

# Categorizing impacts of implementing Enterprise Content Management Systems

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## **Abstract**

This technical report contributes a framework for categorizing impacts of implementing Enterprise Content Management Systems. The results of a literature study on the potential impacts are presented. The categorization framework is designed taking a rigorous design research approach. A combination of the framework and the impacts has been used in a case study research and based on the results, a few changes to the previous results were necessary.

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# List of Acronyms

BAM	Business Activity Monitoring
BI	Business Intelligence
CMS	Content Management System
CRMS	Customer Relationship Management System
ECM	Enterprise Content Management
ECMS	Enterprise Content Management System
EDM	Electronic Document Management
EDMS	Electronic Document Management System
ERM	Electronic Records Management
ERPS	Enterprise Resource Planning System
ES	Enterprise System
IS	Information System
WCM	Web Content Management
WfM	Workflow Management
WfMS	Workflow Management System

# 1 Introduction

This technical report presents parts of the results from a larger research project on the impacts of implementing Enterprise Content Management Systems (ECMSs). This new class of Information Systems (ISs) (Tyrväinen, Päivärinta, Salminen, and Iivari, 2006) differs from existing solutions in that it aims to combine (amongst others) the previously separated ISs for Electronic Document Management (EDM), Electronic Records Management (ERM), Web Content Management (WCM), and Workflow Management (WfM) (Päivärinta and Munkvold, 2005). As their combination, ECMSs are meant to support “activities such as content creation and capture, content editing, review, approval, content indexing, classifying and linking, content distribution, publication and use, update, preservation, format transformation for long-term archival, and retention” (Tyrväinen et al., 2006, p.631).

The original research addresses the following research question:

*What are the impacts of implementing Enterprise Content Management Systems in organizations and how are they related to relevant influencing factors?*

This question has been split up into a number of sub-questions of which the following two are elaborated on this document:

*Which impacts can occur when an Enterprise Content Management System is implemented in an organization?*

This sub-question results in a list of potential impacts. However, a simple list is likely to be only usable as a checklist and does not deliver insights into the nature of the impacts. Therefore, a framework is needed which allows to categorize impacts according to their nature.

*How can the impacts of implementing Enterprise Content Management Systems be categorized and operationalized?*

The remainder of this report is structured as follows. Chapter 2 describes the research method used in this research. Afterwards, a literature study and its results are presented in chapter 3. The following chapter 4 describes how the categorization framework has been designed. Then, the use of the previous results in a case study research and the obtained results are explained in chapter 5. The report ends with a brief summary of conclusions.

## 2 Research method

Design research (or design science) “involves the analysis of the use and performance of designed artifacts to understand, explain and very frequently to improve on the behavior of aspects of Information Systems” (Vaishnavi and Kuechler, 2007). These artifacts can take various forms, namely constructs, models, methods, instantiations, and better theories (Vaishnavi and Kuechler, 2007). For this research, only *constructs* which “define the terms used when describing and thinking about tasks” (March and Smith, 1995, p.256) and *models* — “set[s] of propositions or statements expressing relationships among constructs” (March and Smith, 1995, p.256) — are relevant since the other three forms are not asked for by the sub-questions. Several frameworks for conducting design research have been proposed in literature which have been summarized by Vaishnavi and Kuechler (2007) as depicted in figure 2.1.

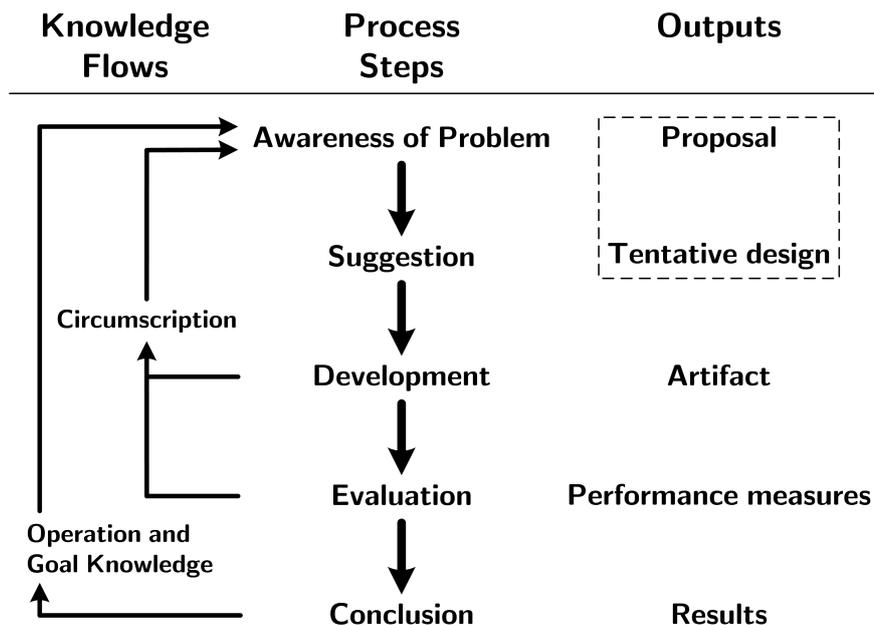


Figure 2.1: General method for conducting design research (Vaishnavi and Kuechler, 2007).

The first step in design research is to become aware of a problem on which research is necessary because it is required by scientific or business needs. This phase results in a (formal or informal) proposal describing the problem which also contains evaluation criteria for and a tentative design of the artifact. This design is created during the suggestion phase which in its essence is a “creative step wherein new functionality is envisioned” (Vaishnavi and Kuechler, 2007). This initial idea of the final artifact is further detailed in the development phase. During this phase, researchers are expected to incorporate findings from previous IS research which can be found in the so-called knowledge base. In the following phase, the artifact is evaluated with regard to the previously mentioned criteria what results in measures of its performance. The method used for the evaluation can take various forms, for example an experimental approach such as a simulation or an observational approach as for example case study research. At this point, it

is important to notice that design research usually is an iterative search process. The arrows in figure 2.1 labeled circumscription describe a feedback loop through which the comprehension of the initial problem (domain) continuously grows based on the findings and events of the design and evaluation phase. This comprehension influences in turn the results of these two phases as well. This loop continues until the artifact is “good enough” (Vaishnavi and Kuechler, 2007) so that the overall results of the research can be summarized in the last phase: either as confirmed knowledge or as triggers for further research, creating awareness of a new problem. In both cases, the results need to be communicated in a way that clearly contributes to the knowledge base. In fact, the continued abstraction of the results can lead to a more general understanding of or to emergent theory about the problem domain (Hevner, March, Park, and Ram, 2004; Vaishnavi and Kuechler, 2007).

The just mentioned goal of communication about design research artifacts can be obtained by including six components formulated by Jones and Gregor (2008). The first one is the definition of the artifact’s *purpose and scope*. Secondly and similar to the first type of artifact formulated by March and Smith (1995), *constructs* are to be provided which means that the elements being used within the artifact are to be named and defined. In addition, the *principle of form and function* which forms the architecture of the artifact is to be explicated. The fourth component *artifact mutability* requires that the description also comments on future changes to the artifact. *Testable propositions* about the artifact help to evaluate it. Finally, it needs to be stated on which *justificatory knowledge*, i.e. which findings from previous research, the artifact is based on.

### 3 Literature study on potential impacts of implementing ECMSs

Merriam-Webster defines an impact as “the force of impression of one thing on another : a significant or major effect” (Merriam-Webster Online Dictionary, 2008b). This broad definition is followed in this document, i.e. the word impact refers to the consequences having occurred due to the implementation of an ECMS. Serving as the preliminary answer to the first research question, table 3.2 on page 11 presents potential impacts of implementing ECMSs which have been described in literature. Next to the description of the impact, the table also contains a column denoting for which type(s) of IS the described impact has been observed. It needs to be mentioned that strictly speaking, governmental or non-profit organizations do not have customers and that therefore the word ‘customer’ should be replaced by clients. However, in order to avoid unusual terms such as for example ‘client service improvement’, the word customer has been put in between single quotes.

Table 3.1 on the following page lists the sources studied and characterizes the type of IS or the topic they have examined. Most of these studies are qualitative in nature. A much more quantitative approach has for example been taken by Dehning and Richardson (2002), who evaluate the impact of introducing Enterprise Resource Planning Systems (ERPs) on the financial figures (net profit margin, return on assets etc.) of several companies. Due to the current, not yet sophisticated state of research on Enterprise Content Management (ECM) (Nordheim and Päivärinta, 2006; Päivärinta and Munkvold, 2005), this kind of research is out of scope and has not been included in this research.

	source	research focus
1	Aalst and Hee (2004)	Workflow Management Systems (WfMSs)
2	Aalst, Hofstede, and Weske (2003)	WfMSs
3	Andersen (2008)	ECMSs
4	Ash, Berg, and Coiera (2004)	Patient Care Information Systems
5	Chiu and Hung (2005)	ECMSs
6	Davenport (1998)	ERPSs
7	DeLone and McLean (2003)	success of ISs
8	Dilnutt (2006)	ECMSs
9	Doherty and Perry (2001)	WfMSs
10	Gattiker and Goodhue (2004)	ERPSs
11	Hendricks, Singhal, and Stratman (2007)	ERPSs
12	Karimi, Somers, and Bhattacharjee (2007)	ERPSs
13	McAfee (2002)	ERPSs
14	Newell, Huang, Galliers, and Pan (2003)	ERPSs
15	Nordheim and Päivärinta (2006)	ECMSs
16	Päivärinta and Munkvold (2005)	ECMSs
17	Reijers and Aalst (2005)	WfMSs
18	Richard, Thirkell, and Huff (2007)	Customer Relationship Management Systems (CRMSs)
19	Shang and Seddon (2002)	benefits of Enterprise Systems (ESs)
20	Smith and McKeen (2003)	ECMSs
21	Sprague (1995)	Electronic Document Management Systems (EDMSs)
22	Sprehe (2005)	ECMSs
23	Symons (1991)	IS evaluation
24	Tyrväinen et al. (2006)	ECMSs
25	Zantout and Marir (1999)	EDMS

Table 3.1: Sources of impacts and respective research foci.

impact	description	source	type(s) of IS
1	change of organizational culture	streamlined management structures, more centralized control possible (Davenport, 1998)	Davenport (1998); Doherty and Perry (2001); Junco, Bailie, and Ledet (2005) Content Management System (CMS), WfMS, general
2	social conflicts	e.g. creation of inter-group conflict and resistance through "shift in information ownership" (Newell et al., 2003, p.44)	Newell et al. (2003) ERPS
3	user (dis)satisfaction	e.g. increase in employee morale due to higher work efficiency or improved employee services (Shang and Seddon, 2002)	DeLone and McLean (2003); Shang and Seddon (2002) general
initial version:			
4	facilitating organizational learning	e.g. broadened employee skills	Shang and Seddon (2002) general
updated version:			
4	facilitating organizational learning	e.g. broadened employee skills or increase in process awareness	Shang and Seddon (2002); C2 ECMS, general
5	concentration on core work	e.g. focus on business process and overall performance	Shang and Seddon (2002) general
6	improved efficiency	e.g. through accelerated exception handling (Chiu and Hung, 2005), decrease of fraction of orders shipped late (McAfee, 2002), shortening service and wait time during process execution (Reijers and Aalst, 2005), simplification of forms (Smith and McKeen, 2003), cycle time reduction (Shang and Seddon, 2002)	Chiu and Hung (2005); Dilmutt (2006); Han (2004); Päiväranta and Munkvold (2005); Reijers and Aalst (2005); Shang and Seddon (2002); Smith and McKeen (2003) CMS, ECMS, ERPS, WfMS, general
7	higher reliability, quality, and timeliness of content	e.g. through central content storage	Han (2004); Päiväranta and Munkvold (2005); Smith and McKeen (2003) CMS, ECMS

...continued on next page

impact	description	source	type(s) of IS
8	quality improvements	e.g. less errors in products and services through central content storage (Smith and McKeen, 2003)	ECMS, general
initial version:			
9	'customer' service improvements	e.g. more simple access to better data and information about 'customers'; long-term and centralized content storage prevents its loss when employees leave the company and allows to manage content for several departments/lines of business/etc. (Hendricks et al., 2007)	CRMS, ECMS, general
updated version:			
9	'customer' service improvements	e.g. more simple access to better data and information about 'customers'; long-term and centralized content storage prevents its loss when employees leave the organization or are temporarily not available; allows to manage content for several departments/lines of business/etc. (Hendricks et al., 2007); C2	CRMS, ECMS, general
10	change of business processes	e.g. (substantial) reengineering (Sprague, 1995) or simplification of processes (Smith and McKeen, 2003) through reduced paperwork (Sprehe, 2005), unification of processes (Shang and Seddon, 2002)	ECMS, EDMS, WfMS, general
11	cost reductions	e.g. through reduced material costs (Smith and McKeen, 2003) and reduced amount of facilities needed for storage of paper documents (Sprehe, 2005)	CMS, ECMS

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impact	description	source	type(s) of IS	
12	compromise costs	e.g. through decrease in efficiency due to inappropriately designed user interfaces, inappropriate process reproduction in the ECMS (Ash et al., 2004)	Andersen (2008); Ash et al. (2004); Gattiker and Goodhue (2004)	ECMS, ERPS, Patient Care Information System
initial version:				
13	risk mitigation	e.g. of risks associated with uncoordinated content exchange and storage such as integrity, redundancy, versioning etc.	Karimi et al. (2007); Smith and McKeen (2003)	ECMS, ERPS
updated version:				
13	change in risk profile	mitigation of risks associated with uncoordinated content exchange and storage (e.g. integrity, redundancy, versioning) (Karimi et al., 2007; Smith and McKeen, 2003) or e.g. increased dependency on IT, increased vulnerability (C1, C2, C3)	Karimi et al. (2007); Smith and McKeen (2003); C1, C2, C3	ECMS, ERPS
14	improved quality of management information	e.g. through making Business Activity Monitoring (BAM) and Business Intelligence (BI) possible (Dilnutt, 2006)	Aalst and Hee (2004); Dilnutt (2006); McAfee (2006); Smith and McKeen (2003); Sprehe (2005)	ECMS, WfMS, general
initial version:				
15	improved decision making and planning	e.g. improved management of organizational resources	Shang and Seddon (2002)	general
updated version:				
15	improved decision making and planning	improved management of organizational resources, e.g. through more flexible staffing	Shang and Seddon (2002); C2	ECMS, general
16	increased compliance	enforcement of organization-external regulations, e.g. content retention policies as set by the Sarbanes-Oxley Act (Nordheim and Päiväranta, 2006; Sprehe, 2005)	Nordheim and Päiväranta (2006); Päiväranta and Munkvold (2005); Smith and McKeen (2003); Sprehe (2005)	ECMS

...continued on next page

impact		description		source	type(s) of IS
initial version:					
17	deteriorated business adaptability	inflexible implementation of the ECMS, e.g. standardized content models (Andersen, 2008)		Andersen (2008); Smith and McKeen (2003)	ECMS
updated version:					
17	change in business adaptability	decrease e.g. through inflexible implementation of the ECMS (standardized content models) (Andersen, 2008); increase e.g. through process awareness and executable process descriptions (C2)		Andersen (2008); Smith and McKeen (2003); C2	ECMS
18	support of business growth	e.g. increase in potential transaction volume		Shang and Seddon (2002)	general
19	building business innovation	e.g. new process chains		Shang and Seddon (2002)	general
20	building cost leadership	e.g. lean structure with streamlined processes, economies of scale in operations		Shang and Seddon (2002)	general
21	enabling worldwide expansion	e.g. centralized world operations, global resource management, or multicurrency capability		Shang and Seddon (2002)	general
22	improved and simplified access to authoritative content/organizational memory	e.g. through central content storage and "ease of navigation" (Smith and McKeen, 2003, p.649) for regular users, centralized search (Han, 2004)		Han (2004); Hendricks et al. (2007); Päiväranta and Munkvold (2005); Smith and McKeen (2003); Sprague (1995); Sprehe (2005)	CMS, ECMS, EDMS, ERPS
23	increase in content sharing	e.g. through simplified access to content (Smith and McKeen, 2003), "improve the efficiency and effectiveness of documents in their role as a primary mechanism for storing and communicating concepts and ideas within [...] organizations (and their groups and individuals)" (Sprague, 1995, p.33)		Smith and McKeen (2003); Sprague (1995)	ECMS, EDMS
24	improved internal collaboration	"involving knowledge creation and sharing through digital content in [...] enterprises with commonly enacted practices" (Päiväranta and Munkvold, 2005, p.2)		Päiväranta and Munkvold (2005)	ECMS

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impact		description		source	type(s) of IS
25	new or value-added products or services	e.g. through new organizational capabilities: "ECM development as such builds competence and technological platforms in the enterprise, on which it becomes quicker to develop and maintain targeted content management applications for emerging purposes" (Päivärinta and Munkvold, 2005, p.2), as for example advanced personalization techniques or innovative customer services (Päivärinta and Munkvold, 2005), product differentiation (Shang and Seddon, 2002)	Chiu and Hung (2005); Päivärinta and Munkvold (2005); Shang and Seddon (2002); Smith and McKeen (2003)	ECMS, general	
26	(additional) efforts are required for keeping content up to date	up-to-dateness of content crucial for its credibility and in turn utilization of the ECMS (Smith and McKeen, 2003)	Smith and McKeen (2003); Zantout and Marir (1999)	ECMS, EDMS	
27	improved governance	enforcement of organization-internal regulations, e.g. through "standardized firm-wide transactions and centrally stored enterprise data" (Hendricks et al., 2007, p.68) or "consistent operating practices across geographically dispersed units" (Davenport, 1998, p.127)	Davenport (1998); Hendricks et al. (2007)	ERPS	
28	change in organization's power structure	e.g. "increased access to information at headquarters may be seen by divisional managers as an erosion of their power base" (Symons, 1991, p.206), employee empowerment (Shang and Seddon, 2002)	Shang and Seddon (2002); Symons (1991)	general	
initial version:					
29	increased IT infrastructure capability	e.g. stable and flexible support of process and structure changes (Aalst and Hee, 2004)	Aalst and Hee (2004); Shang and Seddon (2002)	WfMS, general	
updated version:					
29	increased IT infrastructure capability	e.g. stable and flexible support of process and structure changes (Aalst and Hee, 2004); provision of (improved) facilities for teleworking (C3)	Aalst and Hee (2004); Han (2004); Shang and Seddon (2002); C3	CMS, ECMS, WfMS, general	
30	new or improved 'business' relationships	e.g. simplifying B2B e-commerce (Shang and Seddon, 2002) or by adopting a CRMS (Richard et al., 2007)	Richard et al. (2007); Shang and Seddon (2002)	CRMS, general	

...continued on next page

impact	description	source	type(s) of IS
31	improved external collaboration	"involving knowledge creation and sharing through digital content [...] among enterprises with commonly enacted practices" (Päivärinta and Munkvold, 2005, p.2)	ECMS
32	improved branding	e.g. through "common look and feel to corporate materials" (Smith and McKeen, 2003, p.650) and reused templates (Päivärinta and Munkvold, 2005)	ECMS
33	enhanced 'customer' integration	e.g. through giving external parties electronic access to documents	ECMS
34	improved 'customer' relations	e.g. through time savings on 'customer' side achieved by ECMS, generally simplified content access and inquiries (Sprehe, 2005)	ECMS, general
35	decrease in quality of external communication	communication not adapted to needs of consumers, but to business needs as e.g. streamlining and efficiency	ECMS
new impact:			
36	change of work organization	Work organization is defined as "the way work is structured, distributed, processed and supervised [and it] deals with subjects such as the following: the scheduling of work (such as work-rest schedules, hours of work and shift work), job design (such as complexity of tasks, skill and effort required, and degree of worker control), interpersonal aspects of work (such as relationships with supervisors and coworkers), career concerns (such as job security and growth opportunities), management style (such as participatory management practices and teamwork)" (Carayon and Smith, 2000, p.649). Examples are a simplified and more flexible vacation planning (C2), the use of information gathered by the BI component for planning of work by staff members (C3), and new job descriptions due to disappearance of paper files (C2, partly C3).	ECMS

Table 3.2: Potential impacts of implementing ECMSs.

## 4 Designing the impact framework

The previously created list of potential impacts is not practical with regard to the goals of the original research, namely to relate influencing factors with impacts of ECMS implementations. A simple list does for example not allow determining potential relations among different impacts nor does it deliver insights into the nature of the impacts. Therefore, a framework is needed which allows categorizing impacts and it is designed in the following. Its purpose is to operationalize a dependent variable in a case study research, namely the impacts of implementing ECMSs, so that it can be related to independent variables. The scope of the artifact is aligned with the scope of the original research which means that it is limited to evaluating impacts at single organizations. The following requirements have been defined by the authors. Together with the artifact's purpose, they constitute the testable propositions required by Jones and Gregor (2008).

- R1: The framework has to provide a way to gain detailed insights into the nature of the impacts by providing categories that can e.g. differentiate types of impacts and parties concerned.
- R2: The chosen (sub-)categories should be mutually exclusive and collectively exhaustive to the greatest extent possible.
- R3: All impacts identified during this research have to fit into the framework.
- R4: Both qualitative and quantitative impacts should fit into the framework.
- R5: The framework should be constructed in such way that it is able to accommodate future changes.

The mutually exclusive and collectively exhaustive (sub-)categories also represent the artifact's principle of form and function. Taking into account these requirements, the artifact qualifies both as a construct since it defines terms, but to a certain extent also as a model since the categories depict relations among the different impacts. The categorization frameworks from previous IS research which were used as the basis for this design research are described in the following section. The definitions of the different categories and the definitions of the impacts in table 3.2 represent the constructs of the newly designed artifact. Afterwards, the three frameworks are combined into the new impact framework in the last section.

### 4.1 Frameworks from previous IS research

In literature, three frameworks for categorizing the potential impacts of implementing ISs have been found and they are presented next.

#### 4.1.1 Smithson and Hirschheim

Smithson and Hirschheim (1998) define five levels of IS evaluation. National or international IS impacts are evaluated on the *macro* level, e.g. the influence of IS on national productivity. The *sector* level is concerned with research on a specific industrial sector. Then there are the *organization*<sup>1</sup> and *application* levels. Finally, the impacts of IS on *stakeholders* other than the organization itself

<sup>1</sup> In their article, Smithson and Hirschheim (1998) call it firm level.

can be analyzed, e.g. on customers or the community (Smithson and Hirschheim, 1998). At the organization level, impacts can in turn be divided into the four subcategories *economic* (e.g. “costs, output”), *organizational* (e.g. “changes in organizational structure or procedures”), *social* (e.g. “quality of working life, organizational culture”), and *management* (e.g. “information access and decision making”) (all quotes from Smithson and Hirschheim (1998), p.161.).

Considering the purpose and scope of this artifact, this classification is not fully applicable. Since this research aims at evaluating the impacts of a certain class of applications on an organization and its stakeholders, the analysis would concern three levels at once. Although Smithson and Hirschheim (1998) do not describe the levels as being exclusive during the analysis, mixing them does not seem to be desirable. In addition, impacts 21 (enabling worldwide expansion) and 29 (increased IT infrastructure capability) cannot be placed in the levels, breaching R3.

#### 4.1.2 Bouwman, Hooff, Wijngaert, and Dijk

Another categorization of impacts of ISs<sup>2</sup> developed by Bouwman et al. (2005) is presented in figure 4.1. The first main category are impacts on the *individual*. Quoted impacts range from

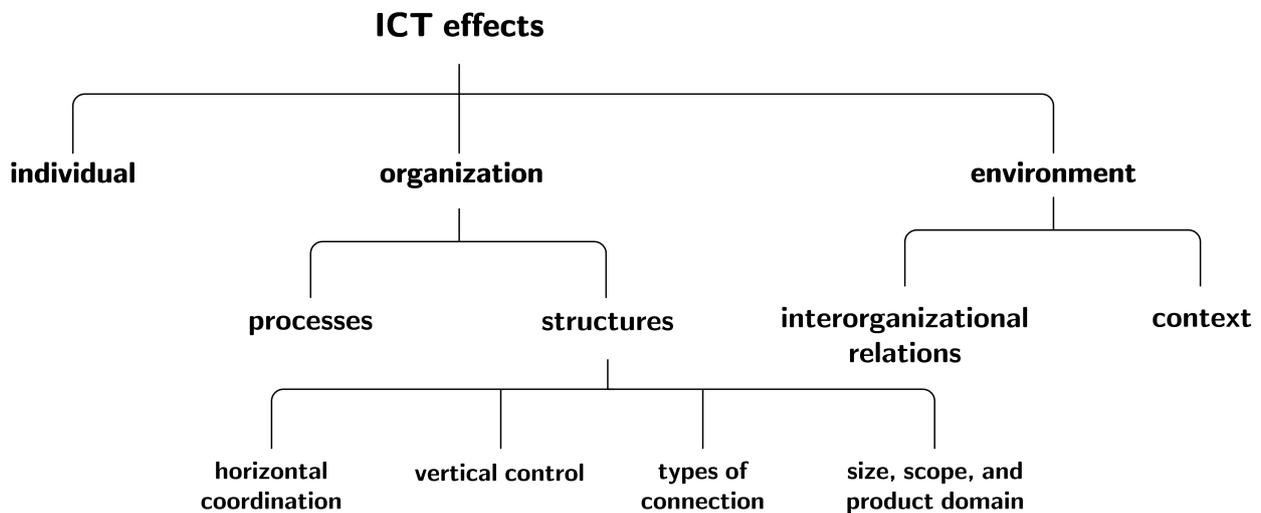


Figure 4.1: Effects of ICT in organizations (Bouwman et al., 2005, p.116 et sqq.).

enhanced productivity of individual tasks over empowerment to decreased employee satisfaction. The second main category *organization* has been divided into the subcategories *processes* and *structures*. The former includes impacts as for example increased efficiency, external effectiveness, and other characteristics of the organization’s business processes. A further subdivision has been done for the sub-category *structures*. Following a model presented in Fulk and DeSanctis (1999), this subcategory is split into *horizontal coordination*, *vertical control*, *types of connection* as well as *size, scope, and product domain*. Impacts of the category horizontal coordination are for example the reduction of transaction costs of cross-functional or virtual teams. This can result in a decrease of vertical control, i.e. the control of employees by their superiors. The size of an organization, e.g. with regard to number of employees or hierarchical layers, can change due to IS and the same is true for the activities carried out by the organization (scope) or the products offered (product domain) (Bouwman et al., 2005). The types of connection refer to the relations that exist in and among organizations, but Bouwman et al. (2005) do not elaborate further on this category. In the original work, these categories describes how organizations can design their relations with other organizations, e.g. with strategic alliances or federations (Fulk and DeSanctis, 1999). *Environment* is the final main category and consists of the two sub-categories *interorganizational relations* and *context*. The former is concerned with the different forms of

<sup>2</sup> To be precise, Bouwman, Hooff, Wijngaert, and Dijk (2005) describe effects of information and communication technology in general.

cooperation with competitors, suppliers, and customers. One example is the current trend of changing the interorganizational relationships from a value chain to a value network. In the latter sub-category, the general economic movement towards an information economy is described.

When looking at the impacts listed in table 3.2, it becomes apparent that several impacts cannot be placed in this classification, violating R3. A changed organizational culture can by definition (Merriam-Webster Online Dictionary, 2008a) not occur at a single individual. Following the definitions of the elements in the category organization, this impact also does not fit into this category. The same holds for the impact social conflicts. Next to this problem, impacts 13 (risk mitigation), 16 (increased compliance), and 17 (deteriorated business adaptability) do not belong to the third category, neither do they fit into any of the headings of the category organization. Finally, enhanced 'customer' integration and improved 'customer' relations clearly belong into the third category, yet do not form part of one of the subcategories (R2). In addition, this framework also has a shortcoming regarding the mutual exclusiveness of the categories. The category 'types of connection' is located under the main category organization, although it describes impacts of the third main category environment in the original research. Finally, environment's sub-category context exceeds the scope of this research.

### 4.1.3 Shang and Seddon

Shang and Seddon (2002) have presented a framework for categorizing benefits of ESs. Based on an extensive literature study, they define the following five areas:

1. Operational: impacts on "day-to-day activities that involve acquiring and consuming resources [which] are usually repeated periodically" (Shang and Seddon, 2002, p.278)
2. Managerial: This dimension comprises impacts on activities such as resource allocation, operations monitoring, and support of strategic decisions.
3. Strategic: The third dimension includes the impacts on high-level, long-range planning decisions.
4. IT infrastructure "consists of sharable and reusable IT resources that provide a foundation for present and future business applications" (Shang and Seddon, 2002, p.279) and it is impacted by the implementation of new ESs.
5. Organizational: Benefits "in terms of focus, cohesion, learning and execution of [the organization's] chosen strategies" (ibid) are subsumed in the final dimension.

The framework appears to be exhaustive and all impacts described in table 3.2 can be placed into this framework, even though for example placing impact 33 (enhanced 'customer' integration) would not be distinct: on the one hand, it is a strategic impact (since it concerns building external linkages), but on the other hand it can also be an operational one (since it potentially concerns day-to-day activities carried out by employees). The main point of criticism however is that the amount of just five categories is too limited for fulfilling R1.

## 4.2 Enhanced impact framework

Since it has been demonstrated that all three frameworks presented above are not entirely suitable for this specific research, the new framework presented in figure 4.2 on the following page has been designed. It addresses the mentioned shortcomings and fulfills all five requirements.

The framework from Bouwman et al. (2005) served as a basis for the design because it is already very detailed and, other than the levels from Smithson and Hirschheim (1998), does not encompass different foci of analysis. It has been combined with elements from the framework of Smithson and Hirschheim (1998) and the name of the original category 'individual' has been changed to 'employees' so that group effects can be captured as well. The framework from Shang and Seddon (2002) has also provided two major inputs. The idea of categorizing processes into operational, managerial, and strategic ones has been incorporated. In addition, the category 'IT infrastructure'

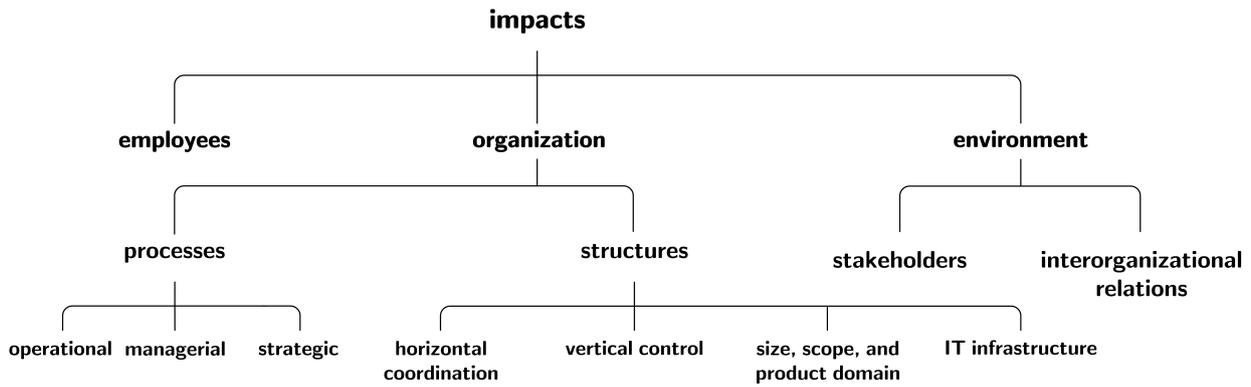


Figure 4.2: Enhanced impact Framework (Bouwman et al., 2005; Shang and Seddon, 2002; Smithson and Hirschheim, 1998).

has been included as well in order to render the framework more IT-specific (R1).<sup>3</sup> This change of the categories shows that the structure of the framework is extendable so that future changes and additions (such as for example the inclusion of financial figures or a further detailing of categories) can be expected to be easily realizable (R5).

<sup>3</sup> Actually, the framework might also be used for categorizing impacts of various organizational decisions if the category 'IT-infrastructure' would be called assets instead.

## 5 Application in case study research

The previous results can be used for operationalizing the impacts of implementing ECMSs as the dependent variable of a case study research. The first two sections of this chapter describe how exactly this can be done. The last section presents the results of an actual case study research and the resulting changes.

### 5.1 Impact table

The combination of the impact framework and of the results from the literature study forms the so-called impact table (table 5.2 on the next page) which has been created by categorizing the impacts from table 3.2 according to the new framework. It should be noted that a number of impacts could be categorized differently and therefore the reasons for their categorization are explained. Applying a less strict interpretation, all impacts from the category structures could be categorized as impacts on operational or managerial processes. However, the four categories under structures are more specific than the three process categories and therefore allow more precise insights into the nature of the impacts. The argumentation also holds for the impacts of the category context which could be considered to belong to the categories managerial or strategic processes. This explanation shows that the newly designed framework violates R2 to a certain extent, which on closer examination partly conflicts with R1. Since the latter is the main goal of the framework, the limited violation of R2 is acceptable.

### 5.2 Coding scheme

The impact table has been used for coding the impacts observed in a case. Impacts which have not been observed have a white background, whereas the background colors of observed impacts are changed according to the coding scheme presented in table 5.1. In the textual reports, the coding of the impacts derived from the evidence is denoted in the following manner: [→ 25 high, 32 low] for example means that impact 25 has been coded as high and impact 32 as low.

intensity	description
low	minor change in comparison with the previous situation (i.e. before the implementation of the ECMS); respondents only used 'soft' adjectives such as small
medium	moderate level of change; respondents did not make explicit remarks about the impact's strength
high	major change in comparison with previous situation; respondents have (extensively) stressed this point

Table 5.1: Coding scheme for impact intensity.

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

Table 5.2: Categorized potential impacts of implementing ECMs.

### 5.3 Results

The impact table and the coding scheme have been used during case studies at three organizations. The obtained results made it necessary to perform certain changes in the impact table and the underlying descriptions, as it has already been indicated in table 3.2.

The first case showed that the naming of impact 13 (risk mitigation) was not correct, because actually a change in risk profile occurred. In the past, files used to be stored in offices in closed file cabinets or in archives. After the implementation of an ECMS, they are digitally stored on servers. Therefore administrators have access to all files now and the company has also become more vulnerable to digital attacks. Therefore, impact 13 has been renamed to 'change in risk profile'. The second case provided new examples for impacts 4 (facilitating organizational learning), 9 ('customer' service improvements), and 15 (improved decision making and planning). In addition, the text of impact 17 has been changed to 'change in business adaptability' because the novel reliance of executable process definitions and the increase in process awareness have actually increased the business adaptability of that organization. Next to this change, the new impact 36 (change of work organization) has also been included in the impact table. This was necessary so that two observed impacts could be captured: at one group of the organization, the implementation of the ECMS led to a simplified and more flexible vacation planning and it also changed the type of work (scanning and tagging documents instead of carrying files throughout the building). The third case contributed additional descriptions of the impacts 29 (increased IT infrastructure capability) and 36 (change of work organization).

In summary, the data collection phase of the case study research has been guided well by the initial impact table and only slight modifications of the impact table and the impact descriptions were necessary.

## 6 Conclusions

Based on the results from a literature study, an initial list of potential impacts has been created. For categorizing them, an impact framework has been designed taking a rigorous design research process. This was necessary because none of the encountered existing frameworks for categorizing impacts of implementing ISs was detailed enough. All impacts from the impact list have been mapped to the framework. This impact table and the coding scheme were used for the operationalization of the dependent variable in a case study research. The data collection phase has been guided very well by the impact list. During the analysis phase, the impact table and the detailed categories of the underlying framework, proved to be useful because they provided the basis for an in-depth analysis of the nature of impacts and their relations with influencing factors. The exploratory results of the case study research led to the updated version of the impact table and the impact descriptions. This list is the first recapitulatory overview of this kind in ECM literature.

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