

Benefits of Enterprise Systems Use

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Abstract

Realizing business value and identifying the benefits arising from implementations of enterprise systems remains a significant challenge for both research and practice. A review of existing work on enterprise systems benefits reveals some of the gaps in current research. This paper presents findings from an ongoing research project to develop 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. Using an iterative content analysis, this preliminary study provides a classification of enterprise systems benefits. The classification, based on 32 case studies is developed into a four level framework to guide the analysis and representation of benefits. The current framework is presented and illustrated by four exemplary company cases. Finally, some future applications of the framework are outlined.

1. Introduction

Identifying the benefits arising from enterprise systems implementations and understanding their contribution to business value is still a key challenge for practitioners [2]. The findings of a series of recent surveys of information systems and technology issues for senior executives identify that whilst a main priority for managers is the further implementation of enterprise systems to drive business improvement ([13], [3]) organizations are still being challenged to maximize the benefits arising from such investments. Achieving the expected benefits from IT investments ranked as the second most critical issue overall for organizations of all sizes and was the most critical issue for large organizations (> \$1 billion in revenue) ([3], p.14). The same survey also revealed that return on IT invest-

ments remains an issue with 43 % of respondents reporting low, negative or unknown returns ([3], p.17).

Understanding the nature of enterprise systems benefits has also been the focus of scholarly research interest in recent years ([9], [11], [15], [26], [29], [28]). However research findings continue to identify that organizations do not always achieve the benefits they desire from their investments ([3], [13], [29], [7], [19]).

In this paper we argue that whilst the extant research literature provides broad insights into the nature of enterprise systems benefits, its emphasis has been largely means-end with a focus on information systems success rather than on the identification and realization of business value. We also argue that organizations' failure to identify enterprise systems benefits may be partly related to the level of information available to monitor benefits management performance. In the 2009 survey mentioned above, the top issue identified by organizations of all sizes and in all industry sectors was the availability and integrity of adequate information to facilitate enterprise performance management (EPM), business analysis and decision making ([3], p.3, p.11, p.14). A key imperative for practitioners is to understand the nature of enterprise systems benefits, how these may change over time and how well their organizations are performing in terms of benefits management and benefits realization. To achieve this requires detailed information about their benefits profile and to be able to compare this with the performance of other organizations undertaking similar projects within their industry sector.

The paper is organized as follows. In the next section we discuss existing research in the area of enterprise systems benefits and outline some limitations of existing studies. We then provide an overview of an extended framework for identifying and analyzing enterprise systems benefits that accommodates these limitations. The framework provides insights into the range and complexity of motivations and a method for mapping and presenting enterprise systems benefits in the context of individual implementations. Drawing

from our empirical research we provide mini cases to illustrate the details and application of the different elements of the framework. Finally we discuss how the framework can be used to extend current knowledge about enterprise system benefits and its practical value to organizations.

2. Literature Review and Methodology

Given the large amount of research literature on the topic of enterprise systems benefits, the question arises as to why organizations continue to struggle to both identify and realize the benefits of their enterprise systems investments. To assist us in answering this question and to gain further insights into the problem domain we conducted a review of the extant research and practitioner literatures to 1) understand where current research effort is focused and 2) whether there are any limitations to the focus of this research, especially with respect to its applicability to the imperatives of practice.

We identify three distinct areas of research focus: 1) classification of ERP benefits; 2) benefits as success; and 3) benefits in context. A summary of the three areas of focus and illustrative examples of key studies are provided in Table 1.

2.1. Limitations of current research

There are 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 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.

Further, previous studies particularly those focusing on developing classifications of ERP benefits and critical success factors draw their data from the literature or from short vendor case studies. This presents a number of limitations in terms of the depth and richness of this secondary data. There is often little information about the size of company, industry sector and the type of enterprise systems project (reach and scope) being undertaken. It is also not possible to distinguish the reasons why each project was initiated (motivations) or how benefits have changed over time. 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 we argue is also 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.

Thus, the aims of our research project 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.

We begin our study by drawing on data gathered from 32 case studies (out of our database of 120 cases) of organizations of differing size, maturity and industry sector the study adopts an iterative content analysis to empirically derive a comprehensive benefits framework.

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

Research focus	Example studies
<p>Classification of ERP benefits</p> <p>Research in this area seeks to identify lists of ERP benefits and to classify them into groups or categories.</p> <p>It is largely descriptive or prescriptive and outcomes focused.</p> <p>It provides useful insights into the diverse range of enterprise systems benefits organizations are seeking to achieve.</p> <p>It provides a framework for categorizing benefits and (in the work of [26]) tools to visualize the timing of benefits.</p>	<p>O’Leary [17], drawing from a database of vendor success case studies to compile a list of ERP benefits. Distinguishes between tangible and intangible benefits.</p> <p>Shang and Seddon [26] provide a more comprehensive classification of ERP benefits. 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.</p> <p>Murphy and Simon [15] classify enterprise systems benefits using several dimensions including: tangible vs. quantitative, temporal, external vs. internal, hierarchical (strategic, tactical, operational), organizational and technology.</p>
<p>Benefits as success</p> <p>This research focuses on the phenomenon of IS success and addresses two broad themes: the identification of critical success factors (CSF) and/or measurement models of enterprise systems success.</p> <p>Attention is focused on the description and measurement of success and defining generic dimensions of success; limited attention is given to contextual factors or to how success is defined by individual organizations.</p>	<p>Critical success factors:</p> <p>Nah, Lau, and Kuang, [16] identify 11 CSF relevant to successful enterprise system. Implementation. They map the factors onto Markus and Tanis [12] ERP lifecycle model. CSFs 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.</p> <p>Sammon and Adam [20] 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</p> <p>Measurement models of enterprise systems success:</p> <p>Sedera, Gable, and Chan [25] developed a measurement model for assessing enterprise system success comprising five dimensions: <i>Quality, Satisfaction, Individual Impact and Organizational Impact</i> and 42 sub-constructs that measure the five dimensions.</p> <p>Tan and Pan [32] develop a three-layer model of enterprise system success: infrastructure success; infostructure success; knowledge success. They argue that first successful implementation of the technological system should be achieved 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).</p>
<p>Benefits in context</p> <p>A third research focus considers benefits in context and draws attention to the situated nature of enterprise systems implementations; focusing on in-depth analysis of individual projects</p> <p>This work draws attention to the variations in the motivations for, and nature of, enterprise systems projects, a fact that is largely unacknowledged in the previous two areas of research focus.</p>	<p>This research focus provides greater insights into how benefits are achieved (or not).It adopts a range of different theoretical and analytical lenses.</p> <p>Grant et al. [7] use discourse theory to investigate the extent to which managers involved in enterprise systems implementations accept and adopt the technologically determinist discourse associated with these systems and whether these implementations produce the organizational changes that are suggested by this discourse.</p> <p>Williams and Hardy [33] use theories of socio-technical change to investigate the implementation of enterprise systems and draw attention to the importance of project change and the emergence of unintended consequences (benefits and disadvantages).</p> <p>Staehr [28] uses structuration theory to confirm the existing benefit dimensions and categories of Shang and Seddon’s [26] ERP business benefits framework. Her study also identifies new benefit categories and amends the ERP benefits framework.</p>

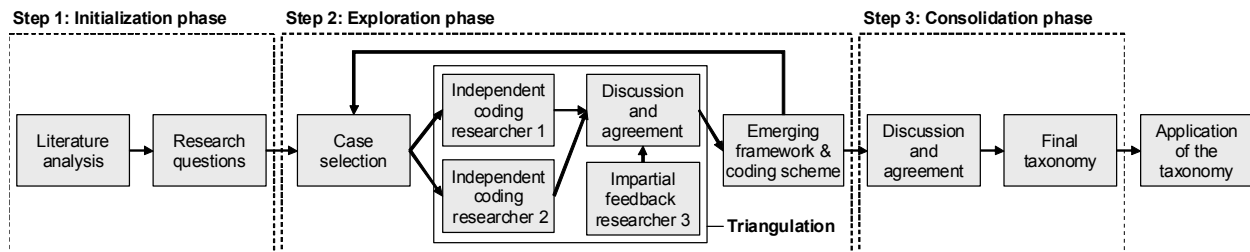


Figure 1: Research steps for the development of the benefits framework

The first stage of the project provides a *comprehensive, heterogeneous, empirically derived classification* of the drivers and benefits of ERP systems implementations.

2.2. Research Design

The research approach we use to develop the extended enterprise systems benefits framework is discussed below. Our research design and methodology are presented in greater detail in [22] and [23].

The empirical data used in this study is derived from a longitudinal research project underway since 1999 (the *eXperience initiative*, c.f. [24]). This project has developed more than 120 in-depth case studies of real world IS implementations. The majority of these cases deal with enterprise systems implementations. Each research case includes an in-depth description of an existing enterprise system solution and respective practices in an organization. Independent, specially trained authors obtain the contents of the cases directly from the representatives involved in the IT project in one or several interviews. Documentation is carried out

with the help of a standard template (the case study grid). The interviews are conducted with the project managers who are/were in charge of the introduction and maintenance of the enterprise system (ERP system). With the help of the *common template* and the use of a *uniform terminology*, the eXperience editorial team [24] ensures that the cases are comparable and can be cross-analyzed.

Drawing on this extensive source of detailed data we selected a sample of 32 cases and performed a comprehensive and in-depth content analysis applying open and axial coding techniques (cf. [14] and [1]). Our aim was to develop a comprehensive classification of enterprise systems benefits, which would form the basis of an extended benefits framework.

The process of deriving and developing the benefits framework consists of three main phases. The **first phase** is a preparatory phase where the literature was reviewed and analyzed to motivate the research, formulate key research questions and identify the limitations of existing ERP benefits frameworks.

The **second phase** is performed to iteratively code the research data. The project researchers use text analysis and open and axial coding. Cases are coded independently and a subsequent coding review is conducted to develop the basic framework. Every time agreement about codes has been achieved, the next set of cases is coded and the results are added to the framework. Since this phase is still ongoing, the framework is still preliminary in its nature and is likely to gradually change over the next months. The final version of the framework will be based on the full set of 120 eXperience cases. The process needed for the iterative validation requires a vast amount of coding time.

In the **third phase**, the results are consolidated and the final taxonomy is agreed upon. The research steps are displayed in Figure 1.

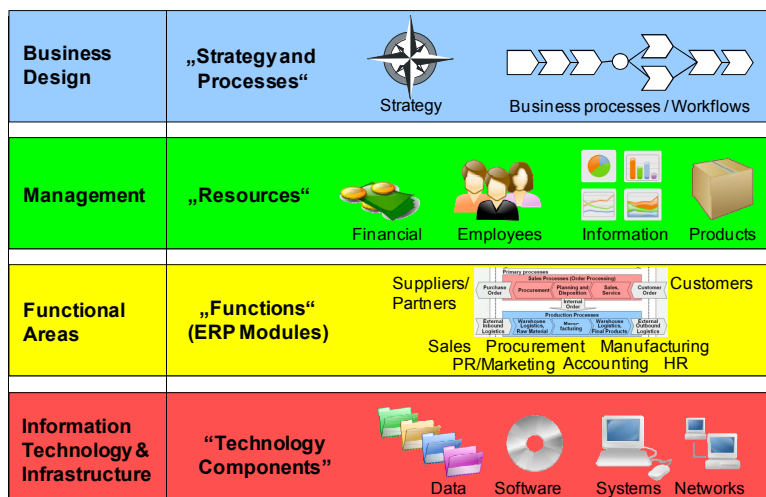


Figure 2: The Exp-Ben Framework (as of August 2009)

Table 2: Levels of the Exp-Ben Framework

Business Area	Description and Theoretical Background	Case
1. Business design (strategy and processes)	Strategy and business processes of a company Typical criteria for this area are automation, transparency, complexity, effectiveness, and efficiency. Theoretical background: Markets and hierarchies [34], IS strategy, Business Process Reengineering [8], Business Process Modeling [21]	Case FREITAG: Main benefit: business processes are now more integrated, more efficient, and more transparent.
2. Management (resources)	Resources of a company which are essential for running the business (financial, employees, information, products) Typical criteria for this area are cost, skills, productivity, satisfaction, time, and availability. Theoretical background: financial management, knowledge management, change management	Case Ziehl-Abegg: Main benefit: improved product configuration (using components from previous orders) makes employees more effective and saves cost
3. Functional Areas (functions)	The business functions which relate to departments (marketing, procurement, manufacturing, sales) Examples of criteria for this area are transparency of the process, complexity, number of transactions, sales opportunities, and turnover. Theoretical background: Porter's value chain with primary and secondary business functions (functional view and NOT process view) [18]	Case ARP Datacon: Main benefit: increased number of transactions due to new e-shop, analysis of customer behavior for sales promotions
4. Information technology and infrastructure (technology components)	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. Theoretical background: IT management, ITIL, hosted solutions, ASP	Case Pavatex: Main benefit: central access to application and databases improves reliability and availability of relevant business information.

3. The Exp-Ben Framework

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

As of June 2009 the preliminary framework is based on the coding of 32 eXperience cases. As mentioned earlier, the taxonomy is developed in an exploratory approach. In the process of coding, the authors originally identified five different categories in which expectations and benefits could be grouped (described in [22] and [23]). In a major refinement following a workshop with all involved researchers in July 2009, one of the categories was eliminated and the elements were moved to the other levels. Figure 2 shows the updated model with the four main categories and their elements.

Table 2 gives an overview of the Business Areas and their theoretical background. In order to illustrate the different levels of the Exp-Ben Framework we selected one case study for each business area. The cases

show examples of typical benefits that are expected/realized on this level.

4. Mini Cases on Expectations and Benefits

The following cases were selected in order to show typical examples of benefits that are expected/realized at the different levels of the Exp-Ben Framework. We profiled each of the available 120 eXperience cases according to company and project characteristics. The following mini cases show an extract of the profiling information available in the case study database.

The case profiling helps overcome some of the deficiencies identified in previous research. Being able to group companies according to company size, industry sector, project scope, motivation and actual enterprise system being implemented enables us to study possible interdependencies between e.g. company/project characteristics and expected/realized benefits.

Table 3: Example for Business Design: Case FREITAG

Case: FREITAG Lab. AG (Source: Dreiling/Wölfle 2008 [4])	
<p>Company Profile</p> <p>Year of Foundation: 1993, Switzerland No. of Employees: 170 Industry Sector: Manufacturing Products: Bags from truck tarpaulin Perspective/Role: B2B/Manufacturer</p>	<p>Project Profile:</p> <p>Enterprise System: ProConcept ERP Modules/Processes: Sales, Service Time for Implementation: 24 months Cost: 584.000.- Euros</p>
<p>Description of expected and realized benefits</p> <p>The Swiss company FREITAG produces bags from used truck tarpaulin and has managed to create a hip product that is well known especially among young people in Europe. Ten years after the start of the company the business had reached a size and volume of transactions (sales and service process) that could not be managed any more with the organically evolved IT infrastructure. FREITAG was using different isolated software systems and self-developed Excel sheets. Some of the information was stored in multiple locations.</p> <p><i>Expected:</i></p> <p>The main benefit expected from the investment in a new Enterprise System was the efficient handling of the increased number of transactions. The company saw a great need to integrate the processes and make them more efficient and transparent. Another expected benefit was the possibility to support the B2C sales process with an integrated e-shop.</p> <p><i>Realized:</i></p> <p>The company benefited noticeably from the introduction of the new ERP system. The business processes are now supported by an integrated software solution. As an effect the processes run smoothly independent of location and department. The efficiency of the workflow and the transparency of the available resources have increased substantially. The integrated online shop was accepted very well by the customers and is adding to profitability.</p>	

Table 4: Example for Management: Ziehl-Abegg AG

Case: Ziehl-Abegg AG (Source: Fischbach/Frick 2008 [5])	
<p>Company Profile</p> <p>Year of Foundation: 1910, Germany No. of Employees: 2450 Industry Sector: Manufacturing Products: Ventilators and elevator engines Perspective/Role: B2B/Manufacturer</p>	<p>Project Profile:</p> <p>Enterprise System: proALPHA Modules/Processes: All primary processes Time for Implementation: 30 months Cost: 820.000.- Euros</p>
<p>Description of expected and realized benefits</p> <p>The German company Ziehl-Abegg is one of the leading manufacturers of ventilators and elevator engines. It has sales subsidiaries all over the world. In 1993, the company was faced with the problem that it had to generate product configurations from scratch for every customer order although many past orders were similar. The existing software did not allow for the reuse of components from previous orders. This made life difficult for the employees (seen as a company resource that was not effectively used). At the same time, the configuration of the products became more and more complex and the company noted an increased cost pressure due to competition.</p> <p><i>Expected:</i></p> <p>The benefit of the introduction of a new software solution was seen in an improved handling of complex products, the improved support of employees (leading mainly to time savings) and thus a decrease in the cost of the sales process.</p> <p><i>Realized:</i></p> <p>The expected benefits were fully realized. After the introduction of the new Enterprise System there were no redundant data sets for products any more – each product is only defined once in the system. Components from previous orders can now be reused in the order process. Expensive development resources in the product design phase are not wasted any more. This has a positive implication on the cost structure also due to the fact that errors were reduced. Product design has become cheaper. The lead time of customer-specific orders was reduced. The employees are much more productive in the generation of new orders.</p>	

Table 5: Example for Functional Area: ARP Datacon AG

Case: ARP Datacon AG (Source: Gasenzer 2008 [6])	
<p>Company Profile</p> <p>Year of Foundation: 1988, Switzerland No. of Employees: 250 Industry Sector: Wholesale trade (mail order) Products: IT products Perspective/Role: B2B/Wholesaler</p>	<p>Project Profile:</p> <p>Enterprise System: SAP CRM/BW Modules/Processes: Sales, Service, Procurement, Purchasing, Marketing, Communications Time for Implementation: 18 months Cost: 2.000.000.- Euros</p>
<p>Description of expected and realized benefits</p> <p>The Swiss company ARP Datacon is part of the German Bechtle group and is a specialist in the mail order business for IT products. The company handles an assortment of 20.000 products from more than 600 manufacturers.</p> <p><i>Expected:</i></p> <p>The introduction of a new Enterprise System in 2005 was accompanied by various expectations regarding improved software functionality. The software was expected to now support <i>central</i> procurement for the whole group. As a side benefit the introduction of an e-shop was meant to offer a better support for the interaction with customers. Further, the company wanted to be able to analyze customer behavior for an improved management of sales promotions.</p> <p><i>Realized:</i></p> <p>The software implementation brought about full multi channel integration. Customers can now access the same product information regardless of the medium (telephone, web shop, print catalogue). This is made possible through a continuously fast and accurate data preparation. The electronic product catalogue is centrally stored, continuously updated, multilingual, and shows current prices and availability. Also, customer behavior can now be analyzed. This is used for improving the usability of the online shop and for a more effective customer relationship management.</p>	

Table 6: Example for Information Technology and Infrastructure: Pavatex

Case: Pavatex (Source: Siegenthaler 2007 [27])	
<p>Company Profile</p> <p>Year of Foundation: 1932, Switzerland No. of Employees: 159 Industry Sector: Manufacturing Products: Soft roof tiles Perspective/Role: B2B/Manufacturer</p>	<p>Project Profile:</p> <p>Enterprise System: Microsoft Dynamix AX Modules/Processes: Logistics and warehouse Time for Implementation: 13 months Cost: 618.000.- Euros</p>
<p>Description of expected and realized benefits</p> <p>The Swiss company Pavatex is a manufacturer of roof tiles which are mostly used for the insulation of private homes. The manufacturing process is process-oriented consisting of approximately ten different process levels. A key element of company success is the fulfillment of delivery dates.</p> <p><i>Expected:</i></p> <p>In order to improve the meeting of delivery deadlines the company was looking for a reliable system which could calculate delivery dates based on the key figures from the production process. Further, they wanted to be able to have access to relevant management information in order to set up a management cockpit. The introduction of a new ERP system seemed beneficial because the existing heterogeneous systems and isolated applications were generating high cost.</p> <p><i>Realized:</i></p> <p>The new ERP system brought about a lot of the intended benefits. The system is centrally run and managed and gives access to the subsidiaries and the mobile sales force. All important data is stored centrally in one system (no data redundancy). Compared to the previous situation, the access to data is more reliable now and the system availability has increased. The planning of delivery times greatly benefits from correct data and improved algorithms.</p>	

Case study information was gathered from the source, i.e. from the people responsible for the software evaluation/implementation so the authority and representativeness of the information and the level of detail are much more reliable than vendor cases.

5. Conclusions and Future Research

In this paper we present an extended enterprise systems benefits (Exp-Ben) framework. We provide a series of mini cases to illustrate the different levels of the framework. In these cases the focus has been put on expected and realized benefits that fall into the respective level of the framework. Typically, the companies in the eXperience database obtain benefits in at least three of the four areas, which draws our attention to the fact that benefits are complex and may be realized at different levels and at different points in time.

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 120 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 ([22], [23])) enable us to gain deeper insights into the nature of enterprise systems benefits, contextual variations and how they may change over time.

The findings of the research also provide useful business intelligence for companies. In our future work we are going to develop 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. The large amount of data available will 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 which will be guided by the principles of action research. Over time the framework will be extended and the level of detail on the benefits will increase.

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. Secondly, the case studies were not written with an explicit focus on benefits. The description of the intentions and the outcome of the projects are sometimes scattered over the case study text and thus hard to find for the coders. 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.

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