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Abstract

The concept of Enterprise Content Management (ECM) represents 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. Based on a case study of a Norwegian oil company (Statoil) we identify a wide range of issues related to management of content, infrastructure and change. The ECM perspective is found to integrate and extend the existing research areas of information resource management and document management, as well as "the repository model" of knowledge management. ECM may thus deserve further attention beyond the current market hype as a potential area of IS research.

Keywords

Enterprise content management, information management, document management, knowledge management, infrastructure, change management, case study

1. Introduction

Content management is framed as an evolutionary step of information management, which integrates the management of structured, semi-structured, and unstructured information – and embedded pieces of software code – throughout the entire content life cycle in the organizational contexts of content production and utilization (Boiko 2002). The concept originates in the technologies of web content management, document management and digital asset management (Boiko 2002, Gingrande 2001). Accordingly, the current definitions focus on the functionality of content management technology:

"*ECM* [Enterprise Content Management] *is the technology that provides the means to create/capture, manage/secure, store/retain/destroy, publish/distribute, search, personalize and present/view/print any digital content (i.e. pictures/images/text, reports, video, audio, transactional data, catalog, code). These systems primarily focus on the capture, storage, retrieval, and dissemination of digital files for enterprise use.*" (Meta Group, in Weiseth, Olsen, Tvedte & Kleppe 2002).

Such institutions as IBM, Butler and Gartner Group estimate the content management market to reach between $3-10 billion per year in 2003-04 (depending whether related services are included). Consulting institutions publish reports on the content management market and products, and practitioner-oriented books have started to emerge (Boiko 2002, Nakano 2002). Professional associations focusing on the theme exist, such as AIIM International (www.aiim.org), and a number of IT vendors (e.g. IBM, Microsoft, Documentum, Vignette) are now providing "content management products" for the enterprise with varying software functionality. A practitioner community around the concept of ECM thus exists, representing considerable business potential for a cluster of vendors and consultancies.

The academic discipline of information systems (IS) has practically ignored the concept of ECM. The few articles we have been able to identify mainly report constructions of some technical functionalities in content management software (Kerer, Kirda & Kurmanowytsch 2002, Surjanto, Ritter & Loeser 2000) or purely conceptual suggestions (Goodwin & Vigden 2002, Han & Pape 2002). Fewer articles refer to an organizational context for content management. Hence, this paper seeks to identify issues related to ECM from the viewpoint of the enterprise. The second goal resides in a preliminary assessment of how these issues relate to the following "established" fields of IS research we assumed to be related with ECM: information resource management (IRM), electronic document management (EDM), and knowledge management (KM).

To gain an organizational viewpoint to ECM, we conducted a case study of Statoil, a Norwegian oil company, which has explicitly started to speak of "content management" as a strategic effort towards integrated knowledge resources throughout the corporation. The contribution from the paper is twofold: an exploratory case study on contemporary ECM issues from the viewpoint of the organization, and the positioning of these issues in relation to the more "established" fields of IS research, demarcating the possible standing of ECM as an area of IS research.

2. Background and Research Approach

2.1 Brief Presentation of Statoil

Statoil is the world's third largest exporter of crude oil, with approximately 16,600 employees in 25 countries and an operating revenue exceeding US $ 21,7 billions (2000). Statoil IT, with about 700 employees, is responsible for maintaining the large portfolio of IT applications in the company.

Statoil's main platform for document management and workflow is Lotus Notes, including a Notes-based "virtual project room" (*Sarepta Arena*), and an electronic archive. Numerous other applications are also used for file creation and data storage, including disciplinary applications and databases, intra- and extranet applications, and file structures in MS Office 2000. An ERP-solution (SAP) covers a proportion of business processes and related databases across the organization.

Typical for many decentralized corporations, Statoil's IT architecture has evolved gradually into a portfolio of technologies with partly overlapping functionality and applications. As a result, the company's information is currently scattered across a number of different storage media and applications, with the total number of databases estimated to exceed 5500 (Kleppe 2002b). This again creates major challenges related to information retrieval, version control and information quality across the enterprise.

2.2 Statoil's Vision for ECM

To address these challenges, Statoil has launched a major ECM initiative, constituting the core of the company's new "e-Collaboration strategy" (Weiseth et al. 2002). Statoil here adopts MetaGroup's definition of ECM, presented in Section 1. This implies that information from external and internal information suppliers should ideally be managed regardless of what application is used for creating this information, and that all types of content should be handled regardless of format. Further, all technical processes in the information life cycle should be automated, from creation to archival, with content delivered to the recipient independent of time, place or media. The overall ambition is to establish a corporate 'knowledge reservoir' that *"provides global access to and the management of a common pool of digital assets used to collaborate, support work processes and share information between the company and their customers, employees and business partners"* (Kleppe 2002b). Coordinated and role-based access to this knowledge reservoir is to be provided through an information portal.

The total ambition of the planned ECM-initiatives goes beyond alleviating single problems and limitations, to also provide a wider foundation for more effective collaborative work practices. As will be discussed, this vision implies several challenges. Statoil has therefore also chosen a step-wise approach, preliminary spanning a two-year period (2002-04).

2.3 Research Process

The enterprise-wide scope of Statoil's ECM programme gives this exploratory case study a *revelatory* character (Yin 1989). Our data sources include interviews, corporate documents and presentations, and discussions with key actors related to information management in Statoil. Eight persons were interviewed, holding key roles related to information management in the business units of Statoil. The corporate e-collaboration disciplinary advisor selected these persons, functioning as

the "content management champion" in Statoil. The semi-structured interviews focused on existing practices, experiences and challenges related to the different stages of the information management life cycle (creation and use, storage and archiving, distribution and retrieval, maintenance and deletion), the informants' expectations for the planned ECM initiatives, and Statoil's future needs related to information management. The interviews lasted from 45-60 minutes and were taped and transcribed. The discussions complemented the interviews with status updates on the development of the e-collaboration strategy and the planned ECM initiatives.

We gained access to extensive Statoil documentation, including existing standards for document management in Statoil, survey and analysis of their existing use of collaboration tecnologies and related practices, reports and presentation material on the new e-Collaboration strategy (Weiseth et al. 2002) and related ECM initiatives.

The transcribed interviews and documents were searched for statements concerning ECM issues, i.e. problems, challenges, goals, and development initiatives related to content management. The researchers then conducted individual categorizations of these issues, which finally were compared and merged into a set of common categories. The identified categories are all grounded in the data collected from the case organization, although affected by the researchers' previous knowledge of the field. The next section presents the results of this categorization.

3. Results

3.1 Overview of ECM Issues in Statoil

The concept of ECM involves several issues beyond the content management technology and software functionality often highlighted by the vendors. Figure 1 summarizes the major ECM issues resulting from our analysis. Statoil's rationale for ECM resides in the aim of *effective and efficient e-collaboration* between the organizational stakeholders, including customers and other partner organizations, and the "basic content management solution" represents the core foundation of Statoil's e-Collaboration strategy (Weiseth et al. 2002, p. 12). This ECM solution requires management of several issues, categorized in our analysis as *Management of Content*, *Management of Infrastructure* and *Change Management*. In the following sections we discuss the issues identified within each of these categories.
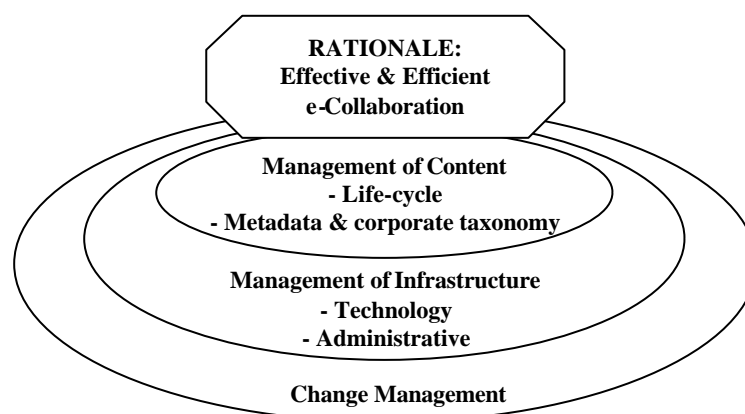

Figure 1. Major Categories of Contemporary ECM Issues in Statoil

3.2 Management of Content

We identified two logically separable, although intertwined, subcategories related to the management of content: *Management of Content Life Cycle* and *Management of Metadata and Corporate Taxonomy.*

Management of Content Life Cycle

The interviews showed that the term content management has yet to become widely adopted in the business units in Statoil, and document management is still most familiar. Further, in the standard for overall document management, the concept represents the common term for planning, organization and execution of the following tasks: capture, distribution, registration, storage, retrieval, transformation, securing, and destruction of documents. These functions related to document instances are referred to as the document (or content) life cycle. Currently, Statoil faces several challenges in the management of the content life cycle functions and their integration.

The *capture/storage* of produced and received content into a shared system lacks control. For instance, personal e-mail-boxes store a major amount of e-mails and attachments, although many of those carry relevance to be more systematically shared and stored. As well, other important documents may be saved plainly on personal file folders after their production and first-hand delivery (typically through e-mail). Naturally, personal storages will not be commonly accessible, despite of the espoused policy pursuing the utilization of the shared document management systems, such as Sarepta Arena.

"...[I]n reality, there are too many who work just with their e-mail-boxes, and too few who work with Arena-databases."

"A great deal of the information I need is stored in the different e-mail-boxes in Notes. Knowing where this information is stored, and navigating in this 'e-mailbox system' is a huge problem."

The problems in content capture cause further inefficiency when people are *distributing* document copies as e-mail attachment files, instead of informing about new shared content with reference links. Although some units do better than others in this area, depending on their application infrastructure, the enterprise-scale challenge remains.

The thousands of currently existing heterogeneous content databases involve stand-alone intranet and extranet applications and more than 800 databases of archived documents. Although these might be "technically" shared across the enterprise, they most probably are not "logically" shared, as people are more or less unaware of the existence, contents, and relevance of a great number of those. In this jungle of options where to store which piece of content after its production or receipt, it becomes rather understandable that many pieces of content never end up into a shared ECM system. The above-mentioned problems in capturing the content also hinder the systematic *archiving* of content pieces, which should ideally take place in the immediate connection to their production processes.

Many of the current heterogeneous document applications lack *version management* facilities, especially those of managing compound documents and their parts from multiple authors. In relation to this challenge and content *publication* in general, possibility for standardized *workflows* should be preserved in the future solution (Weiseth et al. 2002).

The storage of files in their production format makes retrieval difficult after some years, as the applications to view and re-produce the files and/or templates have been changed. On the other hand, storage in a changed format can make content re-use more difficult, if the original application still exists. This is a relevant problem especially in certain fields of content with a life cycle exceeding a few years, which would highlight the possibility for application-independent storage format(s).

Currently, there are no embedded routines for *deletion* of information in the production, storage or archiving systems. This results in redundant storage and accumulation of content. The "cleaning and deleting of information" is not highly prioritized among the employees. Typically, the clean-ups of content take place in 'campaigns':

"It takes place as part of conversion to new systems, at least. And then, yes, it does happen from time to time, there are some units that take on the responsibility and then does it once a year, that is if we're lucky. But once a year, or every other year."

Finally, *search, retrieval*, and *reuse* of content emerges problematic due to the heterogeneity. No integrated search facility covers even all the shared databases/repositories. Information retrieval across business units may appear problematic despite of shared unit-level systems, as different business units have different taxonomical and physical structures for their information resources. For example, part of Notes databases are not integrated with corporate search tools. Hence, the employees today cannot be sure that a search result is complete within a topic, nor that they get the latest version available. The challenge of integrated accessibility, search, and retrieval of information across the corporation thus remains to be solved in the future ECM solution.

Management of Metadata and Corporate Taxonomy

In Statoil, the concept of *metadata* corresponded rather straightforwardly to the concept of document metadata (Murphy 1998) for describing content objects so that they can be found and evaluated concerning their relevance. Especially, there is lack of contextual, or organizational (ibid.), metadata to describe the original business context in which the piece of content was created, in addition to the generic metadata elements (such as author, date, title). For example, if a document reader has difficulties to interpret the content s/he often has a need to contact the content producer or owner personally to get additional information. Still, several informants stated that metadata is currently seen as the sole responsibility of archivists, not the producers of content.

"I don't believe that this [metadata] is something which is much recognized out there in our organization, I think we take it easy and leave it to them who can do it [archivists]."

Content producers should also be aware of which content would require metadata. If a piece of content is intended ephemeral, metadata for later retrieval appears unnecessary. The interviewees identified a major challenge in easy and maximally automated production of organizational metadata attached to the content objects, as well as in the awareness of the content producers about its importance. All in all, the issue of metadata, especially the contextual metadata, thus represents a trade-off between efficient production/capture of content and effective retrieval and reuse.

In addition to the metadata attached to individual content objects, the issue of *corporate taxonomy* as a whole was raised. In Statoil, this concept represents the logical structuring of the whole information resource from varying viewpoints (e.g. in terms of shared electronic folders and other such categorizations), and the guidelines how to do that. The corporate taxonomy should function as the basis for the users to navigate through content collections and to conduct searches (Kleppe

2002a). It should provide also a basis for defining and coordinating access rights to content collections. In addition to structuring information resources as such, the corporate taxonomy must categorize user roles and their business responsibilities. Corporate taxonomy was regarded as a fundamental part of ECM, and the related software should support the maximally automated definition and maintenance of it (ibid.). The taxonomy might also serve as a basis for automatic creation of organizational metadata on content pieces, based on the system's identification of each user, according to the role-based modeling of users, and their explicated relationships with certain business contexts (ibid.).

3.3 Management of Infrastructure

Technological Infrastructure

The current infrastructure in Statoil related to content management includes a large number of heterogeneous and 'parallel' applications, providing several alternatives for producing and storing information. This includes individual tools as well as shared applications:

"...it's too much of 'each man his tool', or his macro or his spreadsheet."

In general, lack of application integration represents a problem throughout the content life cycle. For instance, the current system for document management is poorly integrated with several production packages. While document copies may reside in several different systems, changes and updates are typically registered only in one of these. With increasing focus on external collaboration, e.g. with other oil companies, suppliers and partners, standardized technological solutions for this become increasingly important. Currently, while some units have developed 'local' extranet solutions for sharing information with partners and subcontractors, no standard solution for content sharing with external partners exists.

The integration of standardized applications and tools throughout the content life cycle thus represents the major technological challenge of ECM in the future. Moreover, those tools should be user-friendly, intuitive, and easily accepted and adopted by a majority of users (Weiseth et al. 2002). For instance, current search tools have been regarded unsatisfactory due to long response times and the e-mail distribution of content is provoked due to technical problems in some current solutions to deliver links (resulting in annoying error messages for target audiences). In connection to a standardized device portfolio, common portal solutions to access information and applications globally, and advanced networks and wireless solutions, robust technological integration represents a crucial issue in Statoil's vision of e-collaboration.

Changes in IT infrastructure along time set another challenge to ECM. For instance, based on the shift of the office tools from Lotus Smartsuite to MS Office 2000, numerous potentially relevant documents in the file formats of the former package still exist – hindering the effective utilization of that content. Hence, a technological challenge concerns an application infrastructure that could produce and utilize "application-independent" and standardized content formats.

A technology-related issue resides in appropriate tools to ensure information security. For instance, technologies for public key identification, electronic signatures, and e-mail encryption need to be adopted according to the advances in the field (Weiseth et al 2002). An important part of the e-collaboration strategy is also to establish technical services for secure collaboration with external parties.

Administrative Infrastructure

The administrative infrastructure consists of policies, routines, and procedures for content management and the organizational roles required for following these. Several routines for document management have been documented at the company level. However, these are recognized and operationalized to various degrees in business units; a survey among employees in one unit indicated that only 22% of the respondents knew about the governing standards for document management.

"…[W]e have more like good ideas and intentions than structured routines and processes to follow."

Further, although 'localized' routines for information management were stated to exist in units, the degree of their operationalization varied strongly as well. A general problem resides in the overall number of routines in the first place:

"Yes, there are very many, very many routines. Probably… so many routines that people cannot relate to them. You just distance yourself from some."

The issue of information security relates also to the administrative infrastructure. Statoil changed the policy regarding information security a few years ago, from a "need to know" to a "need to restrict" principle. In principle, all information in Statoil should be open and available to employees, unless specifically stated otherwise. Each individual should ensure that information is made available to contribute to the company's value creation. This requires that information owners need to be defined for the sensitive content. The information owner then needs to manage access to this, and to document the reasons for the restricted access rights. The latter is important for others to be able to take over this task in case the information owner leaves this position. External consultants, when working within Statoil offices, will have access to databases including internal information, which may also constitute a security hazard requiring an explicit administrative policy and actions.

Finally, a service organization is considered necessary for upkeeping corporation-wide ECM and supporting users. Especially, it should train and support users, partners and internal advisors in ECM issues – including the establishment of a collaborative network sharing knowledge of ECM throughout the corporation (Weiseth et al 2002).

3.4 Change Management

The issue of managing change related to the evolution/development of ECM was addressed. Several user-related issues requiring change management emerged, including a general opposition to tool and content standardisation and reluctance to adoption of new technology. Clearly, fluent user skills in managing content and motivation to utilize the related tools are required. A survey of existing use of collaboration technologies in Statoil identified lack of user training as a major cause for frequent underutilization of the technologies. Several employees had experienced new software or hardware just being "dropped" in their offices without further guidance, so that they could not use the tools fully. Frequent upgrades and shifts have also caused some frustration, and some argue that, rather than implementing new technologies, the exploitation of the existing ones should be improved.

"…[We need] more focus on the routine and competence side than on tools, it is always nice to acquire new tools, but as a rule they do not give major effects in application."

To tackle these issues, the facilitation of corporate services providing training and active user support for ECM on the way was regarded as crucial. ECM represents a wide development

program for the enterprise that sets considerable challenges to manage the related project portfolio; currently identified with more than 50 related initiatives to be launched within two years (Weiseth et al 2002). However, resources available for individual subprojects can be limited, especially in relation to technical competence needed for technological integration of solutions and the carry-through of ECM pilots. The economical justification and follow-up of the particular investments in this wide and expensive program need to be scrutinized, for which the company has also started to establish sensible measures.

4. Discussion

Table 1 summarizes the issues identified, mapped under the categories from Figure 1. These issues together represent a holistic picture of contemporary issues related to ECM, from the perspective of the case organization. This illustrates the complexity and multi-faceted nature of this enterprise-wide ECM initiative. Truly, when viewed separately, each of these issues can be identified among the focal issues in research areas related to ECM, i.e. IRM, EDM and KM. Especially, the fields of IRM and EDM appear as the closest "ancestors" of ECM. The most visible difference between the IRM construct (Lewis, Snyder & Rainer 1995) and the ECM issues identified in Statoil is IRM's lack of focus on content life cycle issues, metadata of heterogeneous content, and corporate taxonomy beyond formal models and data dictionaries of structured databases. The major contribution of the concept of ECM in relation to EDM resides in the fact that the modern technologies, especially in the Web-based applications, integrate the previously separated issues of structured databases and dynamic application interfaces to them (Morrison, Morrison & Keys 2002), semi-structured documents, and unstructured file management under a common conceptual umbrella. This brings in a new level of complexity beyond the traditional "file-based" connotations (Bielawski & Boyle 1997, Sprague 1995) of EDM.

Knowledge management (KM) has been categorized into two broad approaches called the "repository model" and the "network model" (Alavi 2000). The former of these pursues the management of the "codified" (Zack, 1999) and "explicit" (Nonaka, 1991) knowledge in shared information storages, whereas the latter approach pursues the facilitation of human-to-human communication in enterprises involving knowledgeable experts to demanding knowledge work situations (Alavi 2000). From the viewpoint of KM, ECM could be seen to correspond rather straightforwardly to the repository model of KM. Moreover, the idea of corporate taxonomy could also be enlarged to cover information about "who knows what", often referred to with the metaphor of "corporate yellow pages", to guideline with whom to communicate about particular areas of knowledge within the network model of KM.

However, the concept of ECM highlights the importance of managing content life cycle long-term, beyond contemporary knowledge sharing situations and communities, as well as the importance of the metadata and corporate taxonomy issues beyond the current knowledge management literature. The enterprise-wide focus of ECM might also exceed the focus of the most reported KM solutions, which speak of "communities of practice" or some specific application areas that are used to demonstrate KM issues, as illustrated in a recent case of medical professionals (Davenport & Glaser 2002). Hence, although KM represents a wider concept than ECM including also the management of tacit knowledge with related organizational arrangements (the network model), the concept of ECM would still appear useful in highlighting the special problematics of managing content repositories long-term with the enterprise-wide focus.

Category	Issues
E-Collaboration	• Routines for e-collaboration across business processes and organization units • Inter-organizational e-collaboration standards with customers and partners
Content Life Cycle	• Ensuring content capture into a shared ECM system from production/receipt • Informing about content with references to shared storage instead of copied content • Numerous currently existing heterogeneous content databases • Controlled archiving immediately from production • Version management, especially of compound content with multiple producers • Possibility for standardized workflows • Application-independent storage format(s) • Routines for controlled deletion • Integrated accessibility, search, and retrieval across corporation; effective (re)use
Metadata and Corporate Taxonomy	• Capturing contextual organizational metadata with content produced/received • Easy and maximally automated production of content metadata • Awareness of the importance of metadata among content producers • Guidelines how to define, maintain, and utilize corporate taxonomy (in general and in connection to selected ECM technologies)
Technological Infrastructure	• Technological integration of standardized tools: integrated content production, storage, distribution, and access/retrieval environments • Tools to support standard "application-independent" content formats • Technological issues related to information security
Administrative Infrastructure	• Meaningful administrative routines related to content life cycle • Awareness of relevant routines among content producers • Administrative issues related to information security • Establishing support/service organization for ECM

Change Management	• User motivation for required technological and administrative changes:
	  - General opposition to standardization
	  - Reluctance to new technology adoption
	• Updating user skills (in managing content and utilizing information technology)
	• Facilitation of corporate services related to ECM
	• Organizational resources and competence to carry through ECM development
	• Justification and evaluation of investments in ECM

Table 1. Summary of ECM Issues in Statoil

5. Conclusions and Implications

By documenting issues and challenges from the enterprise-level perspective, as well as pointing to possible directions for addressing these, our exploratory study represents a contribution to the existing (scarce) body of IS literature on ECM.

Our second contribution lies in the preliminary assessment of ECM as a potential separate research area within the IS field. ECM represents 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. ECM could thus actually replace the concept of EDM, avoiding the pitfall of plainly file-level connotations of the concept of "document", still including all the basic issues of EDM. Moreover, the concept of ECM sets new challenges to content life cycle, metadata, and corporate taxonomy, beyond the database-centric IRM and file-based EDM, which now must be integrated and conceptualized together with modern (often Web-based) semi-structured solutions. The concept of ECM could

cover all issues related to explicit information content in the field of KM. Especially, the ECM issues seem to correspond to the repository model of KM as such and the corporate taxonomy including descriptions of both repository-based and network-based knowledge resources. The enterprise-wide scale and long-term management of content represent additional issues in the ECM concept to those most commonly identified with the KM field. We thus argue that ECM, as framed by the case organization, represents a modern perspective to information management integrating the research traditions of IRM, EDM, and the repository model of KM.

This integrated perspective of ECM also raises questions about how the issues are interrelated. As the enterprise-wide programme in Statoil is yet in its infancy, an in-depth analysis of the issues' relationships in the target organization and beyond remains on our future research agenda.

The rationale of ECM resides in the global collaboration needs of an organization's employees, customers, and partners through digital information content. To establish and maintain ECM in the world of ever-changing IT opportunities and business requirements requires coordinated change management. Numerous IS practitioners, consultants, and IT vendors have already adopted the concept of ECM in their efforts of addressing these organizational needs. Whether the academic IS community will follow suit, remains to be seen.

Acknowledgements

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