need to establish a more developed system for knowledge capture. The current system required retiring/vacating officers to pass on knowledge by working together with their replacements.

The many information systems the municipalities operated complicated their integration and posed a threat to the maintenance of public information. As a result of uncoordinated procurement procedures, whereby individual units purchased their own systems without considering the organizational overall information needs, disparate information systems created islands of information. While there were procedures for how new systems should be procured, they were not being followed.

Table 2 The ECM and records management overlap

ECM factors	Records management factors	
	Municipality A	Municipality B
Change management	Engaged in change management	Engaged in change management
Business process management	Process work is on-going and process owners are appointed	Process work is still ongoing
	Results led to the standardization of case handling in one of the units and some merging of units	Results in one of the units led to rationalization of work, reduction in staff and some merging of units
Collaboration	Staff members engaged in information collaboration but not in a systematic way	Information collaboration existed but not in a systematic manner
	A project to promote information sharing was planned	
	They were having some issues with collaboration and the requirements of the public records act	
Repurposing of information	Consultation with earlier documents and the archives was performed	Consultation of earlier documents and archives had been done
	Investments in a common repository have been made	
	Information modeling has been undertaken	
Knowledge management	Employee-to-employee transfer of knowledge was the norm	Employee-to-employee transfer of knowledge was the norm
	Two projects were underway to systematize knowledge management	
System integration	System integration was taken into consideration at the systems procurement stage	System integration was taken into consideration at the systems procurement stage

The municipalities also lacked enterprise architecture to guide their investments in IT infrastructure, which resulted in an IT infrastructure consisting of disparate systems that created islands of information. Issues regarding enterprise architecture had become more pronounced in municipality A because there was a growing awareness of how systems, processes and practices should be linked, even if these relationships were not well planned for or mapped.

The management of unstructured data in both municipalities remained a challenge.

Discussion

This study set out to determine the differences between and similarities in ECM and records management. Both approaches to information management help organizations deal with their information assets in order to deliver quality service, improve their ability to locate their information resources, and improve their decision making processes. Table 1 lists the characteristics of both approaches while Table 2 presents areas of overlap.

The purpose of records management is to capture, maintain, organize and facilitate the retrieval of information systematically, but it also serves broad societal purposes. Records management uses the lifecycle and the records continuum models, the latter of which offers the more effective way to manage digital information since it combines records and archives management. It also promotes the reuse of information since it views records as artifacts that are constantly in the process of being recalled for reuse in new environments.

For its part, ECM focuses on the effective management of unstructured content in order to improve business efficiency. It emphasizes the salient features of a well-functioning information management infrastructure, such as enterprise architecture, business process management, change management, collaboration, knowledge management, system integration, information lifecycle management, and repurposing of information. ECM systems have been criticized for routinizing work processes and increasing management's control over workers, while records management systems are blamed for failing to act as a knowledge base that guides future action.

As Table 2 shows, the empirical findings from the two case studies confirmed that ECM's prescribed factors were being espoused by the two municipalities under their records management frameworks, but these factors needed further development if the municipalities were to achieve an enterprise-wide information management. The efforts invested by the municipalities in the management of their information resources were fragmentary and did not cover the management of the entire continuum of information and records. What is more, the management of unstructured data remained a significant challenge.

The proliferation of digital information assets will require robust records management regimes that can maintain authentic records and high-quality

information. The networked environment makes the concept of a record and its provenance important because information must be trustworthy, authentic and complete, and users must be able to trace it back to its source. On the other hand, organizations have considerable content that does not qualify as records but that is important to the day-to-day running of business. This is what ECM proponents refer to as unstructured data.

A close examination of both information management approaches reveals that they should complement each other, as both approaches have components that are relevant to modern information management. The search of academic outlets and databases revealed no documented collaboration between archivists/records managers and ECM proponents and its research community. Although the ECM strategy claims to have integrated records management, archivists/records managers are not discussing what this integration implies. The mention of records management in the ECM literature is narrow and does not address fully what records management stands for in society. Records management serves business interests, but it also promotes transparent and accountable government work and enhances the societal memory.

Collaboration of several disciplines is required in order to deal with the soft (people issues) and hard (technological issues) challenges of information management. Instead of creating new acronyms, there is need to improve existing and established information management approaches that will help organizations to get a return on their investments in information systems and to manage the records and information continuum.

The findings confirm that the municipalities were pursuing certain aspects of ECM within their records management frameworks. Despite their challenges, both municipalities were making discernible efforts to improve their information management strategies. However, the challenges are still enormous and omnipresent and are likely to compromise access and reuse of information. Perhaps what these organizations need is a combination of both approaches in order to ensure their ability to comply with regulations through the management of records and to ensure the effective management of all of their content assets. A combination of ECM and records management could be a proactive and holistic approach to information management.

Conclusion

Records management and ECM endeavor to help organizations deal with their information resources. However, as their names suggest, the two approaches differ in that records management focuses on records, while ECM focuses on content. Records management has an evidence-based approach and serves broad societal purposes. As the municipalities continue to struggle with the deluge of unstructured data to be brought into a managed environment, it is important to understand the implications of the solutions they espouse. One of the conclusions that could be

drawn from this research is the necessity to understand the differences between the two information management resources. This is because information management constitutes both soft and technical issues, and there is need to strike a balance between the two in order to find the right solution. Records management offers a deeper understanding of some of the broad societal issues while ECM is more business focused. As the two approaches focus on two different types of information, that is, records and general information, their management also requires different systems. Records management systems have to meet the requirements of maintaining trustworthy, complete and reliable records. There are, however, claims that ECM systems can now manage records (Sprehe 2005). Organizations need to manage records in order to comply with regulations but they also need to focus on the content that facilitates day-to-day business operations. Another conclusion drawn from this research is that in today's complex information environment, organizations need to use both approaches in order to build a well-functioning information management infrastructure.

In summary, as Table 1 shows, ECM and records management differ primarily in five ways:

- ECM is an emerging discipline that requires further investigation, while records management is an established discipline and practice that continues to develop.
- ECM focuses on content, while records management focuses on records.
- ECM is driven by business efficiency while records management is driven by legislation and broad societal needs of government transparency and accountability for democratic developments and the need to maintain the societal memory.
- ECM is technology-oriented while records management is both technology-oriented and analogue.
- ECM is pursued by information systems scientists and the IT industry while records management has occupied records managers/archivists and the IT industry.

The empirical data confirmed that there also are similarities in ECM and records management as demonstrated in Table 2. These similarities, which covered areas of improvements pursued by the two municipalities, included:

- Change management efforts conducted during the introduction of new systems
- Business process management undertaken to improve service delivery to the citizens
- Collaboration, knowledge management, and repurposing of information, which are still underdeveloped but are being discussed
- System integration undertaken in order to avoid information silos and enhance collaboration around information use.

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Conceptual Modeling of Electronic Content and Documents in ECM Systems Design: Results from a Modeling Project at Hoval

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Abstract The implementation of enterprise content management (ECM) software requires careful analysis of an organization's content and document assets, and conceptual information models can provide substantial input for ECM systems design. In particular, content models can support the documentation of both organizational and technological conditions and can illuminate software-related requirements. Therefore, a conceptual modeling language for electronic content and documents has to meet several conditions: It should facilitate description of how content can be reused in different documents, the creators and users of content, and the software systems involved. In addition, given the vast number of digital assets created and used in today's organizations, such a language has to safeguard a clear and consistent representation while also being ready for efficient adaptation and maintenance. With the help of the general criteria of conceptual modeling proposed by Becker et al. (e.g., correctness, relevance, clarity), this chapter identifies these and related requirements and argues that they are not sufficiently met by existing modeling approaches. As a response, we propose a novel modeling language that we developed and evaluated during the course of a modeling project at Hoval, to be used in describing electronic content and documents.

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Introduction

In the era of digitization, companies are confronted with an avalanche of information, and managing the tremendous amount and variety of electronic and other content requires, among other things, maintaining its timeliness and consistency (vom Brocke et al. 2010, p. 3). For example, product descriptions are often present in several types of materials, including instruction manuals, technical specifications, sales catalogues and presentations, and marketing brochures and flyers (compare Rockley et al. 2003, pp. 4–6). Particularly in the early stages of the product lifecycle, such content is subject to frequent change, which can have important economic effects, as updating all of the relevant documents may be difficult and time-consuming at an enterprise-wide level. Because many of these documents make promises about products and services, outdated and/or inconsistent documentation can lead to problems with customers and can even have legal consequences (vom Brocke et al. 2011b, p. 970).

Numerous approaches to and software solutions for dealing with these or similar challenges have been discussed in research and practice. Document management systems, which primarily serve to store and retrieve files, are of only limited help to companies. More promising are solutions for content management that allow content to be handled independently of its structure and presentation (Boiko 2002, pp. 135–137; Clark 2007, pp. 44–45) so textual or graphical content from different containers, such as Web pages and documents, can be reused efficiently (O'Callaghan and Smits 2005, pp. 1272–1274), increasing efficiency in the process of creating documents and keeping them up-to-date (e.g., when content is revised, extended, or translated) (Rockley et al. 2003, pp. 24–26). Since the turn of the millennium, the academic discipline of IS has addressed the issue of company-wide management of electronic content and documents under the umbrella term "ECM" (Päivärinta and Munkvold 2005; Smith and McKeen 2003; Tyrväinen et al. 2006; vom Brocke et al. 2011a), an integrated concept that supports the management of all possible forms of information across their entire lifecycle (Smith and McKeen 2003, p. 648; vom Brocke et al. 2011b, pp. 967–968).

ECM systems offer a number of benefits to companies, such as meeting retention requirements, improving information quality, capturing and disseminating knowledge, and supporting collaboration within and between organizations (Päivärinta and Munkvold 2005, pp. 2–3). At the same time, however, organizations that adopt ECM face challenges in selecting the right software, implementing efficient workflows, defining and maintaining metadata and corporate taxonomies, and training and motivating the staff involved (Munkvold et al. 2006, pp. 75–84). The process of implementing ECM in a company begins with identifying and analyzing the company's existing documents and content, a process commonly referred to as a "content audit" (Rockley et al. 2003, pp. 104–105). Having an in-depth understanding of a company's business documents and content facilitates the best possible selection and customization of ECM systems (O'Callaghan and Smits 2005, p. 1275).

The results of a content audit can be documented in the form of conceptual models that can then serve as starting point for ECM systems implementation. Conceptual content models help the creators and users of content by describing and illustrating the software systems involved and how content is reused in different documents. As such, content models may facilitate communication between the ECM project team and the users who will work with the system, revealing the demand for support on the system's side in particular (Kung and Solvberg 1986; as cited in Wand and Weber 2002, p. 363). Thus, content models can provide a roadmap to the company's increasingly complex content and system landscapes that often grow over many years.

Therefore, a modeling language has to meet several requirements, which are identified in this paper with the help of the general modeling principles from Becker et al. (1995), including correctness, relevance, clarity, comparability, and efficiency (pp. 437–439). The requirements we identify are not sufficiently met by traditional approaches, so a novel modeling language, which was developed and evaluated during the course of a modeling project at Hoval, is proposed.

The research project described in this chapter followed the design science paradigm (Hevner 2007; Hevner et al. 2004; March and Smith 1995), in particular the design research methodology from Peffers et al. (2008, p. 54). In the next section, we provide a background for the chapter, and on that basis, identify the requirements a modeling language for electronic content and documents must meet. Then we present the proposed modeling language based on a meta-model and summarize the results from the modeling project at Hoval. The results of the project confirm the utility of the modeling language but also indicate the need for future research, which is outlined in the last section.

Background

ECM remains an elusive concept that lacks a theoretically sound foundation (vom Brocke et al. 2011a, pp. 478–480). However, for the purposes of this chapter, ECM is understood as a modern and integrated approach to digital information management (Päivärinta and Munkvold 2005, p. 1). The integrative nature of ECM has at least three parts (vom Brocke et al. 2011b, pp. 967–968): First, ECM refers to the management of all of an organization's information assets, regardless of type, format, granularity, or source. Second, ECM includes both technological (e.g., software, hardware, and standards) and managerial (e.g., strategies, methods, and processes) capabilities. Third, ECM covers the management of information over its entire lifecycle. As such, the concept of ECM includes "the strategies, tools, processes and skills an organization needs to manage all its information assets (regardless of type) over their lifecycle" (Smith and McKeen 2003, p. 648).

Developing and implementing such a comprehensive approach to managing content and documents is often a highly complex and time-consuming endeavor (White 2002, p. 22). In a longitudinal case study, Munkvold et al. (2006) identified

a number of challenges companies face when implementing ECM systems (pp. 75–84). As these challenges are both technological and managerial in nature, Tyrväinen et al. (2006) characterize ECM as a research topic relevant to the IS discipline (p. 628).

Tyrväinen et al. (2006) present a framework for ECM research (pp. 628–631), which is used here to explain the salient role content audits and models play in ECM implementation. The framework distinguishes four perspectives to which questions relevant to IS research can be assigned: *processes, content, technologies,* and the *enterprise context* (Tyrväinen et al. 2006, p. 628). The four perspectives should be viewed from an integrated perspective, not separately. For example, developing and implementing efficient *processes* that support different phases of the *content* lifecycle requires careful selection and alignment of ECM *technologies* and consideration of the legal aspects relevant to content management in the *enterprise context* (e.g., long-term retention).

While Tyrväinen et al. (2006) designed their framework to stimulate and guide future research in the field of ECM (p. 627), the framework's core ideas can also be transferred to the practical implementation of ECM systems. The content perspective represents the core of the framework, as, "in any piece of ECM research, the content perspective is involved in some way" (Tyrväinen et al. 2006, p. 628). At the outset of any ECM initiative, organizational documents and their content should be closely examined, as they substantially affect the managerial and technological requirements of the three remaining dimensions of processes, technologies, and the enterprise context. Only after a thorough analysis of the content is it possible to determine the relevant legal, economic, and social factors at the level of the enterprise, how existing processes have to be redesigned, and the technologies needed to meet all these requirements (vom Brocke et al. 2011a, pp. 483–484). However, the analysis of content is often a challenge for companies to address, as multiple factors must usually be considered from the content perspective. O'Callaghan and Smits (2005) list a number of questions that should be answered in a content audit including questions related to the types of content that are present in the organization, who is responsible for it, who uses the content, how and where the content is reused and repurposed, which content is to be retained and in what form, and which systems are to be used for the creation and processing of content (p. 1275).

Given the enormous amount and variety of electronic content in today's enterprises, the answers to these questions may be elusive. Unlike structured data, which is usually well-documented, semi-structured or unstructured information is often described to only a limited extent. While document overviews may be present in the form of, for example, tables, these overviews usually answer the central questions only partially and/or they refer only to specific departments, business functions, or processes. Documentation of the results of a content audit is also aggravated, as documents, content, an organization's information needs, and content-related processes are dynamic. Therefore, an approach that allows organizations to acquire, analyze, report, and maintain the information they need to understand the creation and use of content at an enterprise-wide scale is needed. Conceptual information models can serve this purpose.

Content Modeling Requirements

A modeling language for electronic documents and content has to meet several requirements. Any of a number of general approaches to evaluating conceptual models can be used to identify the requirements of a modeling language for electronic documents and content. Many of these approaches refer to data modeling (Frank 1997, pp. 97–98), particularly entity relationship models. For example, Moody and Shanks (1994) propose six criteria for assessing the quality of a data model: simplicity, completeness, flexibility, integration, understandability, and implementability (p. 101). Kesh (1995) presents a framework for evaluating entity relationship models, taking into consideration the structure (suitability, soundness, consistency, conciseness) and contents (completeness, cohesiveness, validity) of data models (pp. 681–685). Genero et al. (2000) examine the maintainability of entity relationship models, differentiating between understandability, legibility, simplicity, analyzability, modifiability, stability, and testability (p. 514).

Similar to Frank (1997), who distinguishes criteria inherent to the model (e.g., completeness and non-redundancy) and discusses the relationship of a model with the observer, with reality, and with the modeling purpose (pp. 98–99), Becker et al. (1995) present a general approach to evaluating conceptual models ("Grundsätze ordnungsmäßiger Modellierung") using the criteria of correctness, relevance, efficiency, clarity, and comparability[1] (pp. 437–439; own translation). Our requirements for a modeling language for electronic documents and content are derived from Becker et al.'s (1995) five general criteria (pp. 437–439).

Correctness. Becker et al. (1995) distinguish between the syntactical and semantic correctness of a conceptual model (p. 437). While the former refers to the consistent use of the model elements and notation rules defined in the meta-model, semantic correctness is related to the model's structural and behavioral compliance with the object system it represents (Becker et al. 1995, pp. 437–438). Accordingly, a modeling language for electronic documents and content has to support modeling on both syntactically and semantically correct levels. On the semantic level, the language should particularly allow the illustration of reuse of content in different documents, the correct assignment of user roles and rights, and the consideration of the software systems involved to be described. For its part, developing a syntactically correct content model requires a meta-model that describes all of the relevant model elements and the possible relationships among them. The modeling language should also provide options that help prevent the language defects (e.g., the use of synonyms) that can occur when the same content

[1] With *systematic structure*, Becker et al. (1995) propose another quality criterion of conceptual modeling, acknowledging that information models are typically put up for different views that must be integrated (e.g., data, process, and functional views) (p. 439). Although this criterion appears also to be relevant in the context of content modeling (e.g., documents are typically part of process models), it is outside the scope of this chapter.

or document objects are part of more than one sub-model (e.g., for certain business functions and areas).

Relevance. Relevance generally refers to a model's goal orientation; model elements are relevant if their exclusion reduces the overall benefit of the model (Becker et al. 1995, p. 438). For example, a model's relevance is closely related to its level of abstraction; that is, models that feature higher degrees of completeness or exactness than others do are likely to cover increased amounts of irrelevant information (Becker et al. 1995, p. 438). Because of the enormous number and variety of documents that must be handled in today's enterprises, the level of abstraction is an important criterion in content modeling. In addition, a modeling language for electronic documents and content must meet the requirements of multiple model users with diverse goals. The potentially relevant content modeling goals include both organizational goals (e.g., in the case of reorganization projects) and technology-related goals (e.g., in the case of implementation projects). Therefore, model developers must be given considerable freedom in the process of content modeling.

Efficiency. Whereas relevance generally refers to the scope of a model (i.e., the results view), efficiency refers to the effort that must be undertaken in the course of the modeling process (i.e., the process view) (Becker et al. 1995, p. 438). The efficiency of content modeling is particularly determined by the frequency with which the developed models must change. Documents and content, as well as information needs and software systems, are constantly changing in today's organizations, so a modeling language for electronic documents and content should ensure efficiency with regard to model development and with regard to model adaptation. The support from appropriate modeling tools may substantially reduce the effort required for model development and adaptation.

Clarity. A language's clarity, which refers to a model's structure and readability, depends largely on the subjective perception of the model user (Becker et al. 1995, p. 438), so it is particularly determined by the graphical notation of a modeling language. Model clarity is also closely related to the principle of correctness because higher degrees of model completeness or exactness are likely to result in reduced model clarity (Becker et al. 1995, pp. 438–439). Therefore, the assignment of attributes to model elements (e.g., metadata for content storage and retrieval), for example, should not too severely impair the model's readability. Furthermore, the clarity of a content model is important to the ability to consider organizational and technological content management requirements equally. Whereas content creators and users typically know more about organizational conditions than they do about technological implications, the adopters of ECM systems are more likely than content creators to be aware of available and required software features. To facilitate communication between the ECM project team and the users, a content model should be equally comprehensible for both groups (i.e., business and IT). The development of sub-models, each of which has its own scope, may be able to take into account the heterogeneity of modeling goals and model users, which would contribute to the relevance of content modeling. Clarity is also an issue when the modeling language is to be extended (e.g., by new model elements).

Comparability. Comparability, like correctness, has both syntactical and semantic dimensions. While the syntactical aspect refers to the compatibility of models developed with different modeling methods and languages, the semantic aspect refers to the comparability of different models at the content level (e.g., as-is model vs. to-be model) (Becker et al. 1995, p. 439). While the syntactical dimension is out of the scope of this chapter, the notion of semantic comparability is especially important in content modeling to support the consolidation and integration of content models developed for multiple company divisions and functional areas.

Discussion of Existing Modeling Approaches

The development and evaluation of conceptual modeling languages and methods is a core topic of design-oriented IS research (Fill et al. 2007, p. 419). During the course of our modeling project, we evaluated some of the approaches for information and data modeling that have been discussed in the community with regard to their applicability for enterprise-wide content modeling. This evaluation was based on the modeling requirements summarized above using questions such as whether all element types relevant to content modeling are provided by the languages, how much time and effort would be needed to develop and adapt the content models, whether there is suitable tool support for the adaptation of the modeling languages, whether the clarity, structure, and readability of content models developed with these languages is sufficient, and whether there is sufficient freedom in the process of content modeling.

The results of the review suggest that existing approaches to information and data modeling have only a limited applicability to the modeling of content and documents at an enterprise-wide level. While many approaches are likely to result in the development of both syntactically and semantically correct content models, they do not sufficiently meet the other requirements of conceptual content modeling, particularly the ones regarding clarity and efficiency. As of today, there are but a few specific approaches to modeling electronic documents and content at an enterprise-wide level. For example, Rockley et al. (2003) propose a table-based approach to content modeling that aims at documenting the reuse of content (pp. 159–182) by distinguishing among semantic data (e.g., subject, date, or contact), basic data (e.g., title or container), and architecture-related data (e.g., type of reuse) (Rockley et al. 2003, p. 175). Existing approaches to content modeling focus on specific areas of information management (e.g., training material or software guides) or are developed for certain industries (e.g., telecommunication or pharmaceutical), while more generic approaches with enterprise-wide scopes are rare (Rockley et al. 2003, p. 177). As a response, the next section presents a modeling language for electronic documents and content developed in consideration for the requirements and criteria presented above.

Modeling Language

The purpose of conceptually modeling content can be support for organizational goals (e.g., information lifecycle management) or technical goals (e.g., ECM systems selection and customization). Examples of content modeling goals include creating transparency in information management, documenting the reuse of content, detecting shortcomings in the process of document creation, and eliminating media disruptions. These goals must be clearly defined at the outset of any content modeling initiative because they largely determine the components a content model later requires, particularly the elements that are used in the modeling process. For example, while some implementation projects may demand detailed descriptions of technical requirements (e.g., system functionality, metadata, user rights and roles), such requirements may be of minor relevance in reorganization projects. The modeling language presented in this section, *Enterprise Content Modeling Language* (*ECML*), is explained with regard to two general modeling goals: conceptually describing the reuse of content in different documents and describing the creation and use of content by different users and systems over the content's lifecycle.

ECML features ten basic types of model elements, which are described by means of an entity relationship meta-model in Fig. 1 (gray boxes). The model elements, which are hierarchically structured, can be further specified according to their attributes. The figure also shows the elements' graphical notations (which are connected with the element types by dotted lines). "Content Types," describe content at a general level; they can, as a function of granularity, be self-contained (e.g., an image) or composed of other Content Types (e.g., a product description that contains an image). In contrast, "Content Assets" represent specific content (e.g., an image of a certain product), so Content Assets are always assigned to at least one Content Type. As it is the case for Content Types, Content Assets may

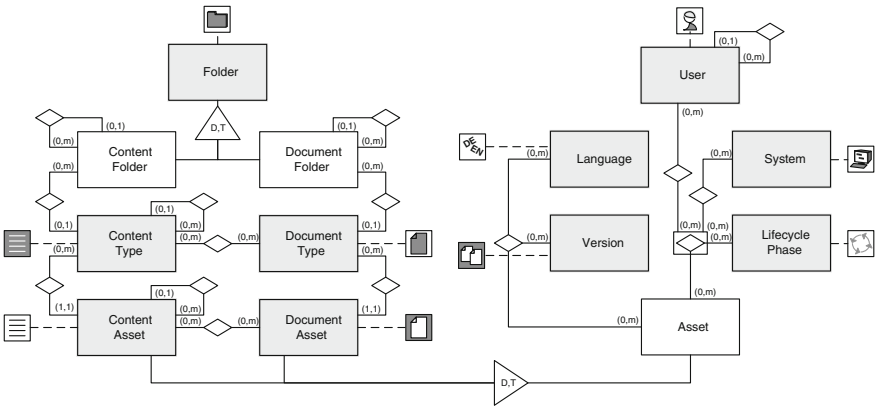

Fig. 1 Entity relationship meta-model for *ECML*

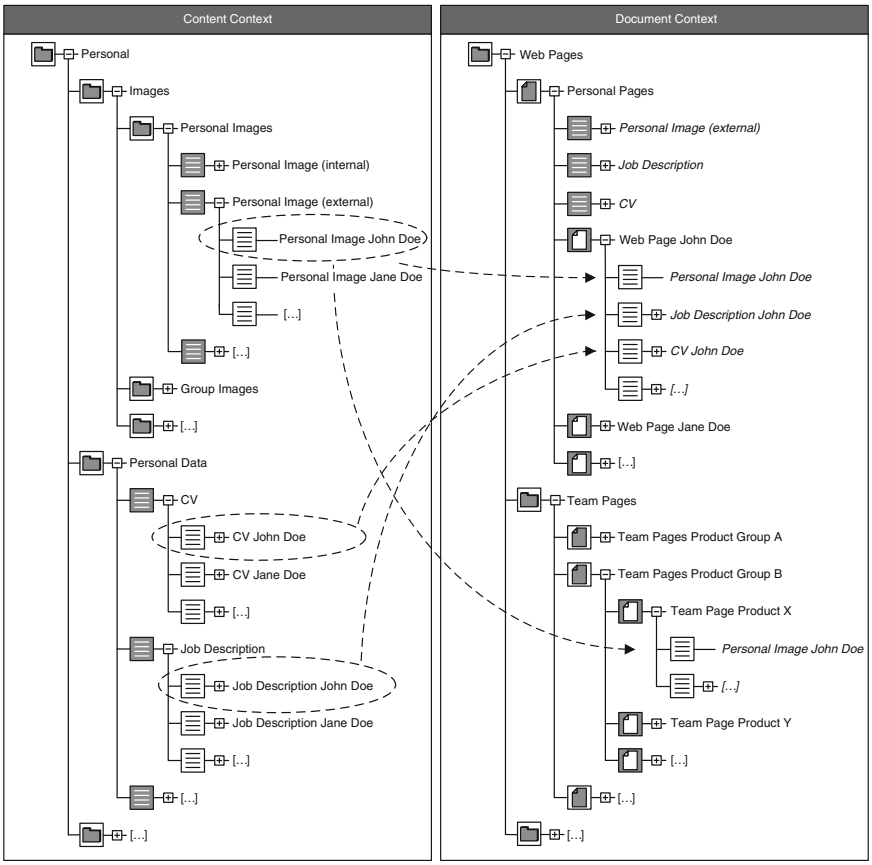

Fig. 2 Example of an *ECML* model (1)

vary in terms of their granularity. In contrast, the granularity can be disregarded for "Document Types" and "Document Assets," which represent complete information products, although they can otherwise be understood analogous to Content Types and Content Assets. Accordingly, Document Types represent general documents (e.g., sales catalogues), while a Document Asset represents a specific occurrence of a Document Type (e.g., a sales catalogue of a certain year). In addition, Document Types and Document Assets may be composed of a number of Content Types and Content Assets (e.g., a sales catalogue that contains multiple product descriptions and images). Both element types can be organized in "Folders."

The element types described so far can be applied to describe the reuse of content. To do so, two general modeling contexts need to be distinguished: "Content Context" and "Document Context." (See Fig. 2 for a fictitious, simplified example.) In the example above, the Content Context covers various pieces

of personnel-related content that can be grouped into »Images« and »Personal Data«. A distinction is made between »Personal Images« and »Group Images« both of which may be used for either internal or external purposes. For example, »Personal Image (external)«, is a self-contained Content Type that subsumes under it a number of specific personal images (i.e., Content Assets, such as »Personal Image John Doe« or »Personal Image Jane Doe«). »Personal Data« is a folder under which »CVs« and »Job Descriptions« are organized and which are modeled as composed Content Types (displayed by the + symbols). Both Content Types and Content Assets are reused in the Document Context, which, in the example, describes the content of »Web Pages«, including »Personal Pages« and »Team Pages«. The content model illustrates that a Document Type determines of which Content Types an information product is generally composed (e.g., »Personal Page« = »Personal Image (external)« + »Job Description« + »CV«) and specifies the concrete Document Assets that instantiate it (e.g., »Web Page John Doe« = »Personal Image John Doe« + »Job Description John Doe« + »CV John Doe«). However, Document Assets do not necessarily have to contain a model element for each Content Type of which the represented Document Type is composed (e.g., not all »Personal Pages« must contain a concrete »Job Description«). This is also true, of course, for composed Content Assets. In the example, the reuse of content (e.g., »Personal Image John Doe«) in various documents (e.g., »Web Page John Doe« and »Team Page Product X«) is illustrated by dashed arrows and by Content Assets written in italics.

However, content models cannot be used only to document the reuse of content in organizations but can also help clarify which documents and content are used by which individuals ("Users") and with the help of which software products ("Systems"). Such information can, for instance, support the selection and customization of ECM systems. As documents and content are created and used by means of a variety of systems over the documents' and contents' life spans (e.g., a marketing brochure may be created by means of a graphics software, then converted into a pdf file, and finally published on the Internet), *ECML* also distinguishes among several "Lifecycle Phases." The combination of Lifecycle Phases, Systems, and Users with specific Document Assets then describes who is responsible for the creation, editing, and publication of a certain document and what software is used in the process. Figure 3 provides another simple example, extending the Content Context from Fig. 2 by the model elements mentioned.

Finally, *ECML* also allows languages and versions to be assigned to certain documents and content. The assignment of "Versions" and "Languages" to certain Document Assets and Content Assets, respectively, then represents a real-world document or content asset (e.g., version 2.0 of the German user manual for a certain product). Alternatively, attributes could be assigned to Content Assets and Document Assets for this purpose. Examples of common attributes that may also represent the metadata required for storage and retrieval, are »ID«, »Notes«, »Status« (e.g., "in progress", "under review", and "in translation"), »Creation Date« and »Editing Date«, »Creator«, »Editor«, and »Owner«.

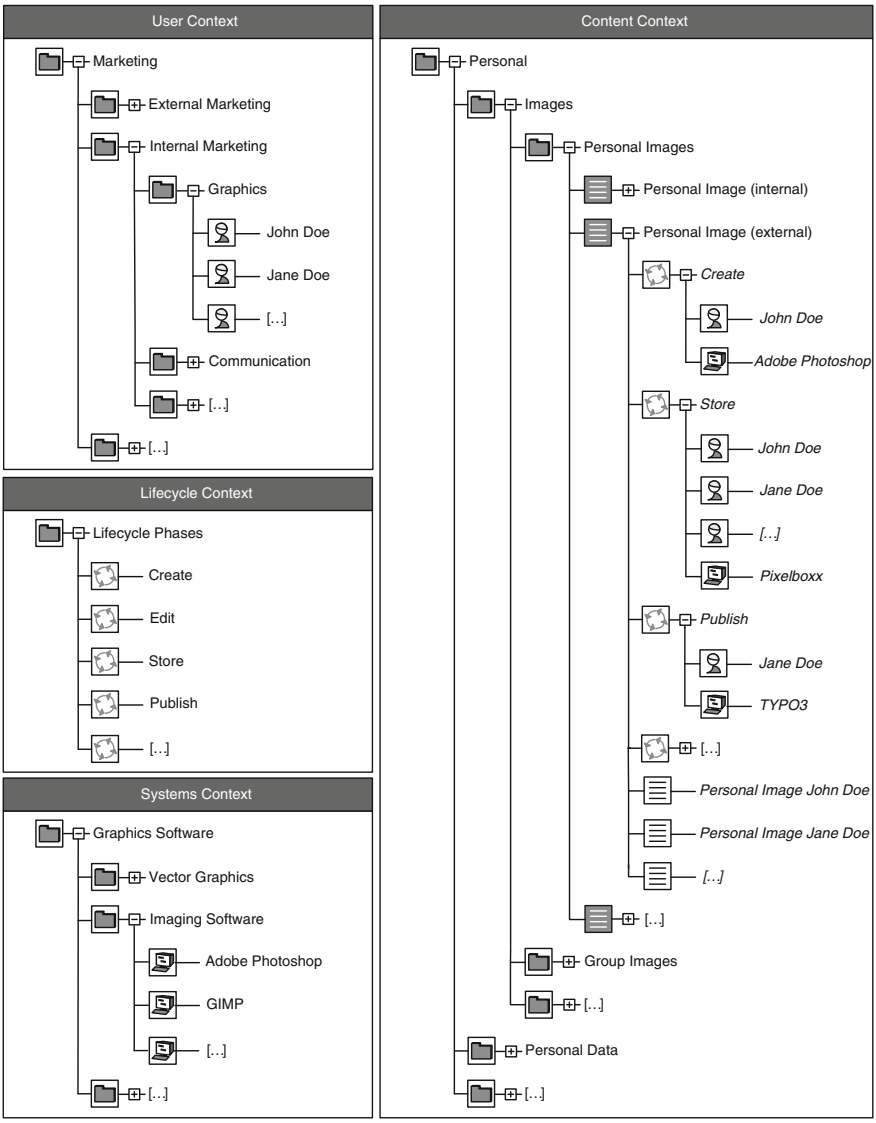

Fig. 3 Example of an *ECML* model (2)

Which model elements are relevant depends largely on the content modeling goals. As many goals can be pursued, *ECML* may require adaptation (e.g., in the form of additional element types and modeling rules). The next section provides an application example of *ECML* from practice.

Application Example and Evaluation

Project Overview

ECML was developed and evaluated during the course of a modeling project at Hoval. Hoval, a manufacturer of heating and ventilation systems, operates in more than fifty countries and employs about 1,200 people (http://www.hoval.com). Hoval operates five production sites in five countries: Liechtenstein (Vaduz), Austria (Marchtrenk), the UK (Lincoln), Slovakia (Istebné), and China (Beijing) (Hoval n.d.). Hoval has subsidiaries in thirteen countries, and the company's headquarter is in Vaduz, Liechtenstein. Hoval is a highly innovative company, and the generation and processing of knowledge and information has always been a central issue. Facing an increasing number of digital documents and an increasing amount of content to be dealt with in their business processes, Hoval started developing an ECM strategy at the beginning of 2009. The objectives of the project were to document semi-structured and unstructured business information, to increase information quality and process efficiency, to make document management more reproducible, and to meet information needs at the level of the individual employee. At a basic level, ECM strategy development at Hoval can be divided into seven phases: goal definition, delineation of tasks, as-is analysis, development of possible solutions, scheduling, implementation, and monitoring and evaluation. The results outlined in the following paragraphs are mainly related to the third phase, the as-is analysis, in which the researchers had the chance to participate as part of the project group.

Identification and analysis of existing documents, content, information needs, and systems was recognized early as a central issue of ECM strategy development at Hoval. While the project group had planned to document the results of this analysis in the form of tables, it became clear that this approach would be inefficient and would produce unstructured and confusing results. Therefore, conceptual modeling was considered as a way to increase the efficiency of the analysis and the clarity of the results. The primary goal of the modeling project was to document the reuse of content in documents at a company-wide level.

The results presented here were established and evaluated based on several sources of data. For example, we participated in four workshops (180–240 min each) and four discussion sessions with the project lead (60 min each) and conducted twelve semi-structured interviews (60–90 min each), each digitally recorded and fully transcribed to allow for detailed analysis, with decision-makers from several departments. The workshops and interviews primarily informed the identification and analysis of documents, content, systems, users, and potential for improvement. They were also used to identify the requirements for content modeling at Hoval, against which the developed modeling language was also evaluated. Our sources of data further included corporate documents (e.g., minutes and presentations from the workshops, existing document overviews).

In sum, twelve content models for the company's departments were developed and integrated into a consolidated model. The models were designed by means of *H2-Toolset*, a meta-modeling software for the specification of hierarchical models developed at the European Research Center for Information Systems (ERCIS). One of these models is presented in the following section, after which evaluation results are presented.

Application Example

The content model explained here was developed to document the reuse of content in Hoval's spare parts catalogue. The main data source for the design of this model was a web-based platform named *Internet Data Access*. As this catalogue is publicly available, no user rights and roles were modeled. Likewise, the modeling of systems and lifecycle phases were out of the scope of this project.

The screenshot displayed in Fig. 4 shows the Content Context and the Document Context in which the product-related content and documents are described and grouped in the »Products« folder. Various Content Types and Content Assets are distinguished in the Content Context, such as the »Front Pages« of »Operating Instructions«, which contain the respective »Product Names« (1) and »Images« (2). »Front Pages« represent composed Content Types, whereas »Product Name« and »Image« both represent self-contained Content Types. For example, Content Assets are the »Product Names« and »Images« for »Oil Condensing Boiler MultiJet® (8–25)« and for »Oil Condensing Boiler UltraOil® (35, 50)«. The described content is reused in the Document Context. As the screenshot shows, »Operating Instructions«, as a Document Type, are generally composed of various Content Types (e.g., »Safety Information«, »Customer Service«, »Functional Principle«, »Boiler System Control«, »Imprint«) (3). In turn, Content Assets (e.g., »Safety Information Oil/Gas Boiler«, »Hoval Customer Service«) are reused in specific Document Assets (e.g., the »Operating Instructions« for »Oil Condensing Boiler MultiJet® (8–25)«) (4). The screenshot also shows the possibility of describing different versions (e.g., »00«, »01«) and languages (e.g., »DE«, »EN«) (5) and of assigning attributes to model elements (e.g., »Number«, »Notes«, »Status«) (6).

In the course of the project, the functionality of *H2-Toolset* was extended by two plug-ins, the use of which is also illustrated in the example. *Document Launcher* is a plug-in that allows model elements to be connected to real-world documents (i.e., to open documents directly from within *H2-Toolset*), and *Reuse Visualizer* allows inquiries about the reuse of content (i.e., to determine in which documents certain content assets are included). In the example, *Reuse Visualizer* indicates which Document Assets need to be updated if, for instance, the product name »Oil Condensing Boiler MultiJet® (8–25)« is changed. (In the example, such a change would affect the following documents: »Op. Instr. 2-MultiJet (8–25) TT23S«, »Op. Instr. 2-MultiJet (8–25) M1.3«, and »Op. Instr. 2/3/4-MultiJet (8–25)«) (7). Using *Document Launcher* makes it possible to get direct access to

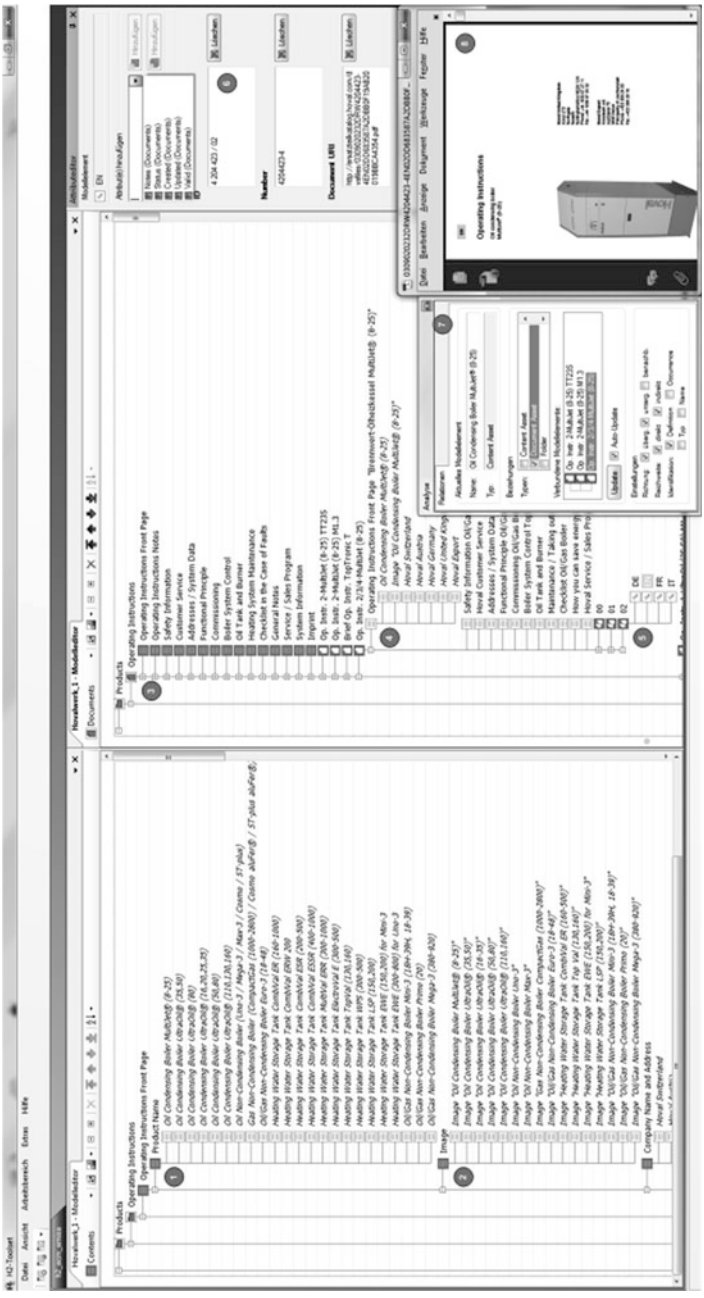

Fig. 4 Application example of *ECML*

documents in the model (e.g., the operating instructions for »Oil Condensing Boiler MultiJet® (8–25)«) simply by double-clicking on them (8). Therefore, a »Document URI« has to be assigned to the respective model element (in this case, a link to a Hoval Web page).

Evaluation Results

At Hoval, *ECML* was principally suited to model semi-structured and unstructured information. While the evaluation results confirm the practicability and effectiveness of the modeling language, they show also that further research is needed. This need is summarized using the requirements for content modeling from the modeling principles in Becker et al. (1995), which also formed the basis of the qualitative evaluation.

Correctness. The content model was assessed as being semantically correct; that is, its structure was determined to be compliant with the object system represented. As *ECML* was implemented by means of *H2-Toolset* (which automatically verifies compliance with the defined notation rules), the syntactical correctness of the model was ensured. While this approach to developing and maintaining the model was considered useful, a number of areas for further improvement were identified that would increase the semantic correctness of the model. For example, one recommendation was to implement a glossary to support model users during data entry and content search. Another recommendation referred to automated validation of the model with regard to its completeness, as model users may not always be able to specify all of the information required. Here, it was suggested that a testing mechanism be implemented that automatically informs the persons in charge of the model's maintenance about missing content or content that needs to be revised. Finally, options were discussed for more specific modeling of systems (e.g., release versions) and the business processes in which documents and content are created and used.

Relevance. The relevance of the content model was appropriate, and abstraction from users and systems in the content model was reasonable, although the level of detail was an issue. Content modeling took place on both a general level of content and document types and on the level of concrete instances, that is, content and document assets. However, since content and document instances are frequently modified, some model elements may be dated after just a short time. Therefore, the effort required to maintain the model could be substantial, which could lead to lower acceptance levels among its users. Stronger focus on the "type" level in content modeling was determined to be able to counteract this danger, but what level of detail ensures efficient maintenance remains to be examined.

Efficiency. The profitability of developing and maintaining the model was assessed as being good. Automatic reuse and updating of model elements, which is supported by *H2-Toolset* with *Object Definitions* and *Object Occurrences*, was considered particularly beneficial, and the usability of the *H2-Toolset* itself was

assessed as adequate. However, the project partner identified some areas for improvement, such as the implementation of standardized dialogs that would support users in the process of entering data and maintaining content (e.g., the definition of mandatory content), and the consideration of inheritance principles (e.g., the reuse of metadata). While the two plug-ins created the possibility of using *H2-Toolset* for searching and maintaining documents and content (similar to using a very simple document management system), implementation of more efficient search mechanisms (e.g., based on a glossary) was also suggested.

Clarity. The project partner assessed the clarity of the model as being high, with particular emphasis on the hierarchical approach chosen as being adequate for the modeling of content. The symbols used fostered readability of the model, and the number of model element types was appropriate. A number of recommendations—such as implementation of where-used lists to document the reuse of content (which has been realized only prototypically by means of the *Reuse Visualizer* plug-in) and use of examples and notes in the model (which has been realized only rudimentarily by providing the ability to assign attributes)—were made to increase the model's clarity. The provision of general modeling guidelines was also an issue.

Comparability of models, the fifth modeling criterion considered, was not assessed in the course of the project. Nevertheless, it can be assumed that the development and maintenance of a glossary in particular would substantially increase model comparability (e.g., to avoid the use of synonyms).

Summary and Outlook

This chapter presented *ECML*, a modeling language for electronic documents and content that can support the implementation of ECM in organizations. Based on a review of the academic literature in the field, we explained the requirements for a modeling language for electronic documents and content. We then explained the *ECML* model elements based on a meta-model and summarized results from a modeling project at Hoval.

While the results of the modeling project confirm the practical relevance and effectiveness of the proposed language, they show also that additional research is needed. Future efforts should investigate the relevance of the *ECML* model elements, the level of detail of modeling, the possibility of assigning attributes to content, and the efficiency of maintaining *ECML* models. An *ECML* modeling method has already been developed and is to be evaluated in upcoming studies and projects. In addition, because we assessed only the applicability of some modeling approaches in this project, future research should investigate the suitability of further modeling languages and methods for describing the creation and use of content at an enterprise-wide level.

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Justifying ECM Investments with the Return on Process Transformation: The Case of an ECM-Driven Transformation of Sales Processes at Hilti Corporation

Jan vom Brocke, Christian Sonnenberg and Christian Buddendick

Abstract Organizations are faced with an overwhelming amount of content to be captured, organized, and archived efficiently. As a result, enterprise content management (ECM) has emerged as a top business priority. Organizations may choose from a variety of sophisticated ECM systems based on their specific functional requirements. While such a choice must also be justified in terms of economic benefits, the current state of research lacks commonly accepted guidelines and methods for evaluating and justifying ECM system investments. This chapter addresses this lack of methodological support and presents an evaluation approach that is based on the concept of potentials modeling. This approach reports economic benefits by means of financial measures and explicitly takes an organization's business process structure into account since implementation of an ECM system causes significant changes in work procedures. The feasibility and potential usefulness of this approach is demonstrated at the example of an ECM-driven transformation of sales processes at Hilti Corporation.

Introduction

More than ever, organizations are confronted with the challenge of efficiently organizing a huge volume and diversity of digital information in support of their business processes. Consequently, they are in need of concepts and technologies that

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support the management of their digital information assets (vom Brocke et al. 2011a). ECM addresses this particular need and is concerned with the "strategies, tools, processes, and skills an organization needs to manage all its information assets (regardless of type) over their lifecycle" (Smith and McKeen 2003, p. 648). ECM takes into account all kinds of digital assets, including various types of documents, web content, images, and e-mails. An organization's adoption of an ECM initiative may be triggered by efficiency considerations (e.g., reducing search times) or by legal requirements (e.g., complying with reporting and documentation standards).

ECM initiatives build primarily upon a specific kind of information technology (IT), usually referred to as ECM systems, and they can choose among a variety of sophisticated ECM systems. The selection of a particular solution should be guided by two questions: "What functional requirements should be supported by an ECM system?" and, ultimately, "What are the economic consequences/benefits of implementing and using the candidate ECM systems?" This chapter addresses this second question by presenting an approach with which to assess the economic consequences of an ECM investment by means of *financial measures*.

The problem of justifying ECM investments is closely related to the general problem of IT value assessments. Both IT value research (e.g., Davamanirajan et al. 2006) and work in the field of ECM (Tyrväinen et al. 2006; vom Brocke et al. 2011a) underpin the importance of a *business process perspective* for assessing the economic impact of IT and ECM investment decisions. Consequently, the assessment approach presented in this chapter builds on *potentials models*, which link process models with financial models. By means of these potentials models, the impact of IT investment decisions can be traced to the business processes that are expected to benefit from these investments. The problem of how to build potentials models has been discussed elsewhere (e.g., vom Brocke et al. 2009), so this chapter focuses on how the information provided by potentials models can be leveraged to assess the financial performance of investments in ECM technology. In particular, the assessment reports the *return on process transformation* (ROPT) as a measure of the expected profitability of a process transformation.

The next section reviews research on IT value assessments and positions our ECM assessment approach in a process theory on IT value that explains how IT can create business value on a general level. Subsequently, we introduce the concept of potentials modeling and the ROPT, which are central to our ECM investment justification approach. We then demonstrate how this approach has been applied at Hilti Corporation in an ECM-driven transformation of sales processes. We conclude the chapter with a short summary and an outlook on future research.

Theoretical Lens on Justifications of ECM Investments

Within the information systems discipline there are many studies that are concerned with the problem of assessing the value of IT. Scientific studies related to this problem have come to controversial conclusions, so research results on IT

value are sometimes ambiguous (Im et al. 2001). By the end of the 1980s, researchers began to analyze the relationship of IT investment and productivity systematically on a macroeconomic level. As a result, they pointed to the "productivity paradox" (Brynjolfsson 1993), signifying a neutral or even negative effect between IT investments and productivity measures. Carr (2003) even held that IT investments generally would not contribute to generating competitive advantage since IT had become a commodity accessible to every potential competitor. However, current research acknowledges that IT can generate value at several loci in an organization: (1) the local firm (2) the competitive environment, and (3) the macro environment. [For an overview of related work see Melville et al. (2004)].

Recent studies on IT value adopt a process perspective to analyze the value impact of IT investments (Davamanirajan et al. 2006; Ray et al. 2007). Today, the question is less *whether* IT contributes to business value creation, but *how* the IT value added can be realized (vom Brocke et al. 2009). This question is particularly valid in terms of ECM investments, as decision makers might be less concerned with the technological possibilities of ECM systems than with how these possibilities potentially affect business routines and practices and how current practices can be transformed to improve organizational performance. For example, decision makers could ask about the benefits of having digital content tagged with metadata and how a policy of compulsory generation and use of metadata would affect business process performance and organizational performance. Would an accelerated search time justify the effort it takes to tag all digital content with metadata? What potential economic benefits can be leveraged by redesigning or streamlining existing processes by making use of ECM systems? Ultimately, a decision maker wants to understand how ECM investments translate into economic benefits.

Several theories have been proposed to describe and explain how IT investments affect organizational performance. Figure 1 shows Soh and Markus' (1995) process theory, a synthesis of prior theories that aims at describing and explaining how IT expenditures contribute to value creation in organizations. Soh and Markus' (1995) process theory can serve as a lens through which to evaluate investment decisions regarding ECM systems. It assumes that IT investments and organizational performance are related through a chain of three processes (cf. Soh and Markus 1995): (1) the IT conversion process, (2) the IT use process, and (3) the IT competitive process. More specifically, the theory specifies events that must occur and conditions that must be fulfilled in order to achieve some degree of competitive advantage from IT investments.

Within the *IT conversion process* IT expenditures are transformed into usable IT assets. Not all organizations are effective in performing this process (also referred to as the process of *IT management*); some organizations create useful application portfolios with more depth and breadth and establish more efficient IT infrastructures than others do (Soh and Markus 1995). Therefore, an IT expenditure is a necessary but not sufficient condition for obtaining useful IT assets. The deployment and implementation of complex ECM systems is a good example of such a conversion process. The implementation of a full-blown ECM system

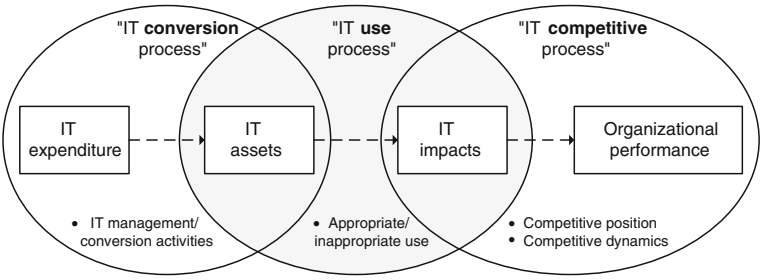

Fig. 1 How IT creates business value: a process theory (cf. Soh and Markus 1995, p. 37)

requires a significant investment in terms of technical infrastructures, training of employees, and time, so productive use of ECM systems might not be realized until months or even years after an investment decision is made, not primarily because of technical complexities but often because of "soft" factors like resistance to change or inappropriate IT applications to support specific tasks. In this regard, cultural factors play an important role in the conversion process to manage change. Examples from the ERP (Enterprise Resource Planning) system domain show that organizations often fail to master the IT conversion processes (see, for example, Bingi et al. 1999; Hong and Kim 2002; Jarrar et al. 2000; Kim et al. 2005; Markus et al. 2000).

A successful conversion process is a necessary condition for obtaining useful IT assets. The potential of IT assets to change work procedures and business processes is exploited in the *IT use process*. IT impacts may depend on the quality of the IT purchase decision and how well business activities are coordinated, new products and services are created, business processes are (re-)designed, and compliance with regulatory requirements is improved (cf. Soh and Markus 1995). Assessment of direct impacts of IT assets on business processes is vital in the IT use process, as the possession of potentially useful IT assets does not guarantee that they have a positive impact on process execution with regard to cost, quality, or time dimensions. Moreover, a successful IT use process requires employees skilled and motivated to use quality IT assets appropriately, without whom process performance is likely to remain unchanged or even to decline.

Having established an appropriate IT use process is a prerequisite for improving organizational performance through the *IT competitive process*. In the IT competitive process the direct IT impacts that materialize during the IT use process are exploited and transformed into competitive advantage and improved organizational performance. The mere realization of IT impacts (e.g., better process performance in terms of time, quality, and output) is not sufficient to create competitive advantage. For example, if IT impacts are exploited only after competitors have realized similar impacts, then IT investments' "potential bottom line results might be competed away" (Soh and Markus 1995, p. 36).

Ultimately, IT assets affect how processes are executed, either directly or indirectly, so it is not surprising that IT value research increasingly highlights the

significance of a business process analysis for evaluating the economic consequences of IT investments. For example, Davamanirajan et al. (2006, p. 67) hold that IT assessments at the business-process level afford several benefits: (1) they account for the impacts of IT investments on the effectiveness of affected processes, (2) they enable the tracing of process performance to individual IT assets, and (3) ultimately IT investment decisions made at the process level.

Applying a process-level analysis to an ECM system investment requires determining which processes benefit from such a system, why they would benefit, how important these processes are in the organization (e.g., for achieving competitive advantage or regulatory compliance), and which tasks the system is meant to support. The importance of and need for process analysis notwithstanding, such process-level analysis remains in its infancy (Davamanirajan et al. 2006).

The theoretical framework shown in Fig. 1 can inform a process-oriented economic justification of ECM investments by drawing a decision maker's attention to three areas of concern: (1) *why* to invest (generate economic impacts), (2) *how* to leverage IT resources to generate economic impacts (via business processes), and (3) *what* IT resources to acquire. Figure 2 presents an exemplary template that corresponds to the theoretical framework in Fig. 1 and that can be used by decision makers as either a pre-assessment tool for anticipating the economic potential of ECM investments or as a tool with which to present a summary of an IT investment proposal. The pre-assessment template requires a decision maker to explicate not only required IT assets but also necessary investments on the process and corporate levels. The framework highlights the central role of business processes since it commands a decision maker to first explicate the economic opportunities and challenges that emanate from the processes affected by an IT investment.

Once a decision maker has assessed an IT investment on a high level of abstraction, subsequent analyses can focus on calculating economic measures in order to make the economic consequences of such an investment transparent. The remainder of this chapter presents an evaluation method that uses *potentials models*, a specific type of process model, to trace IT-level impacts on both a process level and a corporate level. In particular, this method facilitates a detailed analysis of the financial consequences of an ECM investment in terms of the ROPT. The next section introduces the steps to be taken to calculate the ROPT and uses a case study of an ECM-driven process transformation at Hilti Corporation to explain how the ROPT can be calculated.

Potentials Modeling and the Return on Process Transformation

An element that is particularly challenging for IT value assessments on a process level is that of determining the right to-be design—that is, explicating the IT impacts in a process. What is most demanding in practice is not the description of

Description of IT investment scope and targets		
Opportunities and challenges of IT-driven process transformations (as-is situation)		
Description of value creation through IT investment		
Direct effects on **IT infrastructure**	Direct effects on **business processes**	Indirect effects on **competitive advantage**
Investments: - Hardware - Software - IT skill development - Planning and preparation of *IT investment decision*	**Investments:** - Employee training and skill development - Planning and preparation of aspired impacts of *IT investment decision* on process behavior	**Investments:** - Planning and preparation of aspired impacts of *process transformation* on competitive advantage
Expected benefits: - Expected increase of IT performance measures in terms of IT productivity, IT costs, IT quality	**Expected benefits:** - Expected increase of process performance measures in terms of time, costs, or quality - Expected increase in employee satisfaction	**Expected benefits:** - Expected increase of competitive advantage in terms of revenue, costs, market share, product/service quality - Expected increase in customer satisfaction
Anticipated interdependencies: *IT* - Interference with existing solutions - Pre-conditions that must be met prior to investment	**Anticipated interdependencies: *processes*** - Interference with related work practices - Pre-conditions that must be met prior to process transformation	**Anticipated interdependencies: *corporate level*** - Interference or conflict with other corporate goals - Impact on regulatory compliance issues

Fig. 2 Pre-assessment template for an initial justification of IT investments

to-be models but the search for the desirable to-be state. How can one ensure that one to-be process is superior to another? Conventional business process management (BPM) literature provides little guidance for this essential task. Likewise, IT value literature provides little guidance with which to signify IT impacts in to-be models. Most of the recommendations that are available are qualitative and abstract; for example, the recommendation to avoid waste in the context of lean management (Ohno 1988) helps to identify ideas on how to improve processes incrementally. However, such recommendations provide little guidance for how to compare alternative process designs in terms of their contributions to the expected economic consequences.

Today's decision makers (process designers, IT managers) face complex design alternatives that must be evaluated but that are increasingly difficult to understand intuitively. How can a firm leverage cloud computing? How can a firm design mobile applications? Finding the answers to such questions involves myriad partial decisions with diverse relevant parameters. Hence, at least semi-formal *decision models* must be designed in order to help decision makers design and calculate

alternative process variants. The derivation of to-be process variants from as-is models is seldom straightforward. *Potentials models* help in this regard and facilitate evaluation of the economic consequences of alternative process designs (vom Brocke et al. 2009).

Potentials modeling (Fig. 3) provides decision support in process-redesign initiatives by integrating methods that facilitate the computation of the ROPT for specific design alternatives, taking into account specific parameters of process designs. Therefore, potentials models are process models enriched with information on economic consequences and possibilities for process improvements. They describe a set of feasible to-be models together with their potential impact on a set of entities that are deemed to be relevant in a decision context.

A potentials model covers relevant design alternatives to be compared in terms of their value propositions in a specific organizational situation. In terms of decision theory, an alternative is one of multiple exclusive decision choices (Grob 1993). In the course of an information systems (re-)design, several potentials models are compared in order to identify the most beneficial alternative. The concept of potentials modeling distinguishes *factual and value-oriented potentials* as follows:

1. The *factual specification* of design alternatives forms the foundation for further analysis. To use an ECM example, factual specification captures alternative ECM system functionalities for supporting individual tasks and possibilities for business process redesign based on an ECM system's potential to reintegrate certain tasks.
2. The economic consequences associated with the design alternatives are documented and consolidated in *value-oriented potentials models* (e.g., by means of financial measures).
3. On that basis the alternatives can be *compared* and design decisions can be modified.
4. Such an evolutionary approach makes it possible to create, compare, and modify potentials models until an alternative has been identified that is beneficial from the decision maker's perspective. This alternative is the *to-be model* for the subsequent implementation.

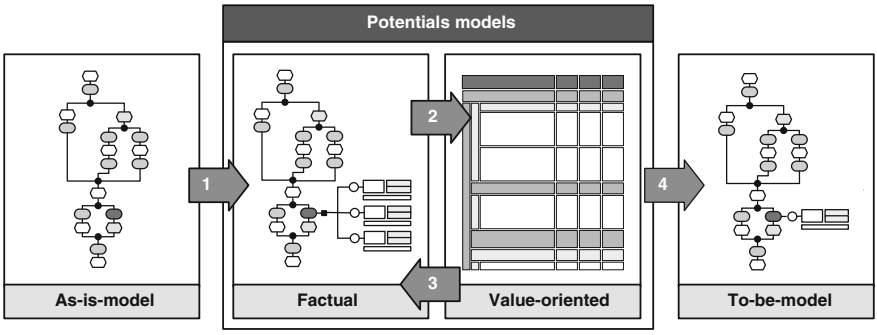

Fig. 3 Finding to-be models via the evaluation of potentials models (cf. vom Brocke et al. 2009)

As a key measure, the ROPT can serve as an example with which to evaluate the performance of an alternative process design (Fig. 4). The ROPT is a ratio between (1) the expected profit (or savings) of an investment plus the implied interest on debt and (2) the investment outlay, consisting of internal and external funds raised to finance the investment. In order to calculate the ROPT of an alternative process redesign, the cash flows resulting from both the potential return and the required investment must be specified (Fig. 4):

- *Assessing the return:* To quantify the return from a process redesign or transformation, *total payments of process ownership* (TPPO), both with (process *p'*) and without (process *p*), are computed (level 0 and 1). The return is then obtained by subtracting the TPPO of *p* from the TPPO of *p'* (i.e., $TPPO_{p'} - TPPO_p$). A special case occurs if the TPPO of process alternatives consists only of out-payments (i.e., the expected cash flow is negative for all periods in the

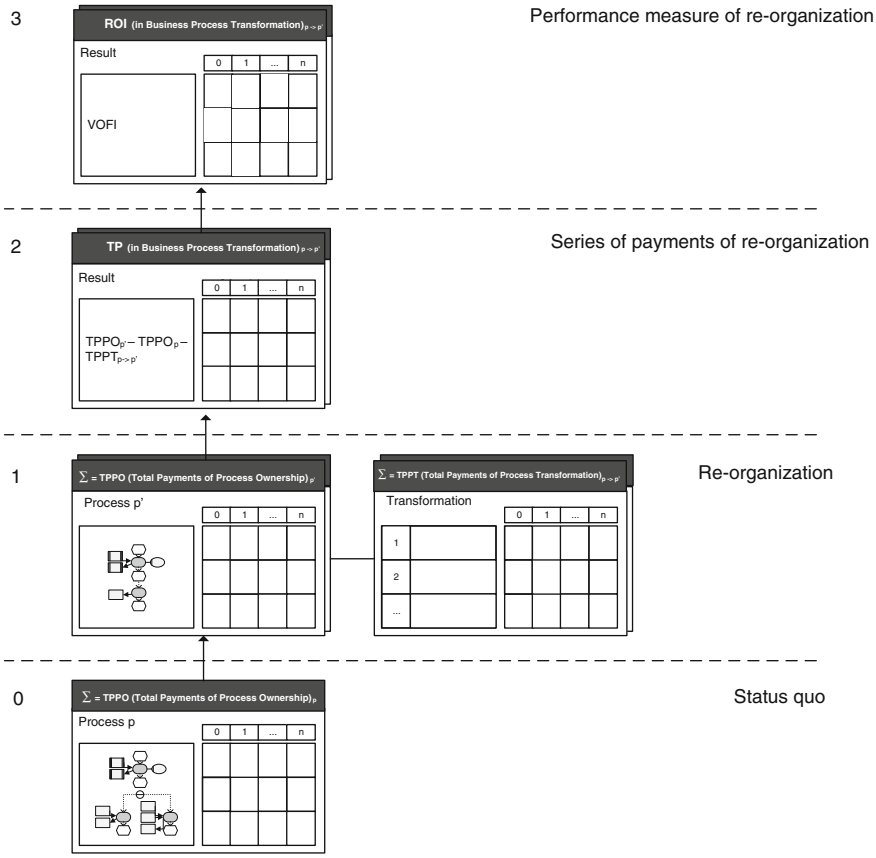

Fig. 4 Framework for calculating the ROPT

planning horizon, which is common in total cost of ownership analyses). In such cases the difference between the two series of payments can be interpreted as the *potential savings* that can be realized from a process transformation.

- *Assessing the investment:* The investment is operationalized by the total payments required to conduct the transformation from process p to p'—that is, the *total payments of process transformation* (TPPT). The TPPT include, for example, initial payments for licenses but also the cost of the effort entailed in communicating and training new practices and maintenance of the technical infrastructure.

In order to assess TPPO and TPPT, one must take into account *long-term economic consequences*. Hence, a dynamic calculation must be carried out that considers a planning horizon of multiple periods (typically around five years). Summing the return ($TPPO_{p'} - TPPO_p$) and the investment in a process transformation (TPPT) computes a representative series of payments that are implied by a potential redesign alternative (level 2).

This series of payments, called original payments, is the foundation for computing the *supplementary payments* that result from financing the series of payments. Supplementary payments include, for example, interest and tax rates. Since the economic effects of the process transformation have been aggregated into one representative series of payments, well-established methods from capital budgeting, such as the net present value (NPV), the pay off period, and the return on investment (ROI), can be applied (Grob 1993; vom Brocke and Grob 2011). The details of calculating a dynamic ROI based on the method of *visualization of financial implications* (VOFI) is presented in detail in the application section.

Various *levels of detail* can be applied to calculate the TPPO, but a two-stage approach is often useful in practice in which a rough calculation based on expert opinions is followed by detailed calculations of selected aspects of the assessment. Process models can serve as a basis for the detailed calculation to analyze resource utilization and the frequencies of certain process branches (vom Brocke et al. 2010b).

The principles underlying such a detailed calculation of the TPPO based on process models are shown in Fig. 5. Input factors for both consumption and usage must be distinguished in order to calculate the payments associated with a particular process. Factors of consumption are objects that are consumed by functions, while factors of usage (also referred to as processors) are objects of input that serve as resources for processing a function. Out-payments of a function consist of payments resulting from usage of objects, as well as from the consumption of input objects when executing a function. In order to calculate payments for input objects the amount (and type) of the objects applied in the function must be accounted for. In order to assess out-payments, the amounts are multiplied by the per-unit cost of input objects. Payments for resource objects are calculated according to the frequency-of-utilization principle—that is, resource utilization is defined as a percentage or as a relationship between resource units that are used by a function and the total sum of all resource units available in a period. Payments related to

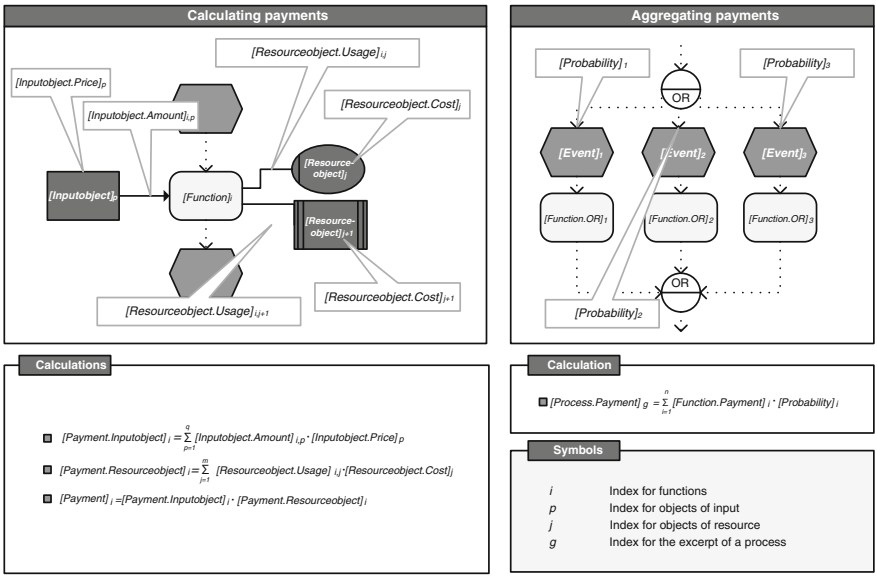

Fig. 5 Principles for calculating and aggregating payments associated with a process design (vom Brocke et al. 2010b)

functions are aggregated for each process and each period in the planning horizon. In the case of process branches, the probability that particular branches will be entered should be considered. To specify such probabilities, relative frequencies can be estimated in which events recur when the process is instantiated multiple times.

Prior research has provided models with which to evaluate the ROPT for a wide range of process transformation projects, including leveraging outsourcing and out-tasking (vom Brocke 2007) and setting up virtual communities in the context of customer relationship management activities (vom Brocke et al. 2010c). However, while the ROPT is an important measure for decision support in process redesign, its information on the financial implications of a decision should usually be complemented with a wide range of quantitative and qualitative decision criteria. Once a decision for a to-be process transformation has been made, the calculation of expected original and supplementary payments can serve as a tool for investment control and as a means to reassess continually the profitability of a process-transformation project.

The next section presents the calculation of the ROPT of an ECM systems implementation at the Hilti Corporation, which shows how the company justified investments in ECM technology to transform and improve sales processes. In particular, it is demonstrated how TPPOs of process design alternatives are calculated and subsequently aggregated according to the level structure shown in Fig. 4. The calculation of the ROPT makes use of the VOFI capital budgeting method (Grob 1993).

Justification of an ECM-Driven Transformation of Sales Processes at the Hilti Corporation

Case Description

The Hilti Corporation is a leading company for products, systems and services for the construction industry in more than 120 countries around the world. Hilti evolved from a family company founded in 1941 in Liechtenstein to become the Hilti Group, which has approximately 21,000 employees today. Hilti established a business model which includes direct sales that serves five sales channels: (1) Hilti centers, (2) territory salespersons, (3) customer service, (4) e-business, and (5) Hilti ProShops. Hilti also established a high-level process to offer *professional services* after sales like repair services and fleet management. In fact, although it is a leading manufacturer of power tools and accessories, in terms of headcount, Hilti is a service company with the majority of its employees involved in direct sales or customer service. As in many other companies, building sustainable customer relationships is important, which is also reflected in Hilti's mission statement: to "passionately create enthusiastic customers" (cf. vom Brocke et al. 2010a). In the following discussion we refer to the processes subsumed under market reach and professional services as *sales processes*.

Because of the significance of its sales processes, Hilti constantly seeks opportunities for *incremental process transformations* (process improvements). As in the case described here, process transformations at Hilti are frequently driven by innovations in Hilti's IT infrastructure (as reported in more detail in vom Brocke et al. 2010a). In the case at hand, Hilti also sought to leverage further the economic potential residing in the standard processes of handling proof of delivery and repair orders within the *order process* (Fig. 6). Process instances differ only in the type of document created and processed by individual process activities, so the order process is considered a standard process in the Hilti centers, facilities where a customer can buy tools or take tools for repair. The order processes are supported by the SAP™ ERP system, where tool orders and repair orders are entered into the system.

Before the process transformation project began (i.e., the as-is situation), customers were required to sign a printed document in the form of either a delivery note or a repair order form after an order was created. Because of regulatory compliance requirements, up to three printed copies of these signed documents had to be created and archived: one copy was given to the customer, one was archived and remained at the Hilti center (see process interface "Archive order documents at Hilti center"), and one was sent to the headquarters of the market organization via postal mail and was archived there (see process interface "Archive order document at headquarters"). The process description in Fig. 6 also depicts the IT resources used in the process, as well as the expected economic impacts on a corporate level.

Expected economic impacts are specified in terms of time/costs, quality, and economic commitments. These impacts occur at specific points in time in the

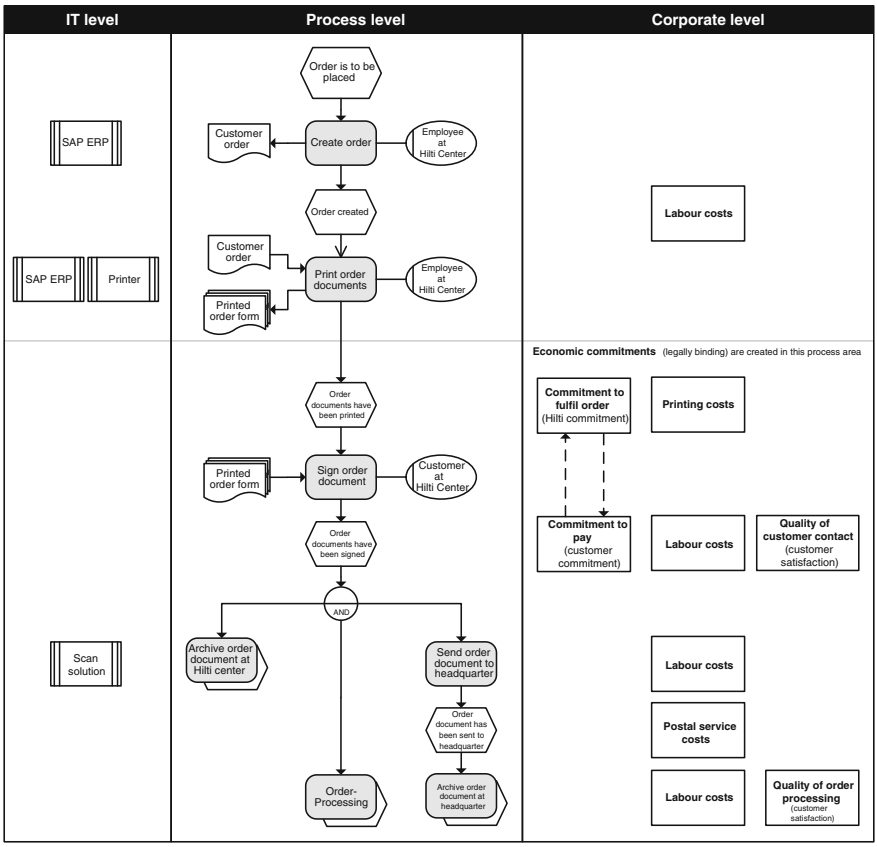

Fig. 6 As-is process for handling delivery notes and repair orders at Hilti centers

context of *process events* (cf. vom Brocke et al. 2011b). For example, direct labor costs that are incurred when an employee executes an activity can be calculated by determining the time between the start and end events of an activity multiplied by a specific labor cost (see calculation scheme in Fig. 5). Likewise, the costs for sending a printed order form copy to the headquarters is incurred when the copy is sent, and printing costs are incurred when order forms are printed.

Relevant process quality impacts occur throughout customer interactions and downstream order-processing activities. The most significant economic impact created by the process in Fig. 6 materializes in economic commitments. An economic commitment denotes an intent to sacrifice or obtain a scarce resource at some future point in time. The two commitments created in this process are the customer's commitment to *pay for an order*, and Hilti's commitment to *fulfill a customer order*. The signed proof of delivery and repair order document is of particular significance here since it documents these commitments and makes them legally binding (i.e., a contract is created) for both parties. Based on these

documents, Hilti has proof of delivery, stating that a particular customer has received the goods and the customer has committed to pay for the goods. The process depicted in Fig. 6 creates economic commitments but contains no event that represents a fulfillment of these commitments, so downstream business processes that create the events that denote the fulfillment of these commitments must be ensured. The expected economic value of a commitment (ex ante value) can be expressed in terms of accounting aggregates (accounts receivable, accounts payable). It is assumed here that the expected economic impact of a commitment equals its expected economic value, but the actual economic impact of a commitment (ex post value) can deviate from the expected economic value if the commitment has been only partially fulfilled at a specific point in time.

A closer look at the process model in Fig. 6 identifies some potential areas of improvement, the most obvious of which resides in the process related to the document management activities. These activities are comprised of redundant tasks that consume a significant amount of resources for printing, sending, and archiving (e.g., printing assets, archiving facilities, labor).

Another, more subtle, potential for improvement relates to the expected value of economic commitments. Although order entries reside in the Hilti ERP system, signed order forms are stored outside the ERP system, so information on economic commitments is partially contained in the ERP system and partially in a physical archive. The partial availability of information on economic commitments significantly affects the downstream fulfillment of interrelated commitments (e.g., detection of incomplete customer payments for a particular order, handling of customer complaints that are due to erroneous order delivery notes). An ECM solution could integrate the order document management activities with the ERP system, thereby maintaining compliance and at the same time increasing the efficiency of the document-handling activities.

The size of the potential for improvement by means of an ECM solution is discussed in detail in the following section. Subsequent sections provide an account of the monetary benefits of the realized ECM-driven process transformation through a profitability analysis.

ECM-Driven Process Transformation and Expected Benefits

Documenting economic commitments and safeguarding compliance in the customer service process depicted in Fig. 6 involves redundant manual archiving activities at both the Hilti centers and the headquarters. Manual archiving is prone to errors, and searching for physical documents in case of complaints, order cancellations, or overdue payments in the downstream business process, “Order processing”, are time-consuming and sometimes fail, making it impossible to fulfill a repair commitment or enforce payment commitments. In particular, lost proofs of delivery can lead to cancellations of orders, decreasing expected revenue. Manual archiving is also inconvenient from the customer’s point of view, as

missing documents increase the time required to handle customer requests. Therefore, the process in Fig. 6 offers some potential for improvement in terms of general quality measures like customer satisfaction and economic measures like costs and revenue.

The improvements in the order process at the Hilti centers should be driven by *digitizing order documents* (proof of delivery documents and repair orders) and by inclusion of the customers' *biometric signature data* into digital documents to eliminate the error-prone manual archiving activities. The digital handling of order documents should be facilitated by a *document management server* and a *signature pad solution*, which could be integrated into the SAP™ ERP environment at Hilti.

Taken together, four types of potential improvements have been identified that can be attributed to the ECM solution: (1) cycle time reduction by eliminating postal services, (2) reduction of printing effort through digitalizing documents, (3) reduction of order cancellations, and (4) maintaining compliance. Moreover, productivity gains are expected through further standardizing the archiving process by means of a standardized document format for delivery notes and repair orders and by making the newly transformed order process mandatory throughout Hilti centers worldwide. The to-be process structure is sketched in Fig. 7, while the resulting to-be potentials model is shown in Fig. 8.

The process transformation reflected in the to-be process model (Fig. 7) substitutes the manual archiving activities with a single activity, "Archive order documents." Once an order is created, the delivery of the order is automatically triggered through the ERP system and the order from is displayed on a signature pad and a screen at the point of sale. The "Sign order" activity no longer requires that paper be printed out (printing is optional). The customer signs on the signature pad, which integrates the biometric signature data with the digital order document. The relevant document-handling activities (signing proof of delivery or repair orders, archiving signed order documents) are completely integrated within Hilti's ERP system (Figs. 7 and 8). The ECM solution ensures that digital order documents are directly related to an order transaction of the ERP system, mitigating the risk of lost order documents and giving service personnel immediate access to archived order documents in case of customer complaints or inquiries. The ECM solution also increases the efficiency of the document-handling activities by reducing the time spent in sending physical documents from Hilti centers to the headquarters. Furthermore, Hilti can save costs related to printing order documents and to sending and receiving documents via postal mail (Fig. 8).

Several transformation activities are required in order to leverage the envisioned benefits and implement the improved processes at all Hilti centers (Fig. 9). Since the process transformation is mainly driven by an ECM solution, a significant part of the transformation effort is required on the IT level. For example, the document server component must be implemented, integrated into the SAP™ ERP environment, and tested, and hardware and software components (including licenses) must be provided and installed in the Hilti centers. On a process level, transformation activities include the design and roll-out of the redesigned processes, and user training and process testing is required. Finally, on a corporate

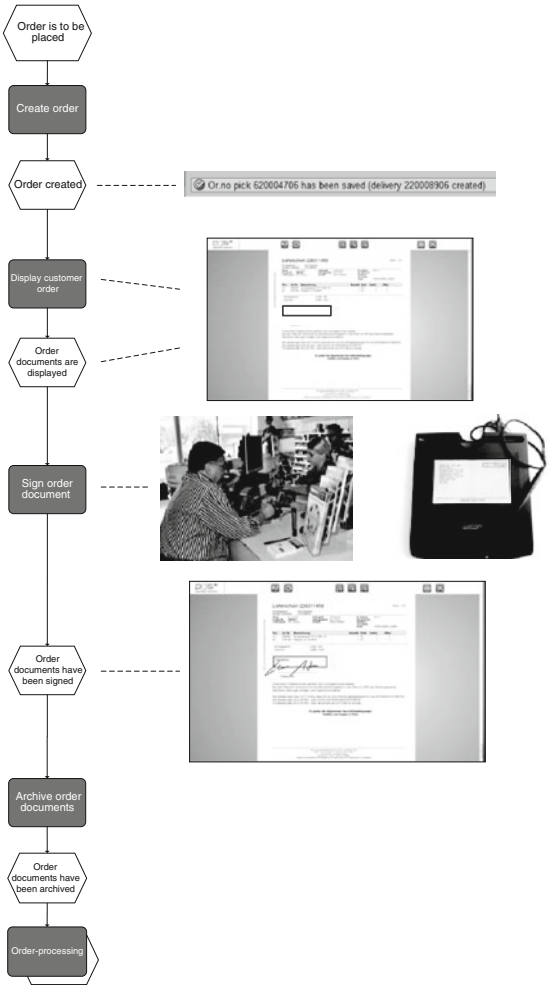

Fig. 7 Simplified structure of transformed process for handling delivery notes and repair orders

level, transformation activities include planning and aligning the expected goals for the process transformation across all market organizations.

Figure 9 summarizes the scope, targets, and expected benefits of the process-transformation activities by means of a *qualitative pre-assessment*. While no significant benefits are expected on the IT level from an investment in this specific ECM solution, benefits are expected to occur on a process level, where the ECM solution enables more efficient processes, and on a corporate level. This phenomenon that IT benefits occur only indirectly through business processes can often be observed in practice when IT investment decisions have to be justified. The consideration that IT impacts are mediated through business processes is also consistent with results of research on IT value. (See the discussion above and Davamanirajan et al. (2006) and Melville et al. (2004).)

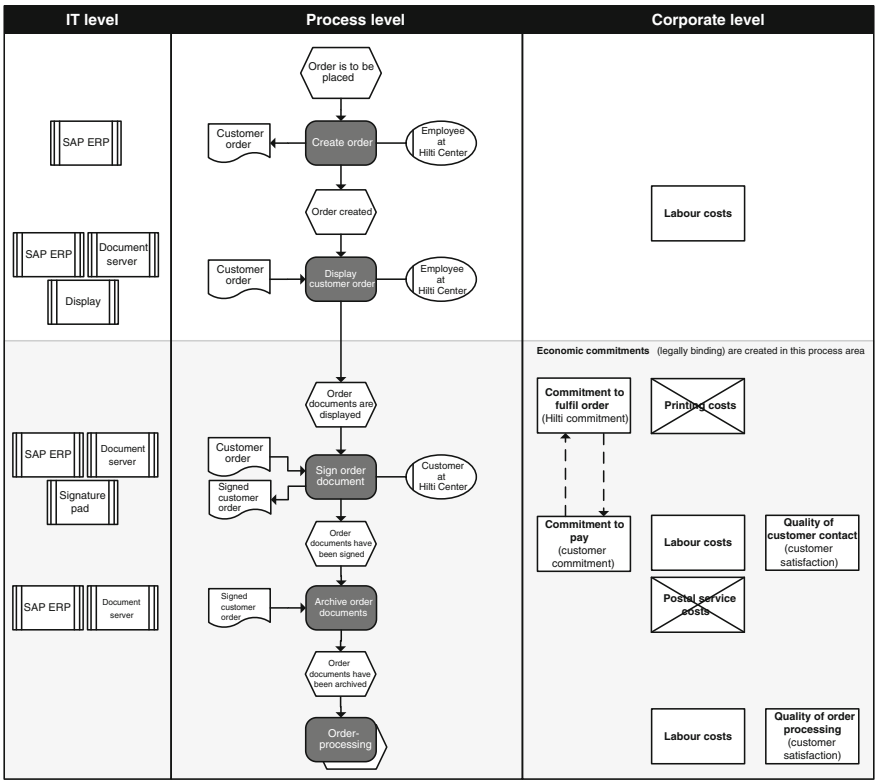

Fig. 8 To-be potentials model (factual) for handling delivery notes and repair orders at Hilti centers

The pre-assessment in Fig. 9 also considers possible spill-over effects of the ECM investment decision. However, as these effects are not easily attributable to a single investment decision (particularly on a corporate level), they are excluded from the subsequent analysis. The qualitative pre-assessment provides the categories for a detailed evaluation of the ECM-driven process transformation in monetary terms on the IT, process, and corporate levels. The following sections analyze in detail the expected financial consequences and effect on profitability of this process transformation. The profitability is reported as the ROPT.

Calculating the Series of Payments with Potentials Models

The relevant monetary effects of the expected series of payments that result from the process transformation are calculated on the IT, process, and corporate levels. In particular, the measurement includes payments associated with the investment

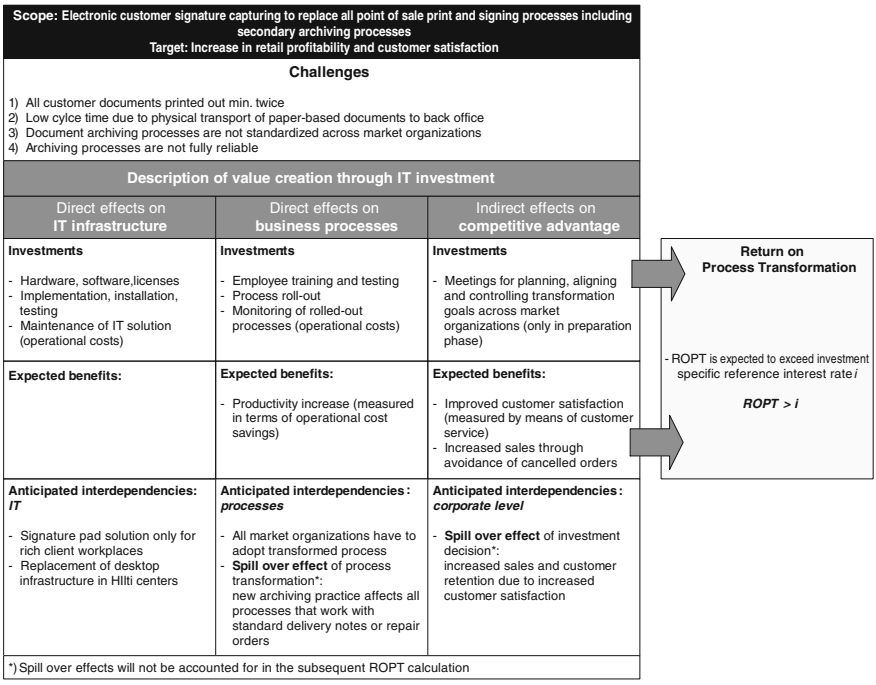

Fig. 9 Qualitative pre-assessment of the ECM investment for a particular market organization at Hilti

into the process transformation (TPPT) and the expected monetary benefits of the process transformation ($TPPO_p$–$TPPO_p$).

Figure 10 provides an overview of the expected monetary consequences of the process transformation. The payments and quantities shown in Fig. 10 do not represent the real figures of the case for privacy reasons, but the order of magnitude of these figures is comparable to the figures of the case. The subsequent calculations reflect the investment decision made for seven pilot market organizations.

Payments related to investments on the IT, process, and corporate levels are expected to occur in the initial period, 0. The calculation of the expected benefits on the process level was conducted according to the calculations scheme presented in Fig. 5. The TPPT is comprised of all IT-level payments and payments attributable to the transformation effort on the process level. The TPPO is reported here as expected savings realized from the new process.

An additional high-level activity, “Handling complaints”, is considered on the activity level. This activity is not contained in the process models in Figs. 6, 7, 8, but complaint-handling activities are affected by the process transformation since it is expected that the number of cancellations can be decreased because of the improved availability of customer order data. A decrease in the number of cancellations directly translates into decreases in back-office working hours at the headquarters. It is assumed that human resource capacity for handling invoices is

Series of payments for process transformation						
Period	0	1	2	3	4	5
IT level	**- 218'800**	**- 5'000**	**- 2'500**	**- 1'400**	**- 1'400**	**- 1'400**
Hardware	*- 131'100*					
Signature pad						
price (EUR/unit)	- 240					
* required units (for 7 market organizations)	190					
= signature pad harware outlay	- 45'600					
Desktop replacement						
payment (per Hilti centre)	- 450					
* required replacements (for 7 market organizations)	190					
= desktop replacement outlay	- 85'500					
Software	*- 51'300*					
Signature pad						
price (EUR/license)	- 270					
* required licenses (for 7 market organizations)	190					
= signature pad software outlay	- 51'300					
Implementation	*- 36'400*					
Installation						
travelling expenses (per market organization)	- 5'200					
* number of market organizations	7					
= traveling exenses due to installation	- 36'400					
Maintenance		*-5'000*	*-2'500*	*-1'400*	*-1'400*	*-1'400*
Expected traveling expenses (for 7 market organizations)		-5'000	-2'500	-1'400	-1'400	-1'400
Process level	**- 9'000**	**49'600**	**53'920**	**58'356**	**60'914**	**63'599**
Transformation effort	*- 9'000*	*-4'000*	*-2'000*			
Training (expenses for workshops)	- 5'000					
Roll-out (traveling expenses for coordination)	- 4'000	-4'000	-2'000			
Activity-level payments		*53'600*	*55'920*	*58'356*	*60'914*	*63'599*
Sign order document		12'000	12'600	13'230	13'892	14'586
Savings for paper/printing						
number of orders (in 7 market organizations)		120'000	126'000	132'300	138'915	145'861
* costs for print/order (incl. postal mail)		0.10	0.10	0.10	0.10	0.10
= savings		12'000.00	12'600.00	13'230.00	13'891.50	14'586.08
Archive order documents		27'200	28'200	29'250	30'353	31'510
Savings due to automatization						
number of orders (in 7 market organizations)		120'000	126'000	132'300	138'915	145'861
* cost charge per hour for employee at head quarter		10	10	10	10	10
* time to archive order (in hours)		0.0167	0.0167	0.0167	0.0167	0.0167
= savings		20'000	21'000	22'050	23'153	24'310
Savings due to reduced physical space for archiving						
archiving service facility rate/month		600	600	600	600	600
* month per period		12	12	12	12	12
= savings		7'200	7'200	7'200	7'200	7'200
Handling complaints		14'400	15'120	15'876	16'670	17'503
Savings from reduced search effort for order documents						
number of complaints in percent of orders (in 7 market organizations)		1%	1%	1%	1%	1%
* number of orders (in 7 market organizations)		120'000	126'000	132'300	138'915	145'861
* cost charge per hour for employee at head quarter		12.00	12.00	12.00	12.00	12.00
= savings		14'400	15'120	15'876	16'670	17'503
Corporate level		**18'000**	**18'900**	**19'845**	**20'837**	**21'879**
Savings due to reduction of cancelled invoices						
cancelled invoice value (in % of sales according to internal analysis)		0.0090%	0.0090%	0.0090%	0.0090%	0.0090%
* sales		200'000'000	210'000'000	220'500'000	231'525'000	243'101'250
= savings		18'000	18'900	19'845	20'837	21'879
Total:	**- 227'800**	**62'600**	**70'320**	**76'801**	**80'351**	**84'079**

Fig. 10 Series of payments for the ECM-based process transformation

increased by such time savings. Therefore, employee costs for the back office are treated as a variable in this particular situation. The same argument holds for the calculation of labor savings for the "Archive order documents" activity.

The expected decrease in the number of invoice cancellations increases expected sales and positively affects revenue. This effect is considered on the corporate level.

As is clear from looking at the total series of payments, the investment into the ECM solution is beneficial, as the initial investment outlay of 227,800 € is regained over the planning horizon of five periods (years). However, to provide a rational basis for the investment decision and to make the expected performance of the investment comparable to the organization's competing alternative investment projects, financial performance measures must be calculated. This is presented in the next section using the VOFI method (Grob 1993; vom Brocke and Grob 2011).

Visualization of Financial Implications

The VOFI method (Grob 1993) is applied here to make the financial consequences of an investment decision transparent. Inputs to VOFI are the series of payments, conditions of funding and re-investment, and tax conditions. With this additional financial information, VOFI aggregates the series of payments over time into financial performance measures like the NPV and the dynamic (multi-period) ROI. The aggregation is done in a VOFI table (Fig. 11; Grob 1993).

Visualization of Financial Implications (VOFI)						
Point in time	0	1	2	3	4	5
Series of payments	-227'800	62'600	70'320	76'801	80'351	84'079
Internal funds						
+ initial balance						
- withdrawal						
+ deposit						
Bullet loan						
+ credit intake	20'000					
- redemption			20'000			
- debit interest (6 %)						
(incl. disagio 5%)	2'000	1'200	1'200			
Loan in current account						
+ credit intake	209'800					
- redemption		32'400	21'348	48'941	56'375	
- debit interest (8%)		27'274	23'062	20'287	13'924	
Financial investment						
- re-investment					0	13'931
+ disinvestment						
+ credit interest (6%)						0
Tax payments						
- tax due		1'727	4'709	7'574	10'052	12'816
+ drawback						
Net funding balance						
Balances						
on bullet loan	20'000	20'000				
on loan in current account	209'800	177'401	156'052	107'111		
on financial investment					0	13'931
Net Balance	-229'800	-197'401	-156'052	-107'111	-50'736	-13'931

Calculation of tax due					
Point in time	1	2	3	4	5
cash flow	62'600	70'320	76'801	80'351	84'079
- interest expenses	28'474	24'262	20'287	13'924	
+ interest yield					0
- depreciation	26'220	26'220	26'220	26'220	26'220
- depreciation on disagio	1'000	1'000			
Tax base	6'906	18'838	30'294	40'207	51'263
drawback					
tax due	1'727	4'709	7'574	10'052	12'816

Calculation of depreciation					
Point in time	1	2	3	4	5
book value at the beginning of the year	131'100	104'880	78'660	52'440	26'220
depreciation	26'220	26'220	26'220	26'220	26'220
book value at the end of the year	104'880	78'660	52'440	26'220	

Fig. 11 Visualization of the financial implications (VOFI) of the ECM investment

The series of payments is listed at the top of the table, followed by the financing conditions. For each period the account balance must equal zero, so negative payments (out-payments) in a period are compensated for with internal or external funds. Positive payments (in-payments) in a period are used to serve loan interests, to redeem loans, or to reinvest free cash flows. At any point in time, the VOFI reports on the current capital stock, which is comprised of raised funds or reinvested cash flows. The net balance (the last row of the VOFI table) indicates the financial performance of an investment.

A periodic update of the capital stock must be calculated in order to aggregate the series of payments from Fig. 10 over time by means of VOFI. Starting in period 0, each period is calculated in a way that compensates for in-payments and out-payments. The following example illustrates the basic procedure. In period 0, an out-payment usually must be financed. If the internal funds available are insufficient, a loan must be taken out. In this case, two conditions for loans are available: a bullet loan and a loan in a current account. The bullet loan, which can be raised only in period 0, has an interest rate of 6 %, it must be redeemed in period 2, and a disagio of 10 % is applied on raising the loan. The loan in a current account, which can be raised any time, has an interest rate of 13 %. Financial reinvestments have an interest rate of 4 %, which is the interest rate of the opportunity in this case. No internal funds are available to finance the investment, and tax payments (or refunds) are calculated on the basis of a constant annual tax rate of 25 %. In calculating the depreciation, it is assumed that all hardware purchases are subject to depreciation (in this case, 131,100 € = 452,600 € (signature pad) + 85,500 € (desktop replacement)).

The VOFI in Fig. 11 indicates a net balance of 13,931 € in period 5, which is equal to the terminal value of the ECM investment at the end of the planning horizon. The pay-off period of the ECM investment is period 5 since the net balance is positive for the first time in this period. The dynamic ROI equals 8.16 %. (The calculation is not shown here, and the procedure for calculating this ROI is discussed elsewhere (Grob 1993)). Overall, the calculation confirms that the ECM investment contributes to creating monetary value, so it improves the financial performance of the analyzed processes within the planning horizon. Therefore, the decision to invest in an ECM solution is justified from a financial perspective. Because of the effects of the assumed financing and tax conditions, the positive effects of the process transformation (the positive payments from periods 1–5) do not occur immediately but only after a time lag. Therefore, although operational improvements are expected to occur quickly, financial value is created only after a period of five years in this case. (The VOFI net balance is positive for the first time in period 4.)

Summary and Outlook

This chapter presents the concept of potentials modeling and the ROPT to develop an approach to assessing the economic value of ECM systems. The application to a real-world example demonstrates its feasibility and potential usefulness for

justifying investments in IT, and ECM systems in particular. The approach presented here is process-oriented since it analyzes the economic consequences of ECM system investments on a business-process level. This level of analysis is considered appropriate since the benefits of IT investments and ECM systems emerge from their ability to support and facilitate the execution of business processes directly or indirectly.

By presenting and applying a value-assessment approach for ECM investments, we contribute to ECM research, which has received little attention in the IS discipline (Tyrväinen et al. 2006). Furthermore, the approach presented here is not restricted to the analysis of ECM investments but is a generalized framework that is applicable to a wide variety of IT investments. Its unique characteristic is that the assessment approach is centered on processes as the main unit of analysis. Our process-oriented assessment approach facilitates the explication and modeling of the potentials of a particular IT investment on a process level—that is, on the level where the impacts of IT investments can be measured directly. The approach allows one to assess IT investments both qualitatively (pre-assessment template) and quantitatively (financial measures, such as the ROPT). The chapter demonstrates by means of a real-world case how the assessment approach presented can been applied in practice and that it provides useful information for firms that need to justify IT investment decisions.

Future research may focus on refining the assessment approach in terms of providing relevant data about process parameters in a particular decision model (e.g., automatic provision of execution frequencies, provision of probability distributions, provision of relevant data on qualitative aspects) or with regard to supporting different levels of detail when analyzing potentials models. A promising approach may be to make use of event logs, which can be fed directly into an organization's accounting information system for the purpose of process-oriented profitability analysis (cf. vom Brocke et al. 2011b).

All in all, an investment into ECM systems should be justified not only based on functional requirements but also based on a performance analysis of the *use processes* of ECM systems (i.e., the business processes). Decision makers and IT managers concerned with IT investment decisions should not ask *if* IT creates value (Brynjolfsson 1993; Carr 2003) but *how* and *where* IT can create value in support of an organization's business processes.

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