A framework for identifying and understanding enterprise systems benefits

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A Framework for Identifying and Understanding Enterprise Systems Benefits

Authors:

Prof. Dr. Petra Schubert (psc.caict@cbs.dk)
Centre for Applied Information and Communication Technologies – CAICT
Copenhagen Business School, Copenhagen, Denmark

Prof. Dr. Susan P. Williams (susan.williams@uni-koblenz.de)
Institute for IS Research, University of Koblenz-Landau, Koblenz, Germany

This paper is a working paper that consolidates and updates our previous work on Enterprise Systems benefits.

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A Framework for Identifying and Understanding Enterprise Systems Benefits

ABSTRACT

Purpose *– Identifying the benefits arising from implementations of enterprise systems and realizing business value remains a significant challenge for both research and industry. This paper consolidates previous work. It presents a framework for investigating enterprise systems benefits and business change, which addresses the identified limitations of previous research and provides a more detailed analysis of benefits and their contextual variation.*

Design/methodology/approach *– Drawing on data gathered from 31 real-world organizations (case studies) of differing size, maturity and industry sector the study adopts an iterative content analysis to empirically derive a comprehensive benefits framework.*

Findings *– The content analysis provides a detailed classification of expectations and benefits, which is described in a four level framework. The four levels (areas) are further subdivided into aspects and criteria plus an attributed appraisal value. The resulting scheme for the "3-level benefit codes" provides a greater level of detail about the nature of expected and realized benefits.*

Practical implications *– The high level of detail and the code scheme comprising 60 different codes and the method for deriving the codes allows companies to identify and define benefits as well as to assess the outcome of enterprise systems implementation projects.*

Originality/value *– The paper empirically develops an applicable benefits framework, which addresses the lack of detail of previous frameworks.*

Keywords *benefits, enterprise systems, ERP systems, framework, content analysis, case studies*

Paper type *Research paper*

Introduction

For many organizations enterprise systems represent an area of significant financial investment and business activity. A recent survey of CIOs (in 1500 organizations across 30 industries and 48 countries) representing over US$138 billion of IT spending identified enterprise applications as the second most significant IT priority (McDonald, 2009). Another survey (of 629 CFOs) reports that in 2008 levels of Enterprise Resource Planning (ERP) activity increased over corresponding levels in 2007. Thirty-two percent of responding organizations are currently involved in some form of ERP activity (e.g. a new implementation in progress, expansion to include further modules, or upgrade to a new release) and a further 12 percent of organizations had new implementations planned for the next year (CSC, 2008). Both surveys emphasize that understanding and improving the benefits and returns from enterprise system investments is a significant and challenging activity.

The topic of enterprise systems benefits has also been widely discussed in the academic research literature (Legare, 2002; Murphy and Simon, 2002; Shang and Seddon, 2002; Staehr *et al.*, 2002; Staehr, 2007). Research findings continue to identify the fact that organizations do not always achieve the benefits they desire from their enterprise systems implementations (Quattrone and Hopper, 2001; Staehr *et al.*, 2002; Grant *et al.*, 2006; McDonald, 2009). Against this background, this research contributes to the reframing of research into enterprise systems benefits. We argue that although there have been advances in knowledge, current frameworks for understanding the benefits of enterprise systems are limited in scope and a more holistic and detailed level of analysis of benefits is required. Our research seeks to address these limitations by developing an extended framework that provides a greater level of detail about individual benefits, their nature and timing. Our objectives are: (1) to assist organizations locate and understand the benefits of their enterprise systems activities and (2) to contribute to extending current theorisations about the business benefits of enterprise systems. In this paper we consolidate and report on work being conducted as part of a long-term programme of research into the benefits and business value of enterprise systems. We focus specifically on ERP systems and on the

development of an extended framework for identifying and understanding ERP systems benefits.

The paper is organised as follows. We begin with a discussion of existing research and provide an analysis of current frameworks for understanding ERP benefits. Through this we identify a number of limitations of existing work and present an argument for the development of a more comprehensive benefits identification framework. Subsequent sections explain the methodology for deriving the framework and introduce the extended framework and its dimensions. We conclude by discussing the extent to which our identified research imperatives have been achieved and present some directions for future research.

ERP Benefits: Background and Literature

A number of reviews of research into ERP benefits have been published (cf. Esteves and Pastor, 2001; Esteves and Bohorquez, 2007; Staehr, 2007). Rather than re-iterate the content of these reviews we present a synthesis of the literature according to the different interpretations of the concept of ERP benefit. A detailed analysis of the extant literature was undertaken following guidelines suggested by Webster and Watson (2002) and Hart (1998). Using thematic content analysis we identify three distinct areas of focus. See Table 1 and the discussion below outlining the three research streams.

Research focus	Example studies
Classification of ERP benefits	O'Leary (2004. Shang and Seddon (2002) Murphy and Simon (2002)
Benefits as success	**Critical success factors:** Nah *et al.* (2001) Al-Mashari *et al.*,(2003) Sammon and Adam (2008) **Measurement models of enterprise systems success:** Tan and Pan (2002) Sedera *et al.* (2003)
Benefits in context	Grant *et al.* (2006) Williams and Hardy (2006) Staehr (2007)

Table 1: Enterprise systems benefits: three areas of research focus

Nature of ERP Benefits (Classification)

Research in this area seeks to identify lists of ERP benefits and to classify them into groups or categories. It is largely descriptive or prescriptive and outcomes focused. For example, O'Leary (2004), drawing from a database of vendor success case studies compiled a list of ERP benefits achieved by organizations, distinguishing between tangible and intangible benefits.

Shang and Seddon (2002) provide a more comprehensive classification. Drawing from a database of vendor case studies they compile a list of ERP benefits (sub-dimensions) and classify them into five groupings (dimensions) operational, managerial, strategic, IT infrastructure and organizational. This work provides useful insights into the diverse range of ERP benefits organizations are seeking to achieve and in the case of Shang and Seddon's work provides a framework for organising them (Shang and Seddon, 2002).

Murphy and Simon (2002) extend this work to classify enterprise systems benefits using several dimensions including: tangible/intangible, quantifiable, temporal, external/internal, hierarchical (strategic, tactical, operational), organizational and technological.

Benefits as Success

A second area of research incorporates ERP benefits into studies focusing on IS success and addresses two broad themes: the identification of critical success factors (CSF) (*cf.* Nah *et al.*, 2001; Al-Mashari *et al.*, 2003; Sammon and Adam, 2008) and/or measurement models of enterprise systems success Tan and Pan, 2002; Gable *et al.*, 2003; Sedera *et al.*, 2003).

For example, in research regarding critical success factors (CSFs) Nah et al. (2001) identify 11 CSF relevant to successful enterprise system implementation. They map the factors onto Markus et al.'s (2000) ERP lifecycle model. The CSFs they identify include: teamwork/composition; change management program; top management support; business plan and vision; business process reengineering with minimum customization; project management; monitoring/evaluation of performance; effective communication; software development, testing/troubleshooting; project champion; appropriate business and IT legacy systems.

Sammon and Adam (2008) view CSF in the context of transformation investments. Their work takes a similarly generic set of CSF as previous work but extends this to develop a causal model to represent the interrelationships between CSFs

Other research focuses on measuring ERP systems success. For example, Tan and Pan (2002) develop a three-layer model of enterprise system success comprising: infrastructure success; infostructure success; knowledge success. They argue that successful implementation of the technological system should be achieved in the first instance and that this provides the foundation for infostructure success (i.e. the provision of useful and accurate information), which in turn provides for knowledge success (knowledge integration and enhanced organizational responsiveness).

Sedera et al. (2003) developed a measurement model for assessing enterprise system success comprising five dimensions: Quality, Satisfaction, Individual Impact and Organizational Impact and 42 sub-constructs that measure the five dimensions.

This stream of research focuses on description and measurement of success. This work is strongly grounded in concepts of IS success, assuming that success can be defined similarly for all organizations and is largely unchanging. Its major strength is the definition of generic dimensions of success and the identification of measures for evaluating success. Less attention is given to contextual factors that shape individual projects or to how success is defined in different organizations.

Benefits in Context

A third research stream considers benefits in context. This work is largely undertaken through in-depth analysis of individual ERP projects (cf. Williams and Hardy, 2006; Grant *et al.*, 2006; Quattrone and Hopper, 2001; Staehr, 2008). These studies adopt a range of different theoretical lenses to examine and draw attention to the situated nature of ERP implementations. For example, Grant et al. (2006) use discourse theory to investigate the extent to which the managers involved in enterprise systems implementations accept and adopt the technologically determinist discourse associated with these systems and whether these implementations produce the desired organizational changes that are being suggested by this discourse.

Williams and Hardy (2006) use theories of socio-technical change to investigate the implementation of enterprise systems. Their work draws attention to the importance of

project change over time and the emergence of unintended consequences that re-interpret benefits.

Staehr (2007) uses structuration theory to confirm the existing benefit dimensions and categories of Shang and Seddon's (2002) ERP business benefits framework. Her study also identifies new benefit categories and amends the preceding ERP benefits framework.

Research in this stream seeks to make sense of individual implementations and the significant variations in the motivation for, and nature of, ERP related projects, a fact that is largely unacknowledged in the previous two areas of research.

Limitations of Existing Frameworks on ERP Benefits and Research Imperatives

The nature, focus and contribution of existing studies are presented above. There are however a number of limitations of existing studies of enterprise systems benefits. In particular they include little insight into, or distinction between variations in:

- ***Motivations*** for undertaking an enterprise systems project and how these different motivations shape the identification of benefits;
- ***Timing and nature of benefits***. Is the benefit desired/expected and identified at the outset of the project? Is it an emergent or an unanticipated benefit that arises during the project? Or is it one that is realized (or not) as a project outcome? The fact that benefits may change over the course of a project is largely unrecognized in the majority of existing studies.
- ***Variations in reach and scope of projects***. Projects vary in reach from those narrowly focused into one functional area to those covering multiple functional areas or spanning multiple organizational boundaries. Projects also vary in scope from implementation of a single function or module, expanding or upgrading an existing system, through to full suite implementations.
- ***Locus of enterprise systems benefits***. Existing research pays little attention to the locus of the benefit and to whom the benefit applies.

Previous studies particularly those focusing on developing classifications of ERP benefits and critical success factors draw their data from previous literature or from short vendor

case studies. This presents a number of limitations in terms of the depth and richness of the secondary data being accessed. Little information is available about the size of company, industry sector and the type of enterprise systems project (reach and scope) being undertaken. It is also usually not possible to distinguish the reasons why each project was initiated (motivations) or how benefits have changed over time. Those studies that do investigate benefits in context provide rich interpretations from single or small numbers of in-depth case studies. However, given the differing theoretical lenses being applied and therefore the different levels of analysis and interpretation it is not a straightforward matter to compare or combine findings.

Existing frameworks and classifications of enterprise systems benefits are also limited to two levels (a category heading and category elements). We argue that these classifications are too high level and provide little guidance to practitioners seeking to understand the nature of change in the benefits profile over time. Further, none of the literature ties the work on benefits to benefits realization planning – the end point is the identification and/or measurement of the benefits themselves. This is of limited value to organizations that require methods and tools to enable them to identify, monitor and understand their changing benefits profile and to also compare themselves with other companies undertaking similar projects or within the same industry sector.

The aims of our research are to:

- assist organizations to *identify, manage and realize the benefits* of their investments in enterprise systems and
- *contribute to knowledge* about benefits identification and realization and to extend theorizations about how these can contribute to our understanding of business change and IT value in organizations.

The research programme for the development of the expectations-benefits framework responds to the limitations of previous work (discussed above) by investigating project motivations and the expected and realized ERP benefits. Our aim is to extend theoretical understanding and provide a richer framework for investigating and explaining the complex mix of motivations for implementing ERP systems and the expected and realized benefits arising from such implementations.

The first stage of the research is to provide a *comprehensive, heterogeneous, empirically derived classification* of the drivers and benefits of ERP systems implementations. Such a framework extends current research by:

- deriving an extended classification to track benefits in context and over time;
- providing insights into the range and complexity of motivations and provide a framework for mapping and discussing the ERP motivations and benefits in the context of individual implementations;
- identifying and (where they exist) describing and explaining variations within and between organizations, for example in organizations: in different industries; of different size; in different stages of maturity; and with different project motivations and goals.

In the remainder of this article we discuss the development of the extended ERP benefits framework.

Research Method and Research Steps

In the following sections we describe our research approach, data sources and the details of our research steps. We used an explorative case study research approach to develop the benefits framework. Case studies are regarded as particularly suitable for understanding phenomena within their organizational context (Yin, 2003). Klein and Myers (1999, p: 68) performed a study and concluded that "case study research is now accepted as a valid research strategy within the IS research community". Bonoma (1985) points out that case studies in social sciences have been used for both (1) validating existing theories and thus deducing empirical consequences and (2) building theory by using inductive principles. We use case studies to explore the organizational context of, and variations in, ERP benefits in order to derive an extended framework for identifying and understanding the benefits of ERP implementations.

Case Study Selection

Our case studies are drawn from a database of cases developed through the *eXperience initiative* (Schubert and Wölfle, 2007). This project has already developed more than *120 case studies* of real-world IS implementations. The majority of these cases deal with

enterprise systems implementations and include detailed analysis of motivations, expected and achieved benefits arising from such implementations.

The eXperience methodology (Schubert and Wölfle, 2007) has been specifically designed for the collection and transfer of best practice experiences in enterprise systems projects. The methodology provides a toolset containing templates for (1) the *writing* of case studies, (2) the effective classification and storage in an *online database* (Web platform: www.experience-online.eu), and (3) ways of organizing workshops and events where first-hand experience is being presented (*knowledge transfer and teaching*). A *common classification scheme* is used for all cases to record the project experiences, which make them an ideal source for a structured cross-case analysis.

The eXperience Cases

The core eXperience case (research case) includes an in-depth description of an existing enterprise system solution and respective practices in an organization. It encompasses:

- a *description* of the organizations and actors involved as well as the national regulations;
- the *business scenario*, partners, and company strategy;
- the objectives, *expectations*, and desired *benefits*;
- the actual *outcome* of the project (enterprise system solution);
- the advantages achieved and the shortcomings observed (*learnings*).

As of August 2010, there were 402 case studies in German, 66 in English, and 13 in French available online (www.experience-online.eu). Before being published, all case studies go through a rigorous data validation and editorial process to ensure veracity and quality. With the help of a *common template* and the use of a *uniform terminology*, the editorial team ensures that the case studies are comparable and can be cross-analyzed. One of the authors of this paper is also a member of the editorial team. The case studies communicate experiences from practice. They show how and why something was done and what resulted from it. Independent authors obtain the contents of the case studies directly from the representatives involved in the IT project in the portrayed companies. Documentation is carried out with the help of a standard template (the case study grid). The interviews are conducted with the project managers who were in charge of the introduction and

maintenance of the enterprise system (ERP system) in the portrayed company. The authors visit the selected company and gain insights from project managers, users, as well as from the responsible IT partners. The interviewees grant access to non-sensitive internal documents relating to the project management, including investment plans, roll-out time, statistics, and so forth. In addition, information is collected from later e-mail correspondence regarding feedback on the texts written, archival records, and publicly available Web pages. These in turn help the researchers to validate and extend the information gathered from the interviews. Each interview lasts for about two hours. Data is gathered using a combination of voice recording and contemporaneous notes. The transcription takes place at a later point in time when all material is compiled. Member checking is conducted; interviewees are asked to give their consent to the final (proof) version of the case study.

Uniform Case Study Structure

The structure is consistent in all eXperience case studies. In the first chapter, the background of the portrayed company is presented, its business sector, the products it offers, its target group as well as its vision. In the following section, the reasons for the project are presented. In this context the significance of information technology in the company strategy, the interplay between the ERP system and Internet applications (if existent) as well as the involved partners are shown. Section three describes the actual (software) solution and outlines the solution from the following views: business, process, application, and technical view. Following this, the implementation aspects are addressed. The steps towards the creation of the software, as well as the technical platform, are outlined. In the fifth section, experiences from the operation are described. Here, the task allocation for the operation of the entire system becomes clear. Costs, benefits and profitability of the solution are evaluated according to the achievement of objectives. The concluding section summarizes the important factors that are necessary for success. The specialties of the solution, the decisive changes as a result of the implementation project and the lessons learned by the people who were involved in drawing up the case studies are exemplified.

Figure 1 shows the uniform case structure and highlights the two chapters that were primarily used for the development of the benefits framework. *Chapter 2.1* describes the original situation of the company and the reasons for the new software implementation. In this chapter the authors write about the expected benefits and the ex ante view on possible results. *Chapter 5.2* of the cases, on the other hand, presents an ex post analysis of the

implementation. It discusses if all objectives were met and the changes that arose after some time of using the new system. One of the basic requirements of the eXperience methodology is that the solution has to be in operation for at least one year. In the process of coding the case studies, an emphasis was put on these two chapters (2.1 and 5.2) however all chapters were analysed for possible indications of expected benefits and resulting outcome.

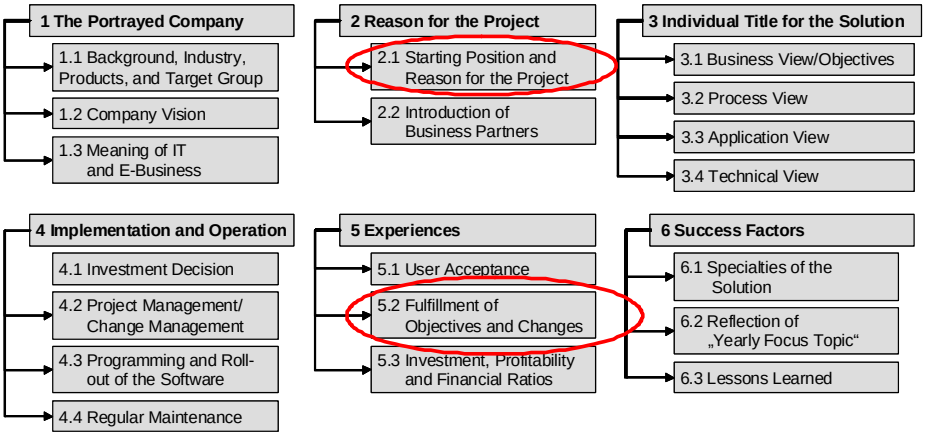

Figure 1: Uniform case study structure and selected chapters

In our study we draw on data gathered from 31 case studies of organizations of differing size, maturity and industry sector. The cases were selected on the basis that they all focus on ERP systems implementations. Further, one of the project researchers has been involved in the collection of the primary data and/or the preparation and presentation of secondary data for the selected case studies thus providing essential first hand knowledge of the case studies.

Research Steps

The process of deriving and developing the benefits framework consisted of three main phases. The *first phase* was a preparatory phase where the literature was reviewed and analysed to motivate the research and formulate key research questions.

The *second phase* encompassed a *cyclical process,* which was performed to iteratively code the research data. The researchers used text analysis and coding. Cases were coded independently and a subsequent coding review was conducted to develop the basic framework. Every time agreement about codes had been achieved, the next set of cases was coded and the results were added to the framework.

In the *third phase*, the results were consolidated and the final taxonomy was agreed upon. An objective of the broader research programme is for this taxonomy to be applied in the research investigation and to provide a framework to assist practitioners to evaluate their ERP initiatives. The research steps are displayed in Figure 2 and explained in more detail in the next sections.

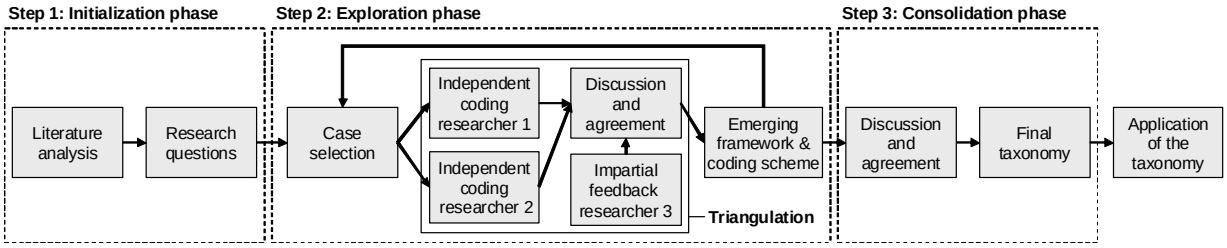

Figure 2: Research steps for the development of the benefits framework

Step 1: Initialization Phase

In a first step (*initialization phase*) the authors performed a comprehensive literature review and analysis. Some of the results have been discussed in the introductory section of this paper. From the literature and the authors' experiences with implementation projects the need for a more holistic benefits framework (as discussed above) and a series of initial research questions was identified.

Step 2: Exploration Phase

The actual research (*exploratory phase*) was a cyclical process of data reduction and coding. A comprehensive and in-depth content analysis applying techniques described by Miles and Huberman (1994), Krippendorf (2003) and Saldaña (2009) was performed. Two researchers initially selected three case studies dealing with the same topic and performed an independent content analysis on the source text. The text was analysed and coded to derive classification items, which were collected and consolidated into an initial framework.

The researchers started with a blank Excel sheet developing a coding scheme in an inductive process of going through the case study materials. Figure 3 shows an example of the coding in the original text. After completing the work on the first three case studies, a first discussion took place in which the third researcher was involved to provide a degree of impartiality, to provide additional insights and to mediate and resolve any coding conflicts. This provides a degree of triangulation and interpretive validity (Miles and

Huberman, 1994, p: 266) and was used to ensure that evidence for the derived code could clearly be identified in the empirical data.

The research team comprised researchers with different academic backgrounds (information systems, computer science, and business administration) located in different Universities in three different countries (Denmark, Australia, Germany). Two of the researchers were German native speakers; one was an English native speaker. All three had at least a basic understanding of both languages; which was important since the case material only existed in German and the research was carried out in English.

The result was a basic framework consisting of five main categories (1. Business Design, 2. Company Management, 3. Business Function, 4. Supply Chain, 5. Information Technology). The code items contained three dimensions (1. Business Area, 2. Aspect, 3. Criterion).

The two researchers who did the primary coding independently identified that the codes needed three dimensions. This is in contrast to previous benefits frameworks which usually only comprise two levels, e.g. the "Updated D&M Success Model" (DeLone and McLean, 2003) and the "IS-Impact Measurement Model" (Gable *et al.*, 2008). During the data analysis, the researchers concluded that two dimensions were not sufficient to describe the benefits expressed and reported by the case study respondents.

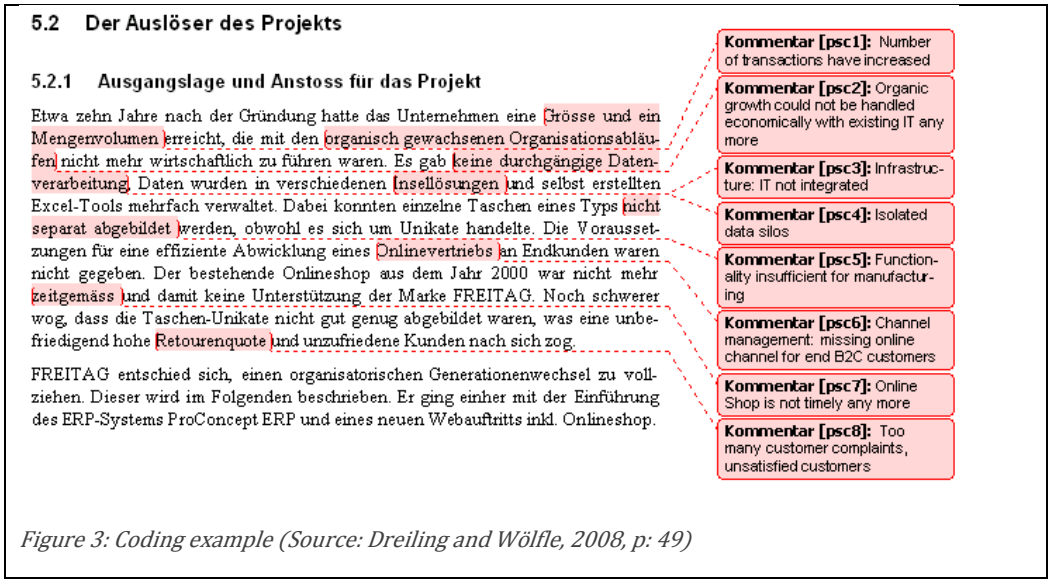

Figure 3: Coding example (Source: Dreiling and Wölfle, 2008, p: 49)

In the *first review workshop* the researchers discussed the main categories and the dimensions (i.e. the actual codes) that they had derived and applied. The result of this workshop was the starting framework containing the *five categories* and the *three code dimensions* together with a common understanding of the terms used in the framework. This starting configuration (initial framework) served as input for the next cycle in which a further five case studies were coded.

After this cycle a *second major review workshop* was held and new codes were added to the framework following a process of verification. Based on the new codes the framework was revised to four levels and the codes from the first cycle were tested on the refined framework. The level "Supply Chain" was removed and merged with "Business Functions". The combining layer "Functional Areas" now comprises the view on the internal value chain as well as processes across company borders. Some other elements of the framework were also modified and improved to better reflect the updated and extended code base. In this paper we present the latest version of the framework and consolidate the previous work. The differences between the initial version of the framework and the advances made to the final framework can be seen in Schubert and Williams (2009) and Williams and Schubert (2010).

Step 3: Consolidation Phase

The coding process continued over several months until all the case studies had been processed. As already described above, we followed a *special triangulation approach* (cf. Figure 4), which involves three independent researchers. Two German native speakers conducted the coding and a third researcher took part in the review discussions, performed plausibility checks, gave feedback and compared the items of the framework with previous approaches in order to insure validity and completeness. Detailed documentation was maintained to ensure the traceability and auditability of the derived coding scheme.

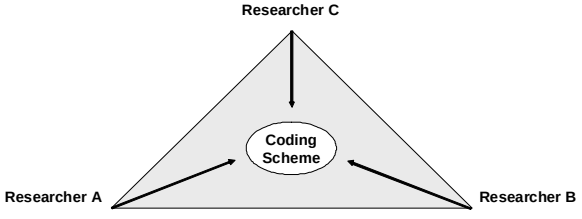

Figure 4: Triangulation for the development of the coding scheme

The framework with its four categories and three dimensions remained unaltered after the second review workshop. The four main categories continued to be adequate for the 31 selected cases. After the 8th case study the *second dimension* appears to be fully developed. Whereas the first two dimensions serve for classification purposes, the third dimension contains the qualitative or quantitative value that each item takes (e.g. in the empirical data the item "*speed*" was described by the values "*increased*" or "*decreased*"). It is likely that this *third dimension* will be further extended when more cases are added to the code base in the future. The current framework already includes more than 60 codes.

It was interesting to observe that once a basic set of codes was in place Intercoder Reliability (Lombard *et al.*, 2005) was high. The agreement between the two coders was approximately 80%. The "disputes" were resolved in the consecutive discussion so that the final agreement was always 100%.

Research Output: Framework and Taxonomy

In this section we describe the extended benefits framework and the dimensions of the coding scheme in more detail.

The Expectations-Benefits Framework

As mentioned earlier, the taxonomy was developed an iterative coding and analysis approach. Through the process of iterative coding, the authors identified four different categories in which expectations and benefits could be grouped. Figure 5 shows these four main categories and their elements.

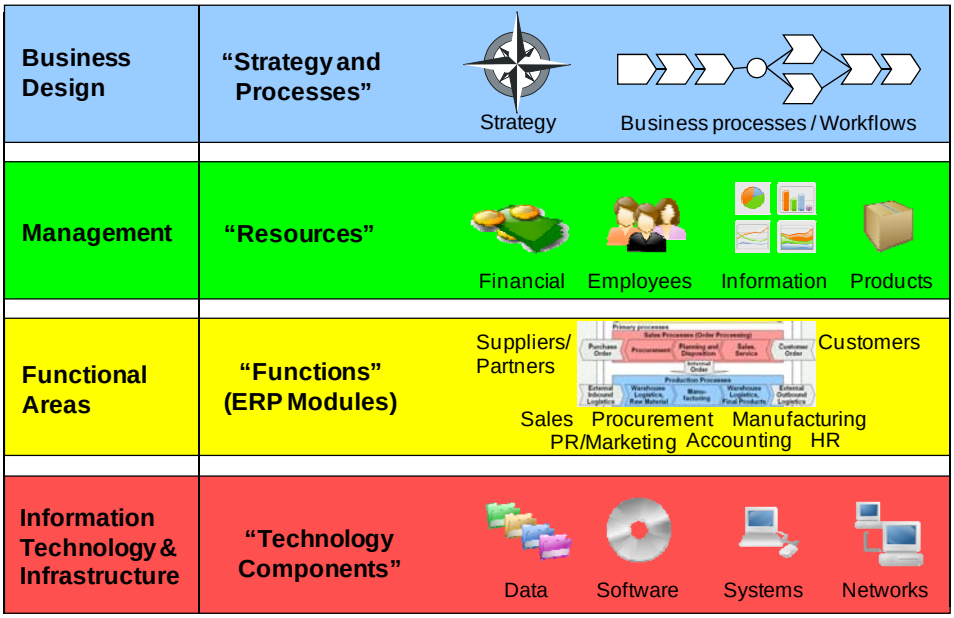

Figure 5: The expectations-benefits framework (exp-ben framework)

Business Design (Strategy and Processes)

The area of "Business Design" includes the strategic direction of the company and its operational organization. The codes in this area describe benefits relating to improvements in the strategic objectives and in the processes (processes and workflows) of the company. Typical criteria for this area are automation, transparency, complexity, effectiveness, and efficiency. This area relates to theory in the field of markets and hierarchies (Williamson, 1983), IS strategy, Business Process Reengineering (Hammer and Champy, 1993) and Business Process Modelling (Scheer, 2000).

Management (Resources)

The area of "Management" includes improvements in access to, and the use of company resources. Dominant here is the improved access to information. Benefits impacting on the levels of employees, product design and cost aspects (finance) fall into this area. Typical criteria for this area are cost, skills, productivity, satisfaction, time, and availability. This area relates to theory in the field of financial management, knowledge management, and change management

Functional Areas (Functions)

The area of "functions" includes the elements of the organisation's value chain. Here benefits focus on the modules and functions of an ERP system. They are generally oriented towards the support of individual functional areas (departments) in the company. The potential benefits in this area arise both from internal improvements as well as across organizations by optimizing the customer and supplier relationships. Since the traditional view of ERP systems has been functional it is not surprising that the business functions correspond to modules typically provided by ERP systems. Examples of criteria in this area are transparency of the process, complexity, number of transactions, sales opportunities, and turnover. This area relates to theory in the field of value chain and value chain analysis of primary and secondary business functions (note: functional view and *not* process view) (Porter 1985).

Information Technology and Infrastructure (Technology Components)

The area of "Information Technology and Infrastructure" focuses on impact and optimization of inter- and intra-organizational technological components, such as applications, databases and networks. An often-realized benefit is the integration of heterogeneous databases, and thus the achieving a uniform view of enterprise data. This area describes the actual enterprise systems landscape of the company (software, databases, systems and networks). Typical criteria for this area are integration issues, adequate functions or functionality, customization, usability, use, availability, complexity, flexibility, reliability, and stability. This area relates to theory in the field of IT management, IT service management and selection and implementation of technology architectures (e.g. in-house proprietary or business software, and hosted external solutions and software services).

The Appraisal Values

Table 2 shows the appraisal values that emerged from the coding and are attributed to the codes. The values are *two-component constructs*. As displayed in Figure 6 there are two different sources (the branches in the mind map) for *expectations* as well as for *outcomes*. Expectations can either arise from the initial situation before the investment decision is made (quite often reflecting a mandatory requirement) or from desired changes (drivers), which look at improving business performance. The actual benefits (outcome) are classified as realised changes (effects) or a final situation (result).

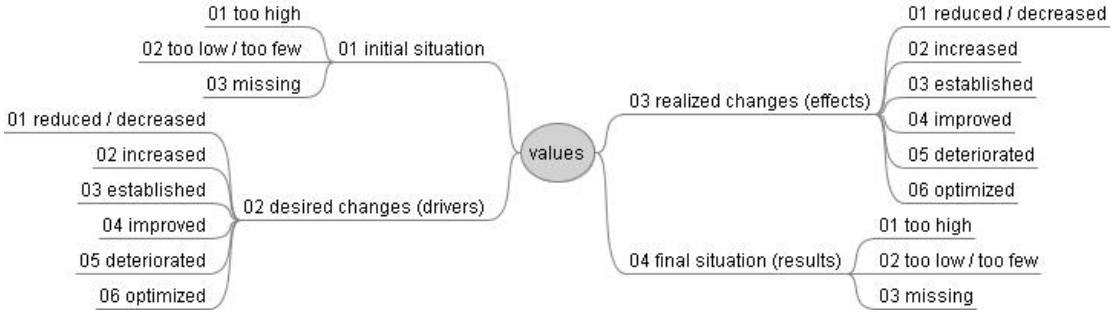

Figure 6: Hierarchy of appraisal values

For an easy comparison between expectations and realised benefits each appraisal value is annotated with an additional code containing the values (explicitly met, implicitly met, undesired negative, undesired positive, and partly met). This gives the researcher a valuable source for evaluating the explicitness of the benefit.

01	initial situation	01	too high
		02	too low / too few
		03	missing
02	desired changes (drivers)	01	reduced / decreased
		02	increased
		03	established
		04	improved
		05	deteriorated
		06	optimized
03	realized changes (effects)	01	reduced / decreased
		02	increased
		03	established
		04	improved
		05	deteriorated
		06	optimized
04	final situation (result)	01	too high
		02	too low / too few
		03	missing
		04	unclear

Table 2: Appraisal values of the extended benefits framework

Coding Scheme (Benefits Table)

The benefits table contains the name of the case study, the verbatim quote and page number of the benefit as it appears in the source text, the assigned code for this benefit as well as the appraisal values and the assessment of the explicitness. Table 3 shows an example for the results of the coding process.

No	Case	p.	<- Literally in Text ->	Business Area	Aspect	Criterion	Code	Branch	Value	Met
1	FREITAG AG	57	Number of transactions has increased	business design	processes	complexity	BDE-PRO-CXY	01	01	02
		57	Organic growth could not be handled economically with IT any more	IT	software	efficiency	ITE-SOF-EFI	01	02	02
		57	Isolated data silos	IT	data	integration	ITE-DAT-INT	01	03	01
		57	Isolated, self-made programmes	IT	software	integration	ITE-SOF-INT	01	03	01

Table 3: Example of the coding of benefits

The Taxonomy of Expectations and Benefits

Table 4 shows an excerpt of the taxonomy with its dimensions. The table contains examples of each benefit as it is identified in the coded case studies. We used this column as part of our validity checking and audit trail. No code can be added without at least one pointer to an instance of that code in the empirical data.

Business Area	Aspect	Criterion	CODE	Examples
BUSINESS DESIGN	processes	automation	BDE-PRO-AUT	Orders were captured manually
BUSINESS DESIGN	processes	efficiency	BDE-PRO-EFI	Missing functionality in online channel for end B2C customers
MANAGEMENT	corporate finance	costs	COM-COF-COS	Increased cost pressure
MANAGEMENT	employees	productivity	COM-EMP-PRO	Increase in the performance of the sales force
MANAGEMENT	information	availability	COM-INF-AVA	Availability of detailed customer information
MANAGEMENT	products	availability	COM-PRO-AVA	Increased product availability
MANAGEMENT	strategic management	competitive advantage	COM-COF-ADV	Possibility of differentiation from competitors
FUNCTIONAL AREA	manufacturing	transparency of process	BUF-MAN-PRC	Improved traceability of products
FUNCTIONAL AREA	procurement	bundling	BUF-PCM-BUN	Open up synergies via the bundling of the procurement across the group
FUNCTIONAL AREA	public relations / marketing	marketing actions	BUF-PRM-MAC	Analysis of customer behaviour for managing the sales promotion
FUNCTIONAL AREA	sales	new sales channel(s)	BUF-SAL-CHA	New sales channels
IT & INFRASTRUCTURE	data	integration	ITE-DAT-INT	Isolated data silos
IT & INFRASTRUCTURE	software	functions	ITE-SOF-FUN	Functionality insufficient for manufacturing
IT & INFRASTRUCTURE	systems	availability	ITE-SOF-AVA	Complete availability of the system

Table 4: Excerpt of the emerging exp-ben-taxonomy

Exemplary Benefits

Table 5 illustrates benefits that resulted from three selected project implementations grouped according to the four categories in the expectations-benefits framework.

	BUSINESS DESIGN Strategy/Processes	MANAGEMENT Resources	FUNCTIONAL AREA Functions	IT & INFRASTRUCTURE Technology Elements
Case 1	Faster processes (e.g. customer quotations, final accounts, material and equipment dispositions) Group-wide reporting Increased transparency	Massive relief for employees in daily business Higher satisfaction and motivation at work All information is centrally stored without redundancies and available for all subsidiaries	Consistent target-actual comparison over the entire life cycle of a project (construction site) Timely construction cost controlling Key Performance Indicators (KPI) for each project	Integration of functional modules is optimized for information delivery Higher security and availability levels by hardware outsourcing
Case 2	Massive acceleration of the processes (e.g. month-end closing 23 days earlier)	Improved inventory management leads to higher stock availability and lower capital lockup. Daily on-line analysis of the situation possible	New warehouse management allows a larger assortment	Through processing reduces error rates significantly Continuous coverage of the processes in the system
Case 3	Increased process transparency Improved competitiveness through faster processes Implementing just-in-time delivery Attractive prices	Reducing costs through more efficient and faster processing Time savings for employees through automation, thereby improving customer service	Generation of analysis and reports for corporate management Increased customer satisfaction with faster order processing	Guaranteed future due to up-to-dateness of software and hardware Technical integration with suppliers

Table 5: Exemplary benefits identified in three cases grouped by categories in exp-ben model

Discussion

Our work addresses the research imperatives outlined in section 2.4 in the following way:

Motivations and ERP Benefits

Our study examines the reasons for implementing business software to solve current business problems. We analyse ex ante experiences comparing them with realized ex post benefits. This way we explicitly look at the match between expectations and outcomes. The resulting extended *benefits framework* incorporates information about an individual organization's motivations and intentions for undertaking a specific ERP project. It is derived from case studies of actual ERP projects and includes only factors that have occurred in real-life settings.

Modality of ERP Benefits and Change over Time

The attributes and the code structure that are used to assess the benefits in our framework clearly position and locate the benefits on a timeline. They reflect the realization of benefits as a process which is open to being shaped by business change and which is influenced by unplanned outcomes that might arise as a consequence of socio-technical change in the organization. Using our code structure, it is always possible to identify the differences between a desired or a perceived benefit, an emergent benefit (which might not have been expected ex ante) or one that is realised (or unrealised).

Spatiality, the Reach and Scope of ERP Projects

The cross-analysis of benefits and company profiles can reveal patterns in the reach and scope of projects. In the final stage of our research, after having looked at the datasets from more than 60 case studies, it will be possible to query the data for questions of difference in scope (e.g. number of ERP modules which are implemented) or reach (e.g. number of subsidiaries where the software was installed).

Research Data

The eXperience database of case studies on business software implementation projects offers a vast amount of data. From this database we will draw our research findings from more than 60 real world case studies, all written in a common methodology that provides a common structure. The editorial board overseeing the eXperience initiative performs an exacting quality control process that ensures the basic data are authoritative and reliable. If questions regarding the statements in the text arise it is always possible to undertake a process of member checking with the original respondent. This high quality data has been used to develop a more comprehensive and empirically derived framework and taxonomy of ERP benefits that accommodate benefits change over time.

Against the backdrop of the current worldwide economic crisis and the further need to measure performance, companies will look for means to measure (gauge) the impact/outcome of their IT investments (Weill and Ross, 2004). We continue to refine the exp-ben-taxonomy and document it so that others can use it. Future research will also evaluate this framework in the context of previous models such as the "Updated D&M IS Success Model" (DeLone and McLean, 2003), the "IS-Impact Measurement Model" (Gable *et al.*, 2008), and the "Enterprise System Benefit Framework" (Shang and Seddon, 2002).

Challenges

There were several challenges in this research. In particular, the three researchers involved in the initial stage of the research project stem from three different countries with different disciplinary backgrounds. In the beginning, we needed to find a common language, a common understanding of terms and most importantly develop an interdisciplinary understanding of the phenomenon of ERP benefits. In the end, this diversity turned out to be a major strength as it helped to develop a richer, more detailed taxonomy than is evident from previous studies.

Unlike previous approaches (e.g. by Sedera *et al.*, 2003 or DeLone and McLean, 2003), which propose models for measuring success, our taxonomy was developed in an explorative way analysing the contextual variations in expectations and realized benefits of *real-world* companies. Our analysis will eventually incorporate data from the actual experiences of more than 60 companies. The results will provide valuable insights into what companies aim to achieve when they implement new systems and on how far they feel they have been successful in their pursuit. This is particularly important given that less than 10 percent of the companies included in this study reported that they made a quantitative calculation of their return-on-investment (ROI). Most of them simply generated a list of qualitative objectives that were to be realized. The success/realization of the expected benefits was rarely explicitly measured. The responsible managers rather "felt" if or if not the company's objectives had been fulfilled. This implies that the measurement of the fulfilment of objectives in projects is only possible on a qualitative and rather descriptive level since in most cases it is not possible to measure concrete success figures because the objectives have not been set accordingly. This is an area where future research will be focused.

In our future analysis of the data, it will be possible and interesting to identify whether there are typical benefits that were realized in projects but not expected or planned by the companies beforehand. The cross-analysis of company profiles and the codes for expectations/benefits will hopefully also reveal interesting patterns (e.g. typical outcomes in SMEs or typical objectives which could not be met in certain industries).

Visualising ERP Benefits

Once the final taxonomy has been developed it will be published and available for wider use. It will enable us to derive quantitative results from the code base. The coded case

studies will be analysed in order to answer our research questions. There are two different pathways for the analysis of the data as shown in Figure 7:

1. *Analysis of the codes* (= benefits) used in the case studies (searching for patterns in the codes themselves)
2. *Profile analysis* (looking for patterns in the company/project profile information of the cases)
3.

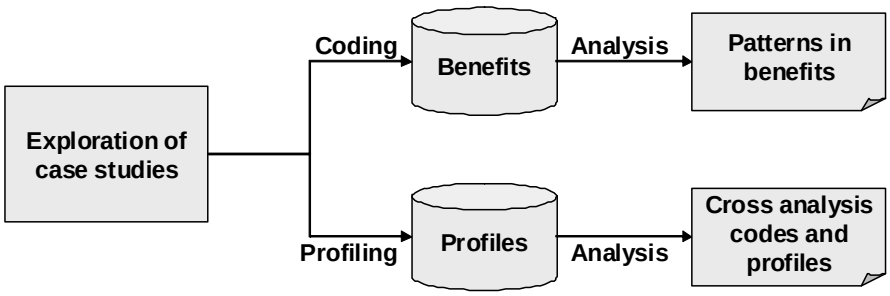

Figure 7: Coding process: resulting tables and possibilities for analysis

The first analysis pathway describes the possibility to show patterns arising in the code structure itself. For example, we will be able to identify:

- Benefits which are most often/least often expected by companies
- Expected benefits which are most often/least often realised
- New, unexpected benefits which result from the implementation of a new software ("side effects" or unintended consequences)

The second possibility is a cross comparison between the coded benefits and the company profiles/different project types. We profiled each case according to its demographics and characteristics regarding industry sector, size, age, level in supply chain, reach and scope of the project, etc. The cross-analysis between the coded cases and the profile information will show benefit profiles and assist in answering questions such as:

- Are there typical expected benefits in certain industries?
- Do benefits vary according to company size? (and if so how?)
- Are newer companies more successful in fulfilling their objectives than older ones?

Conclusions and Outlook

In this article we present an extended enterprise systems benefits (exp-ben) framework. The framework builds on previous work by 1) providing a more detailed classification of benefits that takes into account expected, realized and unintended benefits 2) is derived from rich empirical data (the final framework will incorporate more than 60 cases) allowing for profiling of organizations by industry sector, company size, reach and scope of enterprise system implementation and the timing and nature of benefits.

The framework (and other associated tools to map and visualize benefits change), enable us to gain deeper insights into the nature of enterprise systems benefits, contextual variations and how they may change over time; contributing to further extending current theorisations about the business benefits of enterprise systems.

The research findings also assist organizations to identify and understand the benefits of their enterprise systems implementations. The results of the research provide useful business intelligence for companies. In our ongoing work we are developing a software tool for the identification and the measurement of benefits that is based on the framework and the database. The tool can be used by companies to take a first step for the identification of their possible benefits – typically before taking a decision to invest in a new enterprise system or embarking on a significant extension of an existing system. The large amount of data available will also make it possible to benchmark companies based on specific company profiles (size, industry, and role). Additionally, we intend to apply the tool in our own work with companies. We have a planned programme of action research on benefits realisation within organisations. The research is organised around a series of participatory, in-depth longitudinal case studies. This work uses the insights and tools from our current findings to assist organisations to better define and manage enterprise systems benefits.

There are some limitations to our findings. Firstly, the eXperience cases all reflect “success stories” which were recorded from companies that volunteered to share their experiences with the researchers. Consequently, the remarks made by the interview partners might in some cases gloss over problems or show the outcome in a somehow better light than experienced by the people involved in the project. Our proposed in-depth case studies seek to address this limitation and to focus on dis-benefits and negative outcomes more closely. Secondly, the case studies were not written with an explicit focus on benefits, although it is a key theme throughout the cases. The description of the intentions and the outcome of the projects are sometimes scattered over the case study text and thus sometimes difficult for

the coders to identify. Nevertheless, when looking at the (sometimes also quite critical) remarks in the outcome section of the case studies we came to believe that the interview partners were quite candid in most cases and that the data is thus sufficiently reliable for the purpose of this study. Future case will also address this limitation by following benefits as they change and evolve over time to provide a more in-depth analysis of benefits and business change.

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