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TOWARDS A PROCESS-ORIENTED APPROACH TO ASSESSING, CLASSIFYING AND VISUALIZING ENTERPRISE CONTENT WITH DOCUMENT MAPS

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TOWARDS A PROCESS-ORIENTED APPROACH TO ASSESSING, CLASSIFYING AND VISUALIZING ENTERPRISE CONTENT WITH DOCUMENT MAPS

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Abstract

Nowadays, documents can be scattered across a company in different versions, formats, and languages, and even on different systems. Not only is the resulting content chaos inefficient, it brings with it a number of risks. However, information that is contained in unstructured documents is increasingly becoming a key business resource. Enterprise content management (ECM) is used to manage unstructured content on an enterprise-wide scale. Despite the practical importance of ECM, research is still at an immature state and the process perspective is widely neglected. We suggest a process-oriented approach to identifying, assessing, documenting, classifying and visualizing enterprise content. Within a globally operating engineering company, we check to what extent the applicability of the designed research artifact can be assumed. We give process-oriented guidelines to identify and document enterprise content. Our 7W Framework (7WF) for content assessment contains a collection of metadata (attributes, typical attribute values) to create customized content surveys. Different visual representations of content are proposed, including a document map. Combining business processes and the content of an enterprise, the document map is able to integrate the ECM perspectives and provides decision support. Technical requirements can be derived from it and in-depth analysis of business-critical content is enabled.

Keywords: Enterprise content management (ECM), business processes, applicability check, document map.

1 Introduction

Companies continue to produce large amounts of content at ever increasing rates each year. While structured content can efficiently be stored and managed by enterprise resource planning (ERP) systems, unstructured content still poses a challenge. Even worse, unstructured documents make up the biggest part of the content and are generally spread over different storage locations and systems. Unstructured documents often contain important, innovative and decision-relevant information, and this information is increasingly becoming a key business resource. To manage content on an enterprise-wide scale, enterprise content management (ECM) evolved as an integrated approach to information management and serves as a knowledge resource and support for business processes (Päivärinta and Munkvold, 2005). Managing unstructured content, ECM is able to support knowledge management (KM), and together with business intelligence (BI), it makes content intelligence (CI) possible.

The practical relevance of ECM is confirmed by Gartner and the Magic Quadrant for ECM 2011 (Gilbert et al., 2011): the ECM market shows strong growth even though IT budgets are generally extremely tight. The ECM market is “booming” (vom Brocke et al., 2011b, p. 492) and is “hot and is getting hotter” (Anderson, 2008, p. 66); Gartner projects continuing growth through 2015. Commercial ECM solutions have become more sophisticated and executable over the years.

However, software and the technology itself are not the critical success factors for the implementation of ECM systems (see Tyrväinen et al., 2006, p. 630). Success is determined by organizational aspects, which are in particular the business processes, the content and the users. Integrating existing content management systems on an enterprise-wide scale poses a challenge to both practitioners and researchers. ECM solutions are not typically out-of-the-box; they are one of the most complex rollouts in an organization (vom Brocke et al., 2011b). It is crucial to consider the business process landscape: along with the processes of the company, a “diligent analysis of content is the prerequisite for ECM adoption success and represents a highly complex and challenging task” (vom Brocke et al., 2011b, p. 479).

Even though ECM is an important and popular topic among companies “[...] it has hardly gained any scientific interest up until now” (vom Brocke et al., 2008, p. 2) and little academic research has been carried out (Grahmann et al., 2010, p. 2). In addition to the general lack of scientific ECM literature, there is in particular a gap in the research on process-oriented guidelines for ECM (see Tyrväinen et al., 2006, p. 631, vom Brocke et al., 2011b, p. 478ff.). Little research has been conducted from a process point of view that highlights the relevance of business processes for ECM adaptation (vom Brocke et al., 2011b, p. 482). Few process-oriented guidelines are available for the complex assessment of enterprise content. Considering the entire enterprise and focusing on the content and the business process landscape in order to derive technology, we pursue the research question:

How can enterprise content be identified, assessed and visualized from a process point of view?

Based on existing research, we propose a process-oriented approach that uses the business process structure as an entry point to enterprise content. Our approach intends to provide a consistent guideline for identifying, assessing, documenting, classifying and visualizing content in the ECM context. In addition to assessment guidelines, we suggest a framework to create customized surveys to identify and document business-critical content along with its metadata. We also propose several visual representations that combine processes and content, including a document map. Our approach aims at improving the management of enterprise content and the use of documents in business processes. Further analysis and refinement of content, decision support, and deriving technical requirements are enabled. Within an engineering company, we test the applicability of the designed research artifact.

The remainder of this paper is organized as follows: in section two, the research background is provided, including related work and research design. The third section explains the development and the concept of process-oriented document maps. It includes assessment guidelines, a framework for content surveys, and different visual representations of the content. In section four, the applicability of

the approach is checked within an engineering company. Section five provides a discussion and points out contributions and limitations. The paper ends with a brief conclusion and implications for research.

2 Research background

2.1 Theoretical background and related work

ECM has gained much attention from practitioners in recent years (see vom Brocke et al., 2011a, p. 1). As a matter of fact, it “has been one of the fastest growing areas of IT” (Miles, 2011, p. 3). Along with the practical relevance of the topic, Tyrväinen et al. (2006, p. 627) discuss the importance of ECM for IS research: “[...] ECM provides an important and complex subfield of Information Systems”. Yet very little research has been carried out; the field of ECM research is young and academic literature is still rare (see Grahlmann et al., 2010). Due to the “embryonic state of ECM research” (Grahlmann et al., 2010, p. 4), ECM literature is generally based on case studies and has produced explorative results.

Since the introduction of the term *ECM* in 2001 by the AIIM International, what lies beyond the concept is not clear. There was no accepted and distinct definition of what exactly ECM is and what it stands for, and this led to confusion (see Smith and McKeen, 2003, p. 648). Coming from a definition with a rather technical focus, AIIM adapted the definition in order to emphasize the organizational aspects of the concept: “Enterprise Content Management (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). Emerging from related concepts, such as web content management (WCM), document management (DM), knowledge management and digital asset management (DAM), ECM is an integrated approach to content and information management on an enterprise-wide scale (vom Brocke et al., 2011a, p. 2, Päivärinta and Munkvold, 2005). Before the various IS disciplines were combined within the ECM concept, the original disciplines were considered separate research areas with sufficient scientific knowledge.

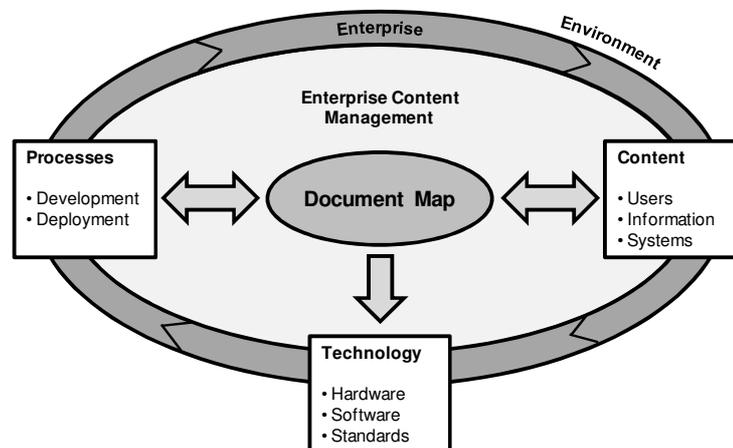


Figure 1. Embedding process-oriented document maps in the framework for ECM research
Research perspectives according to Tyrväinen et al. (2006, p. 628)

The genre theory of organizational communication by Yates and Orlikowski in 1992 forms the basis for the management of documents. The genre-based approach is regarded as a “theoretical lens to view organizational information management” (Tyrväinen and Päivärinta, 1999, p. 1) and provides researchers with accepted terminology to identify and analyze content: Tyrväinen and Päivärinta (1999) note that organizational DM needs to be rethought, Karjalainen et al. (2000) present an abstract genre-based method for enterprise document management (EDM) including metadata, while Honkaranta and Tyrväinen (2003) operationalize the method within case studies. Honkaranta (2003)

provides a comprehensive overview of genres with regard to document and content management. Salminen et al. (2000) perform document analysis in the EDM domain, emphasizing the work context of documents and business processes. They provide fundamental work with regard to document standardization and modeling techniques on an abstract level. For practitioners, however, the presentation of the approaches is not tangible enough and is not able to serve as an integrated guideline.

Based on these more fundamental studies, Munkvold, Nordheim, Päivärinta, Tyrväinen et al. delve deeper into the emerging ECM issue. Munkvold et al. (2006) identify and document ECM issues and challenges in a case study, while Nordheim and Päivärinta (2004) explore the customization of ECM systems and develop a framework for customizing concepts related to ECM. Päivärinta and Munkvold (2005) identify major ECM issues by analyzing case narratives and emphasize the integrated, holistic perspective of ECM. The actual implementation of ECM is examined by Nordheim and Päivärinta (2006). Tyrväinen et al. (2006) examine the contemporary state of the literature and provide a framework of ECM research, covering four perspectives: enterprise, technology, content, and processes. Figure 1 shows process-oriented document maps embedded in this framework.

ECM literature mainly deals with topics about technology, strategy, and implementation (vom Brocke et al., 2008, p. 2). In 2008, vom Brocke et al. indicate a lack of process-oriented guidelines in ECM research and literature. To address this lack, they introduce ECM-Blueprinting, which provides a business process perspective on enterprise content within an integrated approach. This important framework consists of five phases that support the implementation of ECM (vom Brocke et al., 2008, p. 6). The different phases are outlined roughly, but the framework does not provide detailed information for each phase. In a research agenda, vom Brocke et al. (2011b, p. 491f) state that methodological support for the distinct phases is needed. For the second phase (content analysis), this is in particular: guidelines for interviews with content users and document analysis, a systemization of attributes and values, and conceptual modeling of enterprise content. This research gap is addressed by our paper: The process-oriented approach aims to substantiate the first two phases to identify, assess, document, classify, plus to visualize content.

2.2 Research design

Our research design consists of two main phases. During the first phase, the design of the research artifact was the focal point. We conducted a comprehensive literature review within the research domain of ECM and a targeted review within the design science research domain. Despite the fact that ECM research is still at an immature state (Grahlmann et al., 2010, p. 4), selected studies built an important basis for our own research aims. The identified literature was mainly used to refine the problem domain and define detailed requirements. To ensure the quality of the research artifact and the underlying design process, we also used key recommendations provided by design science research. Especially the guidelines of Hevner et al. (2004), March and Smith (1995) and advice regarding the research process by Peffers et al. (2007) and Offermann et al. (2009) were used in this context. The second phase of our research design included analyzing the practical applicability of the research artifact. For this purpose, we used the widely recommended applicability check designed by Rosemann and Vessey (2008) as the underlying method. A framework to analyze the practical relevance and applicability of a research artifact is provided (see Table 1).

Dimension	Description
Importance	Encompasses whether the research artifact addresses a problem that is important for practice and can act as a basis for a possible solution
Accessibility	Encompasses whether the presentation of the research artifact is understandable, readable, and focuses on results rather than the research process
Suitability	Encompasses whether the research artifact meets the needs of practice related to a possible problem solving

Table 1. Dimensions of the applicability check (Rosemann and Vessey, 2008)

In terms of a pre-test, the applicability of the research artifact was checked at a globally operating engineering company (3,500 employees worldwide) during the last twelve months. Within this context, qualitative research methods (see next paragraph for further details) were applied that are recommended for an empirical evaluation of the applicability of research propositions or artifacts (Myers, 2009, p. 71, Rosemann and Vessey, 2008). These research methods primary aim to analyze relationships and circumstances within a specific business situation (Punch, 2005).

During the empirical investigation phase, we were regularly present at a variety of company locations and primarily used three data sources: company documents, open-ended interviews and different observations. Guided interviews were organized and they lasted between 60 and 240 minutes. For the first category, the interview guide contained questions regarding the company's ECM projects and ECM strategy. Afterwards, questions about the importance, accessibility and suitability of our research artifact, which was briefly introduced at the beginning of the interviews, formed the second category. Participant-observations were enabled by regular meetings of the ECM project. For both data sources, minutes were taken during the events. In preparation, we collected and analyzed documents from past and current ECM projects, and studied the ECM strategy of the company. Together with the minutes, we analyzed these documents using open and axial coding (Flick, 2009, p. 305ff., Myers, 2009, p. 110f.), focusing on the definition of sub-categories related to the main categories that are provided by the applicability check. To ensure objectivity during the whole process of data collection and analysis, three experienced researchers were involved. After first analyzing single data sources, an aggregated overall analysis was done in terms of a group discussion to achieve consensus decisions.

3 Process-oriented document maps

3.1 Development of a process-oriented approach to enterprise content

Documents and enterprise content in general are more and more becoming a key business resource. Yet the identification and classification of content is a complex procedure and there is no appropriate scientific framework to support it. Earlier approaches to content assessment are rather abstract and few methodological guidelines are provided. Before an integrated view on ECM was introduced, the process perspective was widely neglected. Content assessment is not conducted from a holistic point of view, because the entire enterprise and ECM research perspectives are not considered. Based on a process-driven framework (vom Brocke et al., 2008) and the genre theory, we present our process-oriented approach to enterprise content in the following:

In Figure 1, the concept of process-oriented document maps is embedded in the framework for ECM research. In addition to the theoretical classification, the figure illustrates our approach to assessing enterprise content. While Tyrväinen et al. (2006) focus on the content perspective, vom Brocke et al. (2008) bring the process perspective into focus and use it as a starting point. Analogously, we strongly recommend starting with the business process landscape and assessing content along the processes. As indicated, the document map concentrates on the content perspective including users, information, and systems, as well as on the process perspective, and finally combines the two. Thus, the assessment of content is independent of the technological aspects. On the contrary, technical requirements (hard- and software) can be derived from the document map and the other perspectives can be integrated.

1. Business Processes: Using business processes as starting point, the enterprise and its business process landscape set the basic structure for the further procedure. All processes, including core, management and support processes, must be taken into account and information about their users, owners and responsibilities has to be collected. Business process management (BPM) and the management system are usually able to provide this information. If event-driven process chains and comprehensive documentation is available, content entities, IT systems, and organizational units can be outlined roughly. Since individuals cannot comprehend all of a company's content on their own (see Tyrväinen and Päivärinta, 1999, p. 7), process owners, domain experts and key users have to be

involved. Interviews, referred to as content audits in the following, have to be arranged for each business process to assess content together with the users. Only in this way can an accurate and complete assessment be ensured. To expedite the arrangement of content audits and to obtain the support of the process owners, it is important to involve them at an early stage.

2. Content: A common language concerning documents and content is provided by the genre theory, which is the study of classifying texts into kinds and types. A genre is a “typified communicative action[s] characterized by a similar substance and form and taken in response to recurrent situations” (Yates and Orlikowski, 1992, p. 299). Similar to a genre, we propose the use of document types to identify content and classify it with specified attributes. A document type is a homogenous class of content that includes all documents of the same kind, with the same purpose and (virtually) identical properties. Thus, documents from different document types are heterogeneous to each other but homogenous in themselves. For example, the document type *incoming invoice* represents all definite invoices that a company receives. All invoices have similar properties and can be differentiated from other document types (e.g. *job instruction*). The distinction between the document types is not made based on technical grounds (e.g. file formats or different constructs in content and document management systems), but on the socio-organizational purpose shared by the class of documents. We insist that content is not distinguished by its media or its physical condition, but by its informational and organizational context (vom Brocke et al., 2008, p. 7).

During content audits, the actual document types need to be identified by the key users with regard to the process in its organizational context. A classification of process-specific content into three categories helps to reduce the complexity and ensure the completeness of the assessment: Specification documents serve as an input for the process, supporting documents are used within the process as an information source, and proof documents are the output of the process (see Figure 3a). The content entities are identified and the document types characterized and documented with their attributes. Before interviews can take place, the content survey has to be designed to determine which attributes to assess. To make the design efficient and assess the metadata in a structured way, we present the 7W Framework (see Figure 2). With seven categories, the generic framework provides predefined attributes and attribute values.

Once the content audits (see section 3.2) are conducted and all document types and attributes are collected, the visualization and analysis follow (see section 3.3). The document map, as a visual representation of all content with its key attributes, helps make content more tangible. Mapping enterprise content with the business processes helps eliminate the content chaos, enhances transparency and improves workflows. Inefficiencies, improvement opportunities, parts of processes with quick wins and typical use cases can be derived from the map. The leading document that is defined also helps to identify and avoid redundancies with regard to storage locations and formats. In consequence, the consistency of the enterprise content can be improved. Statistical analysis of the attributes provides rich insights and substantial understanding of the content situation within the company.

3. Technology: As shown in Figure 1 on the arrangement of the four ECM perspectives, processes and content are largely determined within the company, while technology is specified rather exogenously. In our process-oriented approach to enterprise content, we concentrate on organizational and human aspects rather than on technical aspects (see Honkaranta and Tyrväinen, 2003). Grahlmann et al. (2010, p. 12) conclude that “[...] the functionalities of an ECMS need to be aligned with the nature of the processes of the implementing organization”. Because the content survey is designed independently of technologies, hard- and software requirements can be derived from the document map. For the purpose of decision support, the collected information is essential to analyzing requirements and provides the basis for selecting and implementing ECM software (see also O’Callaghan and Smith, 2005, p. 6). Identified and categorized document types, together with the metadata, can be used to specify requirements, check functionalities of different ECM software solutions, and determine their suitability.

3.2 Survey design and content audits

Before content audits can be arranged and conducted, a questionnaire needs to be developed. Categorized into seven categories, the 7W Framework (see below) lists important attributes and typical attribute values for content assessment. Our universal framework was developed independently, but it contains elements that were used in a similar context. For example, Honkaranta (2003, p. 26ff.) used the 5W1H framework for genre analysis. As suggested by Yoshioka, Herman, Yates, and Orlikowski, the framework represents a similar approach that categorizes attributes within a genre taxonomy. The seven categories that we propose are: what (general information and organizational background), worth (value and importance for the company), where (storage and archive location), which format (physical representation and conventions), who (people), when (lifecycle), and why (purpose and legal regulations). It is not necessary to integrate all categories and attributes into the questionnaire, since some are more essential for a specific context than others. We present this framework as a list of attributes to choose from and use to create a customized survey. At the same time, we recommend including the highlighted main attributes in any survey (see Figure 2). As further indicated, attribute values can be chosen from predefined sets for most attributes. Some attributes allow multiple choices (e.g. a document type can be stored in different formats or in multiple systems) or further specification of the attribute value (e.g. the retention period needs to be specified if there is a legal obligation to preserve it). To ensure consistent and analyzable answers, attribute values can be specified in advance.

Category	Attribute	Attribute value
WHAT	<u>Document Type</u>	String: <i>GENERIC NAME</i>
	<u>Process</u>	Classified: <i>PROCESS NUMBER/NAME</i>
	Origin	*Classified: <i>OWN CREATION, INTERN, EXTERN</i>
	Destination	*Classified: <i>OWN USE, INTERN, EXTERN</i>
	Association	Classified: <i>ASSOCIATED WITH OTHER CONTENT</i> , no
	Template	Classified: <i>EXISTING</i> , not existing
WORTH	<u>Confidentiality</u>	Classified: open, intern, confidential, (top) secret
	Relevance	Classified: low, medium, high, very high
WHERE	<u>Storage Location</u>	*Classified: <i>LOCAL, FILE SERVER, EMAIL, PAPER-BASED, INFORMATION SYSTEM (ERP, CRM, ETC.), OTHER</i>
	Archive Location	Classified: <i>KNOWN ARCHIVE</i> , unknown, none
WHICH FORMAT	<u>Storage Format</u>	*Classified: <i>.doc, .xls, .ppt, .pdf, image, plain text, paper, OTHER</i>
	Archive Format	Classified: as storage format, <i>OTHER, none</i>
	Naming Convention	Classified: <i>KNOWN</i> , unknown
	Storage Convention	Classified: <i>KNOWN</i> , unknown
WHO	<u>Owner</u>	String: <i>PERSON</i>
	Involvement	String: <i>PERSONS, DEPARTURES, COMPANIES</i>
WHEN	Creation	String: <i>GENERIC POINT OF TIME</i>
	Publication	Classified: <i>DATE KNOWN</i> , unknown
	Archiving	Classified: <i>DATE KNOWN</i> , unknown
	Deletion	Classified: <i>DATE KNOWN</i> , unknown
	Creation Frequency	Classified: low, medium, high
	Change Frequency	Classified: low, medium, high
	Frequency of Use	Classified: low, medium, high
States	Classified: in process, finished, approved, published, locked, active, inactive, <i>OTHER</i> , not applicable	
WHY	<u>Storage Reason</u>	String: <i>GENERIC REASON</i>
	<u>Retention Period</u>	Classified: <i>DURATION</i> , none
	Audit-Proof	Classified: yes, no
	Version Control	Classified: yes, no

Underlined: Main Attribute, SMALL CAPS: Further Specification needed/possible, *: Multiple Choice

Figure 2. 7W Framework (7WF) for content assessment

As part of the preparation, information about the content audit and the general procedure should be sent to the interviewee and the process owner well in advance. Document types that have already been identified in BPM documentation or in the management system should be provided. Spreadsheets are an efficient means of recording document types with metadata. The creation of a survey template ensures smooth and quick assessment. Alternatively, an online survey application can be used. In each case, all data is to be gathered within a database to allow for further analysis.

At the beginning of each content audit, the attendees (process owners, key users, interviewers) should introduce themselves and a short thematic introduction given. Possible questions or uncertainties can

be settled beforehand. Then the actual document types can be identified in series before their attributes are specified. Typical document types and examples help the participants make the subject more tangible. Open questions allow insufficiencies and possible improvements to be detected from a user's point of view. General suggestions as well as subjective valuations serve as an important source of informal information. During the semi-structured interviews, important aspects and findings must be written down and minutes should be taken. However, there is no need to transcribe entire interviews.

A document type is only recorded if it is process-relevant and if the information is relevant for at least one recipient other than the author (see Tyrväinen and Päivärinta, 1999, p. 4). To identify document types for the particular process, open questions can be used: *Which documents do you generally work with?*, *Which documents assists you in your work?*, *Which documents do you receive from others?*, *Which documents do you send to others?*, *Which documents do you store in which system?*. Thus, specification documents (input of the process), supporting documents (information source during the process), and proof documents (output of the process) can be identified along the business process.

The effort to assess enterprise content together with the metadata is not be underestimated. Personal interviews are necessary to explain the task, clear up confusion, ensure adequate results, and involve key users. Since user acceptance of ECM systems has a strong effect on its success, key users and process owners need to be involved. This personal contact and interaction with the group at an early stage of an ECM project leads to higher acceptance. Moreover, content audits are required, since it is impossible for one person to identify, record and characterize all enterprise content (Tyrväinen and Päivärinta, 1999, p. 7). Actual users of the documents and systems have to be involved. Content entities must be analyzed in their context due to specific terms and the development of company terminology and acronyms (Yates and Orlikowski, 1992, Honkaranta and Tyrväinen, 2003, p. 75).

3.3 Visual representation and content analysis

Based on the assessed document types and the metadata, different visualizations can be used to present information graphically. In addition to a possible technical system landscape, we present four different representations of the content: a process-oriented view, a document-oriented view, an analysis-based view, and an overview (see Figure 3).

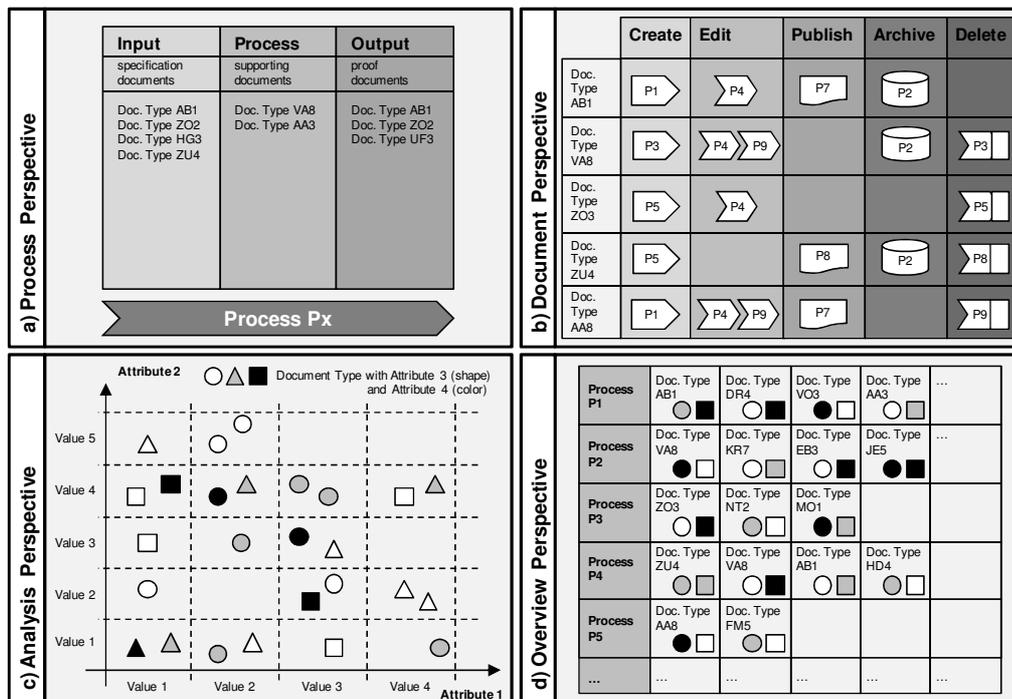


Figure 3. Visual representations of document types and enterprise content

All representations have different purposes and applications. The process perspective (a) shows a business process with input, supporting, and output document types. With regard to the lifecycle, the document perspective (b) helps to break down complexity. For analytical purposes, different attributes can be applied to each other (c). The process-oriented document map provides an overview by combining business processes and enterprise content (d). Thus it is useful for process workers, process managers, information workers and ECM planners.

Once all the information is gathered in a spreadsheet or a database, extensive content evaluation and analyses are enabled. Simple or nested queries, together with the minutes and content visualizations (see Figure 3c & 3d), provide deep insight into the current content situation, e.g. evaluation of the information security in regard to heterogeneous storage locations of critical documents. Insufficiencies are revealed and improvement approaches can be worked out. If the ECM architecture of the enterprise is due to be updated or a new ECM software solution is to be selected, a requirements analysis is enabled and use cases can be derived.

4 Applicability check

To test the practical applicability of our research artifact, we performed an applicability check at a globally operating engineering company. Details of the research method and the setting are given in section 2.2. This section provides our results with regard to the dimensions of the applicability check:

Importance According to Rosemann and Vessey (2008), importance addresses the practical relevance of the artifact and its ability to serve as an eventual solution. The engineering company initiated several ECM projects over the last eight years and invested a significant amount of money. Yet, the project results were not satisfying. Insufficient organizational change is reported as a main reason:

“We built and installed an ECM solution in accordance with the technical requirements. However, relevant workflows and business processes didn’t change. Therefore, the resulting user dissatisfaction and the lack of benefits don’t surprise me.” (Leading ECM project manager)

The interviewees define the detailed planning of specific process and workflow improvements as a critical success factor. The document map is regarded as an appropriate tool to support this activity. Current workflows that are based on the existing document types and a desired target state can be modeled. Our contact persons generally confirmed the importance of the artifact and explicitly highlighted its usefulness in the context of their ECM strategy:

“I have never seen something like this before (the document map). This could be a really good basis for the definition and prioritization of possible ECM projects.” (ECM program manager)

Our process-oriented approach was considered a useful aid for modeling the current state of enterprise content and content-based workflows, and also for defining possible improvement projects.

Accessibility This dimension encompasses whether the presentation of the artifact is understandable for practitioners. Rosemann and Vessey (2008) report scientific terms and descriptions as a main barrier to accessibility. To avoid this, we described our artifact with the focus on useful functionalities instead of the research process. This aspect emerged as a great advantage. We did not have to explain our approach in detail and discussions rather focused on possible applications within the enterprise:

“I do understand your approach and I think it could be very helpful for improving our workflows with unstructured documents. [...] Perhaps we can model such workflows with your approach and enforce them within our organization.” (Business process manager)

Within the given company settings, accessibility was reinforced by a process-oriented mentality and an established process organization. Clear-cut responsibility made it easy to find appropriate contact persons, who were able to recognize the advantages of a process-oriented approach. Therefore, the maturity level of the process organization could be seen as an influence factor of accessibility.

In addition, we did not see any problems with the accessibility of our artifact. Some visual representations of document types required more explanation than others. For example, the overview (document map) was rated as more important and easier to understand than the analysis perspectives.

Suitability The third dimension encompasses whether the problem solving needs of the practice are met (Rosemann and Vessey, 2008). Statements above already indicated that our research artifact was suitable to act as key feature within the company's ECM strategy. Especially against the background of inadequate process or workflow changes in the past, the experts identified high potential for our approach (e.g. to model the current state of content and workflows within the processes). Based on the current state, detailed planning for defining a target state and specific ECM projects were initiated:

“Before we can start with possible ECM projects, we need to document the current state of documents and workflows within the processes and to define targets how that should be organized in the future. The process-based approach for developing a document map could be very useful for this purpose.” (ECM program manager)

Within this context, we were able to show the applicability of the artifact. However, some recommendations were identified for practical application: Participants found the number of attributes to be high and saw this as an obstacle to acceptance. In accordance to our foregoing considerations (section 3.2), they suggested context-specific subsets of attributes. Others recommended identifying competent contact persons, since this appears to be a key success factor of the approach. Generally, (sub-) process owners and power users may serve as contact persons. Further, content reviews are advisable. Within the initial audits, it is difficult to gain a full understanding of the approach, collect all document types, and ensure adequate granularity immediately. In content reviews, the initial contact persons may look at their records, compare them with data from other processes, and make adjustments. A preliminary, printed version of the document map (Figure 3d) may serve as an overview and basis for discussion.

5 Discussion

5.1 Contributions

Driven by our research question which focuses on identifying, assessing and visualizing enterprise content from a process view, we developed a process-driven approach for this purpose. Within the context of an engineering company, we were able to test the applicability of our research artifact.

In terms of accessibility, our approach serves as a consistent guideline that can easily be understood by practitioners. As part of our approach, the 7W Framework for content assessment can be used to create customized surveys to document business-critical content. We proposed different ways of representing content visually, including a document map. By combining business processes and enterprise content, the map provides an illustration of the current content situation and can also serve as a regulatory instrument. It enables further management, in-depth analysis and refinement of content. Technical requirements (e.g. for new ECM software) can be derived from the document map and decision support is provided. In addition to that, we provided practical insights and methodological support.

5.2 Limitations

In previous research, there is a lack of clarity on whether to deal with content, document genres or types. We decided to use document types to deal with enterprise content since it made the subject more tangible. Generally it is more difficult for users to understand the concept of content rather than thinking in document structures. Because the document map shows content in the form of document types, it could also be called a content map. From the viewpoint of ECM systems, content types can be derived from document types with similar elements of metadata. Despite our decision to call them *document types* and *document map*, terminology needs to be harmonized and established in the future.

We did identify certain limitations with regard to completeness and the validation of our approach: First, the assessment of enterprise content together with metadata is time consuming and there is a lot of information to collect. Content assessment is essential though, since “the core of any ECM solution resides in understanding the content itself and its role in the organizational context” (Päivärinta and Munkvold, 2005, p. 3). In particular, participants found the amount of attributes to be high. With this in mind, we propose the use of context-specific subsets of attributes. A greater concentration on the main attributes means that the assessment process can be streamlined, but provides a less informative overall impression of the content situation. Second, it was initially assumed that one survey round was sufficient to assess the information in one go. Within the pre-test of applicability, participants stated that a content review was useful. Content reviews can improve both data quality and understanding of the entire content situation. Thus, the big picture of the actual content situation can be completed. Third, structured into seven categories, the 7W Framework lists attributes and typical attributes values for content assessment. The framework is comprehensive, but does not purport to be complete, so that in particular cases, adjustments might be necessary. Especially the attribute values have to be adapted to the context of the company and the specific task. Fourth, further validation of our approach is needed: we were able to show its applicability within one company, but it has not been checked within other business contexts. Fifth, the content life cycle is a complex task and enhancements are needed to improve the maturity of our approach. One step towards deeper integration can be achieved by including both the creation phase and the usage phase of documents within the map.

6 Conclusion and implications for research

With this paper, we address the general lack of ECM literature and the deficient consideration of the process perspective. The complex task of classifying, documenting, analyzing and visualizing enterprise content requires a structured approach. With regard to implications, we substantiated existing, rather abstract approaches to a practicable level. As part of our process-oriented approach, we suggest useful guidelines, the 7W Framework, and different visual representations, including a document map. The applicability of the approach was initially tested within a globally operating engineering company. In this context, applicability is shown; however, individual specific adjustments might be necessary.

Following the identified limitations, further research steps are required with regard to our approach. It can be enriched by a more sophisticated representation of the content life cycle and the validation of our questionnaire. In general, deeper empirical validation that goes beyond a check of its applicability is required. We plan to conduct action research within a comprehensive ECM project to validate the actual use of our approach and the document map.

Based on this work, implications for further research are drawn. The suggested approach can be applied, tested and refined by ECM researchers to improve its generalizability. Further, there is need for a more comprehensive procedure model for the task of managing enterprise content. The implementation stage of ECM systems, as well as their operation, should be considered in an integrated model. To complement our work from a market-based view, a framework for systematic analysis of ECM solutions is needed. In this way, a suitable solution can be selected based on business and technical requirements that can be derived from a document map.

References

- Andersen, R. (2008). The Rhetoric of ECM: Confronting the Assumptions Driving ECM Adoption and Transforming Technical Communication. *Technical Communication Quarterly*, 17 (1), 61–87.
- Flick, U. (2009). *An Introduction to Qualitative Research*. Sage, London.
- Gilbert, M.R., Shegda, K.M., Chin, K. and Tay, G. (2011). *Magic Quadrant for ECM*. Gartner Group.
- Grahlmann, K., Hilhorst, C., van Amerongen, S., Helms, R. and Brinkkemper, S. (2010). Impacts of Implementing Enterprise Content Management Systems. In *Proceedings of the 18th European Conference on Information Systems*, Pretoria.

- Hevner, A.R., March, S.T., Park, J. and Ram, S. (2004). Design Science in Information Systems Research. *Management Information Systems Quarterly*, 28 (1), 75-105.
- Honkaranta, A. (2003). From Genres to Content Analysis: experiences from four case organizations. PhD thesis, Department of Computer Science and Information Systems. University of Jyväskylä.
- Honkaranta, A. and Tyrväinen, P. (2003). Designing Training in Manufacturing Organizations Using the Genre-based Method. *Educational Technology & Society*, 6 (4), 73-85.
- Karjalainen, A., Päivärinta, T., Tyrväinen, P. and Rajala, J. (2000). Genre-Based Metadata for Enterprise Document Management. In *Proceedings of the 33rd Hawaii International Conference on System Sciences*, Maui, HI.
- March, S.T. and Smith, G.S. (1995). Design and Natural Science Research on Information Technology. *Decision Support Systems*, 15 (4), 251-266.
- Miles, D. (2011). State of the ECM Industry 2011. AIIM International.
- Munkvold, B.E., Päivärinta, T., Hodne, A.K. and Stangeland, E. (2006). Contemporary Issues of Enterprise Content Management: The Case of Statoil. *Scandinavian Journal of IS*, 18 (2), 69-100.
- Myers, M.D. (2009). *Qualitative Research in Business & Management*. Sage, London.
- Nordheim, S. and Päivärinta, T. (2004). Customization of Enterprise Content Management Systems: An Exploratory Case Study. In *Proceedings of the 37th Annual Hawaii International Conference on System Sciences*, IEEE Computer Society, Big Island, HI.
- Nordheim, S. and Päivärinta, T. (2006). Implementing enterprise content management: from evolution through strategy to contradictions out-of-the-box. *European Journal of IS*, 15 (6), 648-662.
- O'Callaghan, R. and Smits, M. (2005). A strategy development process for enterprise content management. In *Proceedings of the 13th European Conference on Information Systems*, Regensburg.
- Offermann, P., Levina, O., Schönherr, M. and Bub, U. (2009). Outline of a Design Science Research Process. In *Proceedings of the 4th International Conference on Design Science Research in Information Systems and Technologies*, Philadelphia.
- Päivärinta, T. and Munkvold, B.E. (2005). Enterprise Content Management: An Integrated Perspective on Information Management. In *Proceedings of the 38th Hawaii International Conference on System Sciences*, IEEE Computer Society, Big Island, HI.
- Peffers, K., Tuunanen, T., Rothenberger, M.A. and Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research. *Journal of Management IS*, 24 (3), 45-77.
- Punch, K.F. (2005). *Introduction to Social Research*. Sage, London.
- Rosemann, M. and Vessey, I. (2008). Toward Improving the Relevance of Information Systems Research to Practice: The Role of Applicability Checks. *MIS Quarterly*, 32 (1), 1-22.
- Salminen, A., Lyytikäinen, V., and Tiitinen, P. (2000). Putting documents into their work context in document analysis. *Information Processing and Management*, 36 (4), 623-641.
- Smith, H.A. and McKeen, J.D. (2003). Developments in Practice VIII: Enterprise Content Management. *Communications of the Association for Information Systems*, 11, 647-659.
- Tyrväinen, P. and Päivärinta, T. (1999). On rethinking organizational document genres for electronic document management. In *Proceedings of the 32nd Annual Hawaii International Conference on System Sciences*, Maui, HI.
- Tyrväinen, P., Päivärinta, T., Salminen, A. and Iivari, J. (2006). Characterizing the evolving research on enterprise content management. *European Journal of Information Systems*, 15 (6), 627-634.
- Vom Brocke, J., Derungs, R., Herbst, A., Novotny, S. and Simons, A. (2011a). The Drivers behind Enterprise Content Management: A Process-Oriented Perspective. In *Proceedings of the 19th European Conference on Information Systems*, Helsinki.
- Vom Brocke, J., Simons, A. and Cleven, A. (2008). A Business Process Perspective on Enterprise Content Management: Towards a Framework for Organisational Change. In *Proceedings of the 16th European Conference on Information Systems*, Galway.
- Vom Brocke, J., Simons, A. and Cleven, A. (2011b). Towards a business process-oriented approach to enterprise content management. *Information Systems and E-Business Management*, 9 (4), 475-496.
- Yates, J. and Orlikowski, W.J. (1992). Genres of organizational communication: A structural approach to studying communication and media. *Academy of Management Review*, 17 (2), 299-326.