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Knut Grahlmann Utrecht University, k.grahlmann@cs.uu.nl

Cokky Hilhorst

Erasmus University, chilhorst@rsm.nl

Sander van Amerongen

PriceWaterhouseCoopers, Sander.van.Amerongen@nl.pwc.com

R. Helms Utrecht Universit, r.w.helms@cs.uu.nl

Sjaak Brinkkemper
Utrecht University, s.brinkkemper@cs.uu.nl

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# Impacts of implementing Enterprise Content Management Systems

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# IMPACTS OF IMPLEMENTING ENTERPRISE CONTENT MANAGEMENT SYSTEMS

- Knut R. Grahlmann, Dept. of Information and Computing Sciences, Utrecht University, P.O. Box 80.089, 3508 TB Utrecht, The Netherlands, k.grahlmann@cs.uu.nl
- Cokky Hilhorst, RSM Erasmus University, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands, chilhorst@rsm.nl
- Sander van Amerongen, PricewaterhouseCoopers Advisory N.V., Postbus 22735, 1100 DE Amsterdam, The Netherlands, Sander.van.Amerongen@nl.pwc.com
- Remko Helms, Dept. of Information and Computing Sciences, Utrecht University, P.O. Box 80.089, 3508 TB Utrecht, The Netherlands, R.W.Helms@cs.uu.nl
- Sjaak Brinkkemper, Dept. of Information and Computing Sciences, Utrecht University, P.O. Box 80.089, 3508 TB Utrecht, The Netherlands, S.Brinkkemper@cs.uu.nl

#### **Abstract**

This paper presents the results of a case study on the impacts of implementing Enterprise Content Management Systems (ECMSs) in an organization. It investigates how these impacts are influenced by the functionalities of an ECMS and by the nature of the ECMS-supported processes. The results confirm that both factors do influence the impacts. Further, the results indicate that the implementation of an ECMS can change the nature of ECMS-supported processes. It is also demonstrated that the functionalities of an ECMS need to be aligned with the nature of the processes of the implementing organization. This finding confirms previous research from the Workflow Management domain and extends it to the ECM domain. Finally, the case study results show that implementing an ECMS to support rather 'static' processes can be expected to cause more and stronger impacts than the support of 'flexible' processes.

Keywords: Enterprise content management systems, IS impact, IS evaluation, IS success/failure.

# 1 INTRODUCTION

The last decades have seen several prominent changes in the environment of both public and private organizations. New legal prerequisites require relevant business communication to be archived (Engel, Hayes & Wang, 2007). Trends toward telework and virtual teams require that employees are able to digitally access files from a distance (Bentley & Yoong 2000, Suchan & Hayzak 2001). In addition to these changes, organizations have been using word processors, homepages, intranets, and e-mail programs for both primary and supporting activities, which produce enormous amounts of content (O'Leary 1997, Sprague 1995). A major consequence is that a large share of organizations' content is now captured digitally (Alavi & Leidner 2001). The increase in the amount of content to be managed and its scatteredness throughout organizations have resulted in a situation where the professional management of content has become close to impossible, even though organizations are highly dependent on it (Dourish, Edwards, LaMarca, Lamping, Petersen, Salisbury et al. 2000, Grudin 2006). In response, Enterprise Content Management has become popular in recent years (Tyrväinen, Päivärinta, Salminen & Iivari 2006). It is defined as being an "integrated approach to managing all of an organization's information including paper documents, data, reports, web pages and digital assets" (Smith & McKeen 2003:647) and "the strategies, tools, processes, and skills an organization needs to manage all its information assets (regardless of type) over their lifecycle" (Smith & McKeen 2003:648). The technical foundation of ECM is usually formed by ECM Systems (ECMSs).

Despite the large potential benefits of ECMSs, little research has been conducted on this subject (Nordheim & Päivärinta 2006, Päivärinta & Munkvold 2005). To add to the problem of scarce scientific research, Andersen (2008) has observed that the discourse about ECMSs mainly occurs in practitioners' literature. She argues that practitioners usually view technology "as having an inevitably positive impact on an environment" (Andersen 2008:69). Päivärinta and Munkvold (2005) concur by stating that the success stories from practitioners should be accompanied by critical research. They have also identified a number of topics needing further research, including "practical means for evaluating the main impacts sought by ECM investments [...]; including also experiences from unwanted impacts and realized risks of ECM development projects" (Päivärinta & Munkvold 2005:9). Therefore, this paper seeks to answer the following research question:

How do the functionalities of an Enterprise Content Management System and the nature of ECMS-supported processes influence the impacts of implementing an ECMS in an organization?

The remainder of this paper is structured as follows. Section 2 shortly presents related work on the topics Enterprise Content Management and information systems' (IS) impacts. In section 3, the research method is presented. The case studies are described in chapter 4 and analyzed in chapter 5. A discussion of the limitations of this research and an outlook on further research topics can be found in section 6. The paper ends with a brief summary of conclusions.

# 2 RELATED WORK

# 2.1 Information systems' impacts

The potential impacts of implementing ECMSs are the dependent variable of this research's conceptual model. Merriam-Webster Online Dictionary (2008) defines an impact as "the force of impression of one thing on another: a significant or major effect". Numerous publications in IS literature have focused on evaluating the impacts of implementing information systems in organizations. It is commonly agreed that it is a complicated undertaking, in particular when a quantitative approach is pursued (Irani 2002). For this research, potential impacts from literature on the implementation of several Enterprise Systems (ES) have been collected in a first step (Grahlmann, Hilhorst, Amerongen, Helms

& Brinkkemper, 2009). In order to obtain insights into the nature of the impacts and their relationships, they have been categorized according to the framework depicted in Figure 1, which is based on Bouwman et al. (2005), Shang & Seddon (2002), and Smithson & Hirschheim (1998). Table 2 gives an overview of the identified impacts and Grahlmann et al. (2009) provide a detailed description of both the literature study and the framework.

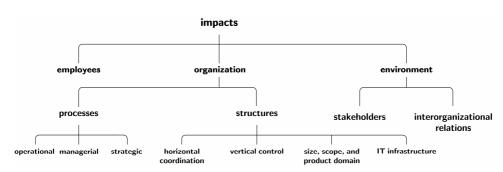


Figure 1: Impact framework.

# 2.2 First factor: Functionalities of ECMSs

Information systems impacts can be influenced by numerous factors and the word 'factors' refers to the "individual, organizational, and technological forces which are important to" (Cooper & Zmud 1990:123) the impacts of IS implementations. Since the existing literature on ECM does not mention such factors, ERP literature has been evaluated. This approach follows Nordheim and Päivärinta (2006) line of thinking. The authors also turned to ERP literature for their research on ECM because although ERPSs in general provide more functionalities than ECMSs, they are considered as a comparable class of ISs.

Hong & Kim (2002) and Mabert et al. (2003) have found supporting evidence that the functionalities of an ERPS influence its impacts. Therefore, the functionalities of ECMSs have been included in this research as an influencing factor. ECMSs as a new class of ISs (Tyrväinen, Päivärinta, Salminen, & Iivari 2006) differ from previously separate solutions in that they aim to combine the following ISs to offer a wider range of functionalities (Päivärinta & Munkvold 2005):

- Electronic Document Management (EDM) Systems: can be used for digitizing paper documents or offer collaborative editing functionality (Sprague 1995).
- Electronic Record Management (ERM) Systems: are supposed to preserve static versions of electronic information, potentially for an unlimited time period (Gilliland-Swetland 2005).
- Web Content Management (WCM) Systems: are similar to EDMSs in that they also manage dynamic version of electronic information. However, they are based on the separation of content and format (McKeever 2003).
- Workflow Management (WfM) Systems: automate the execution of business processes by coordination the flow of information among different ISs and by interacting with users (Aalst 2004).

Since the existing scientific literature on ECMS does not contain a complete list of potential functionalities an ECMS can offer, a Reference Architecture for ECM (RAE) has been designed. The RAE is depicted in Figure 2 and consists of a list of potential functionalities. This list is based on an extended discussion of the ECM concept and the evaluation of the current practitioners' and scientific literature on ECM (Grahlmann, Helms, Brinkkemper, Hilhorst & Amerongen, submitted for publication).

### 2.3 Second factor: Nature of ECMS-supported processes

Another relevant factor which can influence the impacts of implementing an ECMS is the nature of the processes which are supported by the ECMS. As Hong & Kim (2002) and Karimi et al. (2007) have

demonstrated, process characteristics are significant for the outcomes of ERPS implementations. There are many different ways of categorizing processes (e.g. Karimi et al. 2007) and for this research, the characterization scheme described by Mani et al. (2007) has been chosen. This scheme encompasses three abstract dimensions that allow processes to be categorized. The first one is *process analyzability*, which refers to organizational processes that can be planned well, where "participants follow an objective, computational procedure to resolve problems" (Daft & Macintosh 1981:208), and where there is hardly any uncertainty about the outcomes of the process. The second one is *process variety* which refers to sequential variety being defined as the "variability in the sequence of events or actions that make up a process" (Pentland 2003:857). Finally, *process modularity* refers to the interrelatedness of a process with other organizational processes so that it can function "as a coherent subtask that can be analyzed, modified, and enhanced, independent of its influence on other organizational processes" (Mani et al. 2007:8). A process is highly modular if it is 'autonomous' and can be executed independently of other processes.

# 3 RESEARCH METHOD

# 3.1 Case study research

Given the explanatory research question, a positivist case study approach was used as the research method (Darke et al. 1998). The current embryonic state of ECM research also justifies using this method since case study research has been positioned as being particularly appropriate for problems "in which research and theory are at their early, formative stages" (Benbasat et al. 1987:369). The process of this research has been guided by the methodological advices given in Dubé & Paré (2003) and Yin (2003). A case study protocol had been developed which amongst others included the questions for the semi-structured interviews and the coding schemes for the data analysis. As a mainly explanatory piece of research, the initial research model explained below has guided the data collection and analysis phases (Yin 2003).

#### 3.2 Research model

An initial research model has been developed based on the elements described above. The functionalities of ECMSs are captured by the first independent variable 'functional scope' which is defined as
"the range of business functions" (Karimi et al. 2007:105) offered by the ECMS. It has been operationalized by using the RAE. As a design research artefact, it has been designed to be a complete conceptual division of the potential functionalities provided by ECMSs. This means that the RAE represents the maximum functional scope an ECMS can posses. The independent variable 'process type'
refers to the nature of the ECMS-supported processes, namely the three categories process analyzability, process variety, and process modularity. The functional scope and the process type are expected to
influence the dependent variable, the impacts of implementing ECMSs. The assumption behind the
first factor is that the presence of a particular functionality causes certain impacts. With regard to the
second factor, it is assumed that while the occurrence of certain impacts can be related to the particular
process type, ECMSs can generally be used for all processes types.

# 4 CASE STUDIES

# 4.1 Selection of cases

The units of analysis of this case study are ECMSs which have been successfully implemented in an organization. The definition of success follows Bridges (2007): users are aware of the ECMS's presence and they use it for their regular work. Since this research is explanatory, a multiple-case design

has been chosen (Yin 2003:52). ECMSs that fulfilled the criteria for being an adequate unit of analysis were available to the authors for conducting a case study at three organizations. A preliminary screening of the cases was conducted for determining their suitability. The only element of the research model about which information was available for all cases was the process type. The screening showed that all three cases were expected to display different results with regard to the process type.

#### 4.2 Data collection

Data has been collected by conducting semi-structured interviews and document studies. The interviews have not been transcribed, but rather, detailed summaries and individual case study reports have been created instead. These reports also included the results of coding the three elements of the research model. Both the summaries and reports have been checked and authorized by the respondents, which simultaneously served as a coding check. The sources of the data are summarized in Table 1.

Case	Interviews	Documents		
1	three individual interviews with a product champion, a project	internal e-mails; annual report; re-		
	leader, and a partner; one informal discussion (field note)	sults of ISO9001 audit		
2	one interview with the Head of the "information provision"-	proposal document from the system		
	group, a process engineer, and a system administrator; one with a	integrator; results from client survey		
	consultant who participated in the implementation project	from the department		
3	one interview with Operations Manager of the implementation	GlobalStar Enterprise Award 2008		
	project and Assistant Director of the Operational Management	application; fact sheets; articles		
	Division	from IT magazines		

Table 1: Overview of data sources.

# 4.3 Case 1: The case of consulting company Organization A

# 4.3.1 Context

The first case study has been conducted at Organization A (Org. A), a consulting company mainly operating in the Netherlands which was founded in December 2004. Due to the diverse backgrounds of its employees, projects were executed and documented differently. In order to overcome these inconsistencies, a standardized process for performing projects was introduced. An ECMS was implemented to support this process – the only main process of Org. A – in January 2008. The implementation had as its main goal enlarging two sorts of compliance: the compliance with project execution standards (mainly engagement acceptance) and the compliance with documentation standards.

#### 4.3.2 Functional scope

The ECMS is a combination of two applications. The first one supports the acceptance of projects (the first part of the main process) and provides production WfM, limited EDM, and Business Intelligence (BI, post-execution analysis of process data) functionality. The second application is the main one and supports the actual project execution (the second part of the main process) by allowing for the capture of the results of activities at a user-chosen moment. The actual execution of the individual project steps is done by the users and the way how this is done is left open to the largest extent possible. This application provides ad-hoc WfM functionality which is combined with EDM and ERM functionality. Since project files are digitized now, the application also offers BI functionality.

#### 4.3.3 Process type

The two parts of the process differ in their process type. The first part (including compliance checks, risk assessment, writing project proposal) is clearly defined and follows a pre-defined order. The activities to be performed are known beforehand. Therefore, the analyzability of this part is high and its variety is low. In contrast, the second part of the process includes only few mandatory steps and it is often not known beforehand, which activities have to be performed exactly during projects. The order of the performed activities is hardly the same for any two projects. In summary, the analyzability of this part is low and its variety is high. However, both parts together form the only primary work process of Org. A and therefore, the modularity of the two parts is high.

# 4.3.4 Impacts

The impacts of implementing the ECMS occurred mainly in the categories employees, operational processes, managerial processes, horizontal control, size/scope/product domain, and vertical control. They can be sorted into two groups. The first application resulted in various positive impacts with respondents for example mentioning that the acceptance procedure has both been simplified and accelerated. The paper forms used before the implementation (with all associated disadvantages such as incomplete or lost forms) have been replaced by an ECMS which enforces that all required steps of the first process part have to be performed in a dictated, predefined order before employees are able to book their working hours. This has increased the compliance with the acceptance requirements. It was mentioned that the first part of the process used to have a high process variety before the introduction of the ECMS. The implementation of a production WfM module changed this characteristic.

In comparison, the second application has also caused negative impacts. Several consultants are dissatisfied with the application. It is perceived not to be user-friendly since a number of features are missing or have been implemented insufficiently. This results in the feeling that the application does not simplify, but rather complicates things. It is also is not integrated with the time keeping, expenses, and billing system. Therefore, activities have to be performed in different ISs. In addition, the application requires that additional work steps are performed next to the regular work, for example describing the current project status. Although these work steps are necessary for the company as a whole, there is limited added value for the actual project. The resulting atmosphere in the group studied was summarized by one respondent in the following sentence: "In general, I have the feeling that the technology has been tossed into the organization without really thinking how it should be adapted to the work process". There are also some positive impacts of this application. The amount of available information about file keeping has increased. This allows management to get an overview of files which are improperly maintained, so that the responsible employees can be approached to rectify the omission or error. This has enlarged the compliance with documentation requirements. The application also simplifies the cooperation within projects where a lot of documents have to be shared since it provides a central and secure place for storing and exchanging documents.

#### 4.4 Case 2: The case of the social welfare department of a Dutch municipality

#### 4.4.1 Context

The department WCI (work, care, and income) of a municipality in the Netherlands is responsible for a number of areas within the field of social welfare. The staff members oversee the processes of directing several governmental benefits to citizens, for example unemployment benefits, support of low-income citizens, or home care subsidies. They also co-operate with the local employment office. Before the implementation of the ECMS, the department had to pay a considerable amount of fines each year, mainly due to the fact that deadlines had been exceeded. Files were sometimes lost or could only be recovered with considerable efforts and information was often not promptly available. An addi-

tional problem was that changes in legislation occurred frequently and it was hard to put them into practice, for example because outdated forms were still used.

# 4.4.2 Functional scope

This ECMS is formed by the applications GWS4all and DIS. GWS4all (Geintegreerd Welzijn Systeem, engl. Integrated Welfare System) from Centric is a production WfM application and includes process descriptions of all 'social welfare processes' carried out in the department. DIS provides elaborated EDM and ERM functionality and is based on IBM FileNet. Both applications also provide BI functionality.

# 4.4.3 Process type

The main work processes being supported by the ECMS are structured along the laws describing the requirements for receiving certain social benefits. Therefore, all main processes are quite similar. The external triggers for processes are clearly defined and the activities performed are common to different inputs. All processes are clearly structured so that the order of activities is strictly defined and deviations are hardly possible. There are no dependencies among the main work processes as this has been deliberately avoided during their definition. Therefore, the analyzability is high, the variety is low, and processes are highly modular.

# 4.4.4 Impacts

Impacts have been observed in the categories employees, strategic processes, horizontal control, and vertical control. However, the strongest impacts occurred in the categories operational and managerial processes. The implementation of the ECMS resulted in no more fines due to exceedance. During the ECMS-implementation, the handling of case files was completely changed. Before the implementation, paper files were carried through the building. Post implementation, all incoming documents are digitized and all communication regarding cases between employees has to occur digitally via the ECMS. Staff members may only print documents for personal use, resulting in less print-outs and in a cost reduction. Another result of digital files is that these are always up-to-date and available so that citizens have a shorter waiting time when contacting the department. The digitization has also increased the amount and quality of available management information, for example about cycle times, which in turn improved planning processes. Since GWS4all coordinates the department's daily work, adherence to pre-defined processes has become mandatory as it is enforced by GWS4all. The first result of this change is that staff members are now used to thinking about their work processes in a structured way. Secondly, new national laws or requirements from the municipality can be implemented more quickly. In summary, the department WCI is now often referred to as a model example of how such a department should be organized at the municipal level.

# 4.5 Case 3: The case of the Supreme Court of the Netherlands

# 4.5.1 Context

The third case study took place at the Supreme Court of the Netherlands (in the remainder: Hoge Raad) which is the highest Dutch court for civil, criminal, and tax law. It is concerned exclusively with so-called cassation rulings. This means that rulings by lower courts are only evaluated as to whether the law, including procedural rules, has been applied properly. In total, there are about 250 people working at the Hoge Raad who manage the approximately 5000 cases which are brought before the Hoge Raad every year. There were several triggers for implementing an ECMS. Case files only existed as paper documents which impeded collaboration within the Hoge Raad. Each sector (civil, criminal, and tax law) used a different application for registering cases, causing data to be inconsistent.

The applications also did not function properly with the Server Based Computing environment which had been installed in 2001 to reduce operational costs. In 2003, it was therefore decided to introduce a new IS. This was also taken as the trigger to introduce a number of organizational changes, such as making the processes of the administrative support department more efficient and increasing the data and information sharing/exchange.

### 4.5.2 Functional scope

C@sus, the ECMS of the Hoge Raad, is based on OpenText LiveLink ECM that has been extended with several COTS and customized applications. The respective LiveLink modules provide EDM, ERM, case handling WfM, and BI functionality. Content is imported from external sources and also published to external parties. A Component Content Management (CCM) module has been included which allows managing content on a "fine granular level, in ways that allow the [content] components to be easily used, reused, versioned, linked, assembled, and reassembled into different content products" (Trippe 2005:2). The ECMS is also integrated with the word processor, so that for example documents can be edited collaboratively.

# 4.5.3 Process type

The main judicial process is started by incoming documents, which are scanned and enriched with metadata. After registration, a case is assigned to an internal researcher who usually spends several months searching for facts in the legal literature. After the researcher, a State Attorney usually analyzes the case and writes a conclusion. Subsequently, a group of three or five Council Lords renders a judgment based on the previously created documents. Finally, the judgment is pronounced and is mailed to the parties concerned. This is a simplified description of the process and it should be noted that all three fields of law have different rules. Therefore, staff members have to make decisions on a case-by-case basis. Although the general structure of the process has been defined, its execution is not deterministic. All employees have considerable freedom in how to process a case. They have to interpret the facts of each case and use their professional judgement to form a decision. In light of the longevity of the process, the analyzability of the main process is low. The sequential variety is low since there are strong logical dependencies amongst the steps. The latter are to a large extent prescribed by law and are therefore hardly depend case-dependent. Besides some possibilities for inquiries etc. during the first administrative phase of the process, there is no interfacing with other internal processes or institutions. Therefore, the modularity of the Hoge Raad's main work process is high.

# 4.5.4 Impacts

The impacts belong to the categories employees, operational process, managerial processes, horizontal coordination, vertical control, IT infrastructure, and stakeholders. One of the main impacts is that C@sus provides many insights into process execution. For example, information about the number and type of cases is used for the budgeting process and for reports to the public and governmental institutions. Another example is that the productivity of staff members of the administrative department can be monitored. These staff members also create reports themselves and use information such as cycle times or the current size of the case-pool for the individual planning of their daily work. The implementation of C@sus led to a considerable increase in data quality. During the conversion of the old registration systems, the (approximately 445.000) old records from the previous registration systems were tidied up. During the data migration, all digitally available judgments and conclusions were incorporated in C@sus. The fact that case files are digitally accessible simplified the cooperation among the different process participants. Finally, the IT-infrastructure now provides the means for telework.

# 4.6 Overview of case study results

This section visualizes the results of the three case studies. The ECMSs studied at the three organizations have provided the functional scopes depicted in Figure 2 on the following page.

					Impact	type at	cases
Category		#	Impact	1	2	3	
employees		1	change of organizational culture				
		2	social conflicts				
		3	user satisfaction	m (+/-)	h	m	
		4	facilitating organizational learning	1	m	m	
			5	concentration on core work	1	1	
			36	change of work organization		1	m
organization	ses	operational	6	improved efficiency	1	h	1
	ces		7	higher reliability, quality, and timeliness of content	1	h	m
ani	processes		8	quality improvements	1	m	
org			9	'customer' service improvements		1	1
			10	change of business processes		m	1
			11	cost reductions	1	m	1
			12	compromise costs	1		
		managerial	13	change of risk profile	1	m	1
			14	improved quality of management information	h	h	h
			15	improved decision making and planning	1	m	h
			16	increased compliance	m	h	1
		strategic	17	change in business adaptability		m	
		1	18	support of business growth			
			19	building business innovation			
			20	building cost leadership			
			21	enabling worldwide expansion			
	structures	horizontal coor- dination	22	improved and simplified access to authoritative content/organizational memory	m	m	h
	tru		23	increase in content sharing	1		
	S		24	improved internal collaboration	1	1	m
		size/scope/	25	new or value-added products or services			
		product domain	26	(additional) efforts are required for keeping content up to date	m		
		vertical control 27 28	27	improved governance	m	1	1
			28	change in organization's power structure		m	
		IT infrastructure	29	increased IT infrastructure capability			m
cont	interorganizational relations 30		30	new or improved 'business' relationships			
			31	improved external collaboration			
	stak	stakeholders 32 33		improved branding			m
				enhanced 'customer' integration			
	34		34	improved 'customer' relations			
			35	decrease in quality of external communication			

*Table 2: Overview of impacts observed during case studies.* 

The statements of the respondents and the descriptions in the documents studied have been coded into the impacts captured by the impact table. Their type ((h)igh, (m)edium, (l)ow impact) has been coded according to the coding scheme from the case study protocol and is indicated in columns 6 to 8 of Table 2. The latter is an updated version of the initial list of impacts (Grahlmann et al., (2009)). The changes were necessary so that all findings of the cases could be captured.



Figure 2: Functional scopes of the ECMSs of the three case studies.

# 5 ANALYSIS OF EMPIRICAL FINDINGS

The cross case analysis delivered a number of explanatory results which have been summarized in the following propositions, connecting elements of the initial research model. Contrary to expectations, the first two propositions indicate that the functional scope and the process type influence each other.

Proposition 1: Implementing an ECMS can change the nature of ECMS-supported processes.

In case 1, it was shown that the implementation of an element of the RAE (i.e. a production WfMS module) changed the process type. When evaluating the respondents' statements with respect to this particular application, it is notable that this change has not lead to negative impacts even though it can be assumed to have had a considerable influence on the way work is performed. Potential reasons are that the application is perceived as useful since it simplifies the work and that it has been carefully implemented in the organization. This finding can be considered as an example of the 'duality of technology' (human agents influencing technology which in turn influences the human agents) described by Orlikowski (1992) in her paper on theory of structuration in the IT domain. The case also confirms the observation of vom Brocke, Simons & Cleven (2008) that Business Process Reengineering can be part of an ECMS implementation. Further research will need to show whether this proposition also holds true for different original process types.

Proposition 2: The functionalities of an ECMS need to be aligned with the nature of processes.

Contrary to expectations, the analysis showed that the functional scopes are (consciously or unconsciously) influenced by the process types of the ECMS-supported processes. At case 1, the unanalyzable and highly variable nature of the process' second part precludes the definition of all possible workflows and a strict configuration of the system because employees would be hampered in their work. Therefore, an ad-hoc WfM module is most suitable and has indeed been chosen. The process at case 2 is very suitable for a production WfM module because the sequence of the ECMS-supported processes can be determined beforehand. The department's EDM module could easily be integrated with the ERM module since the list of documents to be created during processes is limited and foreseeable due to the high analyzability. At case 3, the low process variety indicates that the tasks to be performed are structured, but the low analyzability also indicates that the actual execution depends on the specific circumstances of the changing environment. Therefore, the chosen case handling WfM module which predefines a general structure but leaves some freedom to employees is indeed most suitable. The relationship between the process type and the WfM module has already been implicitly described by Aalst (2004). He states that each type of WfMS can be assigned to a certain category of work processes. This study therefore adds to existing research by transferring the findings to the ECM domain. In addition, the findings from this study extend the findings from Aalst (2004) to the chosen operationalization of the process type.

Proposition 3: Implementing an ECMS to support highly analyzable processes with a low variety leads to more and stronger operational and managerial impacts than for other process types.

As described in Proposition 2, a production WfM module is most suitable to support highly analyzable processes with a low variety. Case 2 displayed almost all the impacts in the category operational processes and these are also stronger than in the other cases. Case 1 represents the opposite process type and the ad-hoc WfM module at Org. A did indeed cause only few and weaker impacts. The process type of case 3 falls in between these two extremes and this is reflected in the impacts on the operational processes.

The managerial impacts (mainly quality of management information, decision making, and compliance) can also be related to the process type. When a production WfM module is used, a large degree of 'direct compliance' is likely to be achieved because the system itself can enforce regulations. The quality of management information is also higher because all activities performed by employees can be monitored. For other WfM modules (supporting different process types), only an indirect approach for achieving compliance can be taken resulting in weaker impacts (as observed in cases 2 and 3). Since employees enjoy a large degree of freedom, these ECMSs cannot enforce regulations. However, project and case files which were previously only available in analog form have been digitized. Consequently, using BI functionality improved the quality of management information. This impact can be assumed to form the basis for the impact that the decision making and planning has been improved. The availability of better information and/or of previously unavailable information almost automatically gives management an improved basis for decision-making. The newly available information also provides management with a clearer insight into the way processes are executed, potentially down to an activity level. Based on this insight, appropriate actions can be taken to enforce compliance.

# 6 DISCUSSION

Yin (2003) has proposed four types of validity for which case study research needs to strive. The construct validity of this research is high. The operationalization of the constructs functional scope, process type, and impacts are indeed able to capture differences between the cases. The codings of all case studies have been confirmed by the respondents who reviewed draft versions of the particular case study reports. In addition, multiple sources of evidence have been used and the individual reports establish chains of evidence. The reliability is also high since all evidence has been collected following a case study protocol and has also been registered in the case study database. The procedures followed

for both the data collection and analysis have also been described. The internal validity of this research is high as well. Using pattern matching, the observed impacts could be related to the implementation of the particular ECMS in all cases. Finally, the external validity is relatively also high, but has some limitations with respect to the number and distribution of the cases. These are not optimal due to the limited amount of organizations available for study. No organization with low process modularity could be studied so no conclusions with respect to this category are possible. The same limitation holds for the functional scope since not even the combination of the three functional scopes contains all potential functionalities of an ECMS. Therefore, the impacts of, for example, extended collaboration or WCM modules could not be evaluated. In addition, assumptions as for example that processes which are less modular require an extended usage of the Enterprise Application Integration module could not be tested. Furthermore, the cases only cover one relatively small commercial organization mainly operating in the Netherlands and two Dutch public organizations. Therefore, it has not been possible to determine whether comparable impacts also occur at organizations with a larger size and/or scope (e.g., large national companies, multinational enterprises). Further research is needed in order to increase the external validity of the explanatory results and to investigate the newly discovered relationship between the functional scope and the process type (and vice versa).

This study also produced exploratory results. The analysis of the case 1 showed that it displays negative impacts (in particular during the second part of the process) even though the functional scope has been aligned with the process type. In theory, this particular process type can be supported by an ECMS as indicated by Aalst (2004). Therefore, the occurrence of the negative impacts can not be explained by the two independent variables of this study. It needs to be concluded that the initial ECMS impact model most probably lacks (at least) one additional factor which can explain the occurrence of these impacts and which should be subject of further research.

# 7 CONCLUSIONS

The framework for this study has been provided by the research question: *How do the functionalities of an Enterprise Content Management System and the nature of ECMS-supported processes influence the impacts of implementing an ECMS in an organization?* To answer this question, three case studies were conducted. Results indicate that implementing an ECMS to support highly analyzable processes with a low variety causes more operational and managerial impacts. These impacts are also stronger than for other process types. In addition, it has been indicated that the functionalities of an ECMS need to be aligned with the nature of the processes of the implementing organization. This initially unexpected finding had thus far only been described in literature from the WfM domain. Therefore, this study has demonstrated the applicability of this relationship for the ECM domain. Finally, it has also been shown that the implementation of an ECMS can change the nature of ECMS-supported processes. This relationship had thus far only been suggested in the studied literature. This study is the first one to conceptualize and explore both the impacts of implementing ECMSs and their influencing factors. The meaningfulness of the empirical results shows that both the research approach and the operationalizations of the research model's elements are an appropriate method for studying the impacts of implementing ECMSs.

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