

A Conceptual Framework for ERP Benefit Classification: A Literature Review

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Abstract:

This paper presents the results of a detailed literature review on enterprise resource planning (ERP) benefits, carried out according to the guidelines by Webster et al. (2002). The identified benefits are mapped onto previously identified benefit categories. Based on this mapping a list of literature gaps is identified and a three-dimensional conceptual benefit framework is developed. It is build upon several benefit dimensions and the balanced scorecard approach. The framework is supposed to help in the identification, realization and assessment of ERP benefits. Special focus is put on benefits management in cross-organizational ERP implementations.

Keywords:

ERP, Cross-organizational ERP, Benefits, Literature Review, Conceptual Framework,

Introduction

Determining all potential benefits from an ERP implementation is a challenging task, as most benefits are not derived from the ERP system itself but from the various ways the system can be implemented and used. While this is true for any type of information system (IS), it is a particularly burning issue for ERP systems, because of their decisive impact on almost all aspects of an organization. It gets even more crucial in the context of cross-organizational ERP implementations, which is addressed in this paper. The need for a framework for identifying, realizing and assessing ERP benefits is clear, as more than 70% of ERP implementations fail to achieve their estimated benefits (Al-Mashari et al. 2006; Stefanou 2001). Furthermore, many benefits stay unrealized as necessary organizational change and its management are often neglected in the ERP implementation process (Davenport et al. 2001). Researchers have proposed a variety of approaches to analyze possible types of ERP benefits, but little research has been done on creating a complete benefit framework. In this paper, we try to fill this gap. We initiated a systematic literature review (SLR) to answer the following research question: *How to integrate existing benefit approaches into a comprehensive framework?* We answer this question by developing a framework that can be used in identifying, realizing and assessing ERP benefits. It resulted from a structured comparison of benefits we identified in the reviewed literature. To avoid confusion, we note that we will not provide a catalogue of ERP benefit definitions but will focus on the operationalization of benefits previously published. We investigate our research question from the perspective of networked businesses. In what follows, we introduce the concepts of cross-organizational ERP and benefits; we present our SLR and the benefit framework development it yielded. This paper will not add any new empirical results; this forms our future work.

ERP for Networked Businesses

ERP systems are packaged software applications that support most of a company's information needs within and across functional areas in an organization (Kumar et al. 2000). Modern ERP systems serve as the foundation for a wide range of e-business models within one company as well as throughout the value chain (Davenport 1998). Such cross-organizational ERP implementations enable coordination and collaboration among multiple companies in a value network by automating process work flows and data control flows shared by the partnering businesses. In this paper, we call 'a networked business' a value web of profit-and-loss-responsible business units, or of independent companies, who cooperate to achieve common business objectives. In the IS literature, the ERP systems deployed by networked businesses are also referred to as ERP II (Bond et al. 2000). This term meant that whereas traditional, 'ERP I' systems focus on the integration of back-office ISs in one company, ERP II focuses on linking the company to both customers and vendors (Weston (Jr) 2003). Gable et al. (2003) showed that existing models of IS success are geared towards ERP I and may not be entirely appropriate for measuring ERP II success, as ERP II systems are more complex. Based on published studies (Beheshti 2006; Bond et al. 2000; Daneva et al. 2008; Davenport et al. 2004; Rohde 2005), we distilled some issues and challenges that are particular to the context of ERP II, as opposed to implementations of either ERP I or of other ISs, and that therefore merit special attention in an ERP II benefit framework:

- ERP II projects are often dominated by conflicting priorities and interests of stakeholders in the partner companies, which makes coordination a challenge (Daneva et al. 2006).

- Identification and quantification of benefits is more challenging and complex for ERP II than for ERP I than for IS projects (Venkatraman et al. 1998).
- Long benefit payback periods make the management and assessment of an ERP I or II system very challenging (Han 2004).
- ERP II systems are more complex than ERP I systems which are more complex than ISs, and therefore their implementations are more likely to fail (Ferrario et al. 2004).

These issues can be considered risks which make ERP I and II implementations more complicated but also potentially more rewarding (Davenport 2000) than IS implementations. To mitigate these risks, both researchers and practitioners (Rosemann et al. 1999) agree on that a complete business case (BC) is needed to address these issues and reflect the complex nature of ERP system implementations. We consider these issues when developing our benefit framework.

ERP benefits

Knowing if an investment paid off or if it will pay off in the future is key to ERP adopters (Markus et al. 2000). This question motivates our paper as it calls for an assessment of the success measures or benefits of the ERP system. A business benefit can be defined as “an advantage on behalf of a particular stakeholder or group of stakeholders.” (Ward et al. 2006). Clearly, a stakeholder deems an ERP project outcome beneficial only when it is valued positively by that stakeholder. In order to have a complete benefit picture we will consider tangible as well as intangible benefits in our assessment (Murphy et al. 2002).

Systematic literature review

Our process of SLR uses the guidelines by Webster et al. (2002) and by Kitchenham et al. (2002). We started with the search and identification of relevant literature. Our primary search covered literature sources in five areas: (i) ERP implementation, (ii) ERP benefits, (iii) general IT investment valuation, (iv) cross-organizational ERP and (v) the balanced scorecard (BSC) approach in ISs. To get a comprehensive overview of past research, the following eight databases were consulted: ACM Digital Library, Compendex, IEEE Xplore, ISI Web of Science, Science direct (including Elsevier), SpringerLink, Wiley Inter Science and EBSCO Business Source Elite. Additionally, a secondary search was performed, tracing the reference lists of the papers, which resulted in the original sources and new relevant articles. Our primary and secondary search yielded a total of 150 papers. As our search was rather broad, we defined four quality criteria which papers should meet in order to be included in our review. We applied these criteria in two stages: first we used the criterion, labeled (1), to single out those papers on ERP which had a clear discussion on ERP benefits; second, we applied the other three criteria (Herrmann et al. 2008) to the set of papers which met criterion (1). The criteria are listed below:

- (1) the paper is on benefits of ERP system implementations,
- (2) the paper is credible, i.e. the method described is meaningful and intuitive to follow,
- (3) the paper provides enough detail on the context,
- (4) original paper, for each paper we tried to find the original publication.

The use of criterion (1) cast out 80 % of the papers because these showed no direct relation to ERP benefits. Seven articles focusing on IT in general were included, because they provided very detailed guidelines for benefits management, which seemed to be applicable to ERP. The decision to include these articles was made after their review and discussion by two researchers on why it makes sense to include them. All articles reviewed were written in English only and

included qualitative as well as quantitative research. This review process left us with 30 articles, which we then further analyzed by means of a concept matrix (Webster et al.). Analysis of these articles showed that only two of them are focusing on cross-organizational ERP. Our SLR was complemented by a literature review by Cruijssen et al. (2007) on general collaboration benefits. This resulted in several new articles that we will include in our benefit comparison.

Concept mapping

Concept mapping is a type of structured approach to developing a conceptual framework that can be used for guidance or evaluation (Trochim 1989). It is a vehicle that researchers use to categorize their reviewed papers in terms of concepts that help investigate a topic. A concept matrix adds value by identifying common and similar concepts across the papers. We developed three concept matrices based on the 30 articles analyzed that are discussed below. Through these matrices we develop a concept-focused review which will lead us to theory-building. As per Webster et al. (2002), for researchers to be able to build a theory based on a literature review, it is important that the review is concept- and not author-focused.

Our first matrix is based on a set of factors which were analyzed for each article. Because of space limitation, we do not include it in the appendix. However, it is available from the authors upon request. The factors in this matrix are:

- (i) the type of system discussed in the article, either non-ERP IS or ERP;
- (ii) the dispersion of the system, which was either restricted to a single firm (ERP I) or extended to cross-organizational settings (ERP II). These two factors are important, as the benefit concepts might have different meaning for IT/ ERP projects and single vs. cross-organizational ERP projects.

Next to this, the articles were compared on two general benefit variables,

- (iii) timing of the benefits, meaning, when in the ERP life-cycle the benefits got realized;
- (iv) tangibility of the benefits.

Furthermore, we carefully looked at:

- (v) the output of the research, especially whether or not a framework or guidelines for benefits management were proposed.
- (vi) the data collection method used, for example literature study, case study or survey research. This helped us judge the soundness and the reliability of the conclusions that we later drew on.

The conceptual benefit mapping matrices, Appendix 1 & 2, focus explicitly on reviewing the benefits mentioned in the published papers. Compared to our first matrix, these two matrices bring our concept comparison to a new, elaborate level of analysis. In order to ensure comparability between the benefits cited in the 30 articles, we sorted them on level of granularity. This let us compare the benefits described in much detail to those described at a higher-level of abstraction. This analytical process indicated the benefit classification of Shang et al. (2002) to be – with five high level categories and 21 detailed benefits – the most structured, complete and detailed framework. This observation motivated our decision to use Shang's classification in both benefit maps as a ground for mapping other classifications and see if and where they overlap or supplement each other. When trying to map the benefits from the different authors against each other, we experienced some difficulties in positioning a benefit into one category, e.g. 'standardization' fits into several categories: it can be seen as a strategic benefit to

build cost leadership, and also as an organizational benefit. Our mapping exercise revealed the fundamental difference in nature between the benefits in the organizational and IT-Infrastructure categories of Shang's classification and those in the other three categories. This raised the question of what the exact position of these two categories will be in our benefit framework. Before presenting the framework, we first discuss research gaps in the current literature which we identified through our concept-focused literature review.

Literature gaps

Our SLR culminated in identifying under-researched areas and gaps. First, we found that current literature does not provide a complete view on identifying, realizing and assessing ERP benefits. We observe that those authors, who identify benefits, do not give guidelines for benefit realization and assessment (Shang et al. 2002; Spatis et al. 2003). Those authors, who discuss benefit realization and assessment, do not discuss the identification of benefits (Al-Mashari et al. 2006; Davenport 2000). Further, our research process lets us conclude that most of the literature focused on benefit identification defines a number of benefit categories, but there are huge differences in the amount and level of detail provided by the authors (between 3 and 23 benefit categories). Shang et al. provide the most complete and referred to benefit list. However, one can see in Appendix 1 that this list itself does not cover all benefits mentioned in the literature.

Second, we found that only two (Koh et al. 2007; Sammon et al. 2004) out of the 30 articles focus on cross-organizational ERP implementations. This shows that very little research has been done on benefit identification, realization and assessment in cross-organizational ERP projects. In order to create a framework that is applicable for cross-organizational collaborations, we decided to extend our benefit framework with benefits identified by literature in logistics and organizational theory which generally focus on inter-company cooperation's (Crujssen et al. 2007; Mentzer et al. 2000). We noticed that some cooperation benefits, such as cost reduction, fall in the categories mentioned in Appendix 1. However, others, such as having a more skilled labor force, providing complementary goods and services, being able to overcome legal barrier or an enhanced public image are more specific to a collaboration setting. Therefore, they should be included in benefit assessment. We believe that in the future, it might make sense to extend the literature review by including publications on inter-organizational systems that have an ERP system as their backbone. However, it might also be the case that an extended search would not add much new articles as such articles should be included in our search for "ERP". Next to an extended literature search our future research will include cross-organizational ERP case studies to collect more specific data and insights into this field.

Third, we indicated a lack of guidelines that can be used to identify, realize and assess benefits. Only 8 out of the 30 articles identify guidelines about what one can do to achieve certain IS goals. We will now discuss the guidelines of those papers and show how they can be used and why there is a need for more research in this area. Half of the guidelines refer specifically to ERP implementations, and half – to non-ERP ISs. Of the papers that focus on ERP, three (Al-Mashari et al. 2006; Legare 2002; Magnusson et al. 2004) develop conceptual frameworks, which include ERP benefits, and then provide guidelines on how to use their models specifically for ERP. Reviewing these frameworks and guidelines shows that most authors do not focus on benefits but assume that benefits are clear and that their identification, realization and assessment do not need to be discussed. Thus, benefits are included only to achieve model completeness, without adding

new knowledge on benefits management. Therefore, we considered them of limited use for our research problem. Below, we describe our findings in more detail:

Legare's (2002) analysis is based on a case study and provides examples of ERP benefits. His guidelines focus on how organizational factors can help to realize ERP business benefits. He explains transformation mechanisms that link organizational factors, the cause, to ERP benefits, the effect. However, no guidelines are given on how to identify the benefits themselves.

Al-Mashari et al. (2006) analyze the factors that maximize ERP benefits and minimize its risks. A roadmap for successful ERP implementation is proposed, which leads the implementation through the different life-cycle stages. However, benefits are just treated as a measurement or outcome and no guidelines are given on how to identify them. Though, one could see the factors identified as guidelines on how to realize benefits.

Magnusson et al. (2004) provide a conceptual framework that identifies factors which influence the ERP implementation success. A set of questions is used to measure fulfillment of each of the factors. However, as these factors are the classical critical success factors and not benefits, the framework can not be consulted for guidance on benefit identification or realization.

In contrast to these papers, Davenport (2000) gives an introduction into the challenges and opportunities of enterprise systems without directly linking them to a model. He also specifies some tactics for benefit realization, but these are more hints on what to look for during an ERP implementation, than step-by-step guidelines. Further, they focus only on benefit realization and not on identification or assessment.

The following four papers focus on non-ERP IS implementations:

Schmidt (2003) does not directly provide guidelines for benefit identification, but she identifies ten so called "keys" for developing an accurate and credible IT BC. Although she focuses on IT implementations in general, her three keys that focus on benefits can be transferred to an ERP setting. Schmidt stresses the importance of these points, however she does not give any explicit guidelines on how to identify all benefits or on how to realize and evaluate them.

The other three articles, by Ward et al. (2008; 1996) and Peppard et al. (2007), provide guidelines for general IT implementations. They are based on a benefits management model and provide clear BC guidelines on benefit identification, realization and evaluation. Although they are focused on IT in general, we expect that the guidelines are adoptable to an ERP setting. We come back to this when discussing BC guidelines.

One might wonder why the linkage to a conceptual framework is considered to be important for a complete set of guidelines. This is, because it is assumed that it only makes sense to realize benefits that one can define. A framework can be of great use during this benefit identification and definition phase.

Forth, our SLR revealed that benefits are rarely linked to costs. For example, if an ERP adopter wants to realize some benefits, investments must first be made thus extra costs would incur. However, the question of how much it would cost an adopter to realize a benefit is, by and large, under-researched.

Fifth, the detailed benefit mapping suggests that most authors agree on a set of operational and managerial benefits. Although, descriptions of strategic benefits vary widely across papers, most papers identify some benefits which fit into this cluster. However, it appears that most authors do

not identify benefits for the IT-infrastructure and organizational clusters. Apparently, benefits in these clusters are more difficult to define and identify, as we will discuss later.

Sixth, we noticed in our SLR that no paper discussed any causal or logical relations between benefits. Yet, in an ERP project most benefits are not realized in isolation but in connection to each other. We will discuss dependencies between benefit categories later on in this paper.

Seventh, our analysis shows that 30% of the papers discuss tangibility of benefits and when in the life-cycle benefits occur, however only two out of 30 papers link this to the benefit categorization (Al-Mashari et al. 2003; Deloitte-Consulting 1998). Thus, the question of which tangible/ intangible benefit to realize at which life cycle stage remains open.

Conceptual framework development

The results of the SLR laid the foundation for a conceptual framework which is intended to fill some of the identified research gaps. From a theoretical viewpoint, our goal is to (i) provide a complete overview of benefit literature and (ii) understand which published work makes what kind of contribution, where they overlap and where they are complementing each other. The practical implications of our framework are visible throughout the ERP implementation. Before the implementation, our framework intends to help with the identification and classification of possible benefits in order to convince top-management of the investment and to identify actions needed to achieve all possible benefits. We believe our framework can serve as a first step in exploring the relationship between the benefits and the possible costs to realize them. Because these costs reveal only later in the ERP lifecycle, thinking of them upfront in the early project stages may help ERP adopter identify risks for budget overruns. During the ERP implementation, the framework and its associated guidelines provides the adopter with an action plan geared towards realizing the benefits identified earlier. At after-implementation time, the framework can be used as a checklist to assess the project success.

The development of our three-dimensional framework is illustrated in Figure 1.

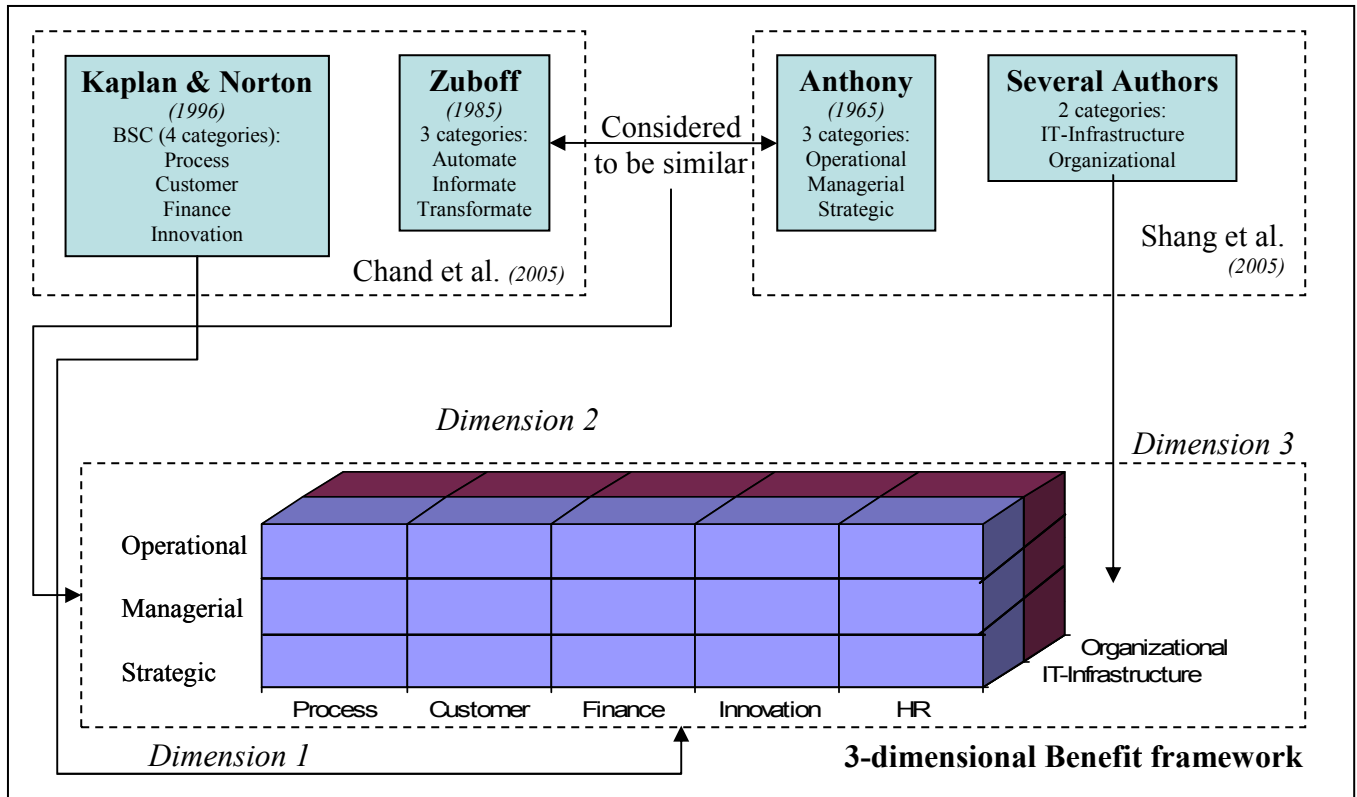


Figure 1 Development of three-dimensional framework

As said earlier, the completeness of Shang et al's (2002) benefit categories motivated our choice to partly use them for our framework. *Dimension 1* is based upon three of Shang's benefit categories – operational, managerial and strategic – which originate from Antony's work (1965) on general planning and control systems. *Dimension 2* is formed by including the following categories of the BSC framework (Kaplan et al. 1993): process, customer, finance and innovation. We added a fifth category to it, focusing on the role of human resources in the ERP-adopter. We deemed it important, because factors as staff satisfaction or resistance to change are recognized to impact the ERP project success (Davenport 2000; Edvinsson 1997; Umble et al. 2003). We including the BSC as a second dimension because other researchers (Chand et al. 2005) have already built their benefit framework on the BSC. Chand et al. link the BSC categories to the following three levels identified by Zuboff's (1985) – automate, informate and transformate – in order to measure the impact of ERP on company's strategic goals. We compared the meanings of these three levels to the meanings of Shang's categories of strategic, managerial and operational benefits and identified similarities. That is, the automate level focuses on operational ERP benefits, the informate level focuses on managerial decision making outcomes influenced by ERP implementations and the transformate level focuses on the strategic impacts of ERP systems (Chand et al.). Thus, the ERP scorecard by Chand et al. is a solution to the problem of linking the reasons for or the objectives of an ERP-projects to the benefits achievable with it (Markus et al. 2000). *Dimension 3* of our framework, deals with benefits falling into IT-infrastructure and organizational categories, identified by Shang et al.. Our SLR shows that besides Shang et al. few authors identify benefit falling into these two categories. This finding raised the question of why this is the case. Two possible reasons traced back to the reviewed literature are that either (i) benefits in these categories are so basic (IT cost reduction) that they are not mentioned anymore, or (ii) they are soft and intangible and thus hard to identify

and measure, such as flexibility or learning. However, both benefit categories are deemed critical for an organization to successfully implement an ERP system (Legare 2002; Murphy et al. 2002), as the realization of them increases the commitment by many stakeholders, such as customers and staff members who are interested in these benefits. Benefits in these categories can be described as support-benefits as the realization of them is expected to result in a more effective realization of operational, managerial and strategic benefits. Further analysis shows that the realization of these intangible support-benefits might result in the need for extra activities, such as change management, training or learning. Such activities are crucial for the success of an ERP implementation. However, they are often very costly and should be taken into consideration as “costs to realize benefit” when performing a cost calculation for an ERP implementation. Concluding, we will add the two benefit categories – IT-infrastructure and organizational – as a third dimension to our benefit framework allowing for a complete benefit as well as cost picture.

The comparison of our framework to others let us conclude that our framework is more complete, as it builds upon benefits identified by both consulting companies (Deloitte, Accenture) and scholars. In contrast to existing literature which focuses on benefits at post-implementation time, our framework is focused on both pre- and post-implementation. We believe that practitioners could use the framework for better managing benefits in their projects, as it builds a bridge between benefits and costs, by identifying those benefits that result in extra-indirect-costs. In the next section, we describe how our framework translates into what we call ‘a complete business case description’. We formulate propositions regarding dependencies between benefits that we think need to be considered so that a BC is complete.

Business cases

A business case exists to ensure that, whenever resources are consumed, this supports one or more business objectives. Therefore, a BC should be reviewed at the various stages during the IT lifecycle. Literature indicates that for most IT implementations, BCs are developed (Ward et al. 2008), but are solely used to obtain funding approval for the huge up-front financial investment and not to actively manage the project (Nah et al. 2001; Ross et al. 2002). Furthermore, traditional BCs are often only based on financial benefits and costs, and thus, ignore non-financial benefits. We attempt to propose a more comprehensive BC concept, one that (i) takes costs of realizing benefits into account, (ii) is updated throughout the ERP life cycle and (iii) provides IT managers with robust guidelines. The purpose of our guidelines is to help (i) accurately determine the financial value of an ERP implementation in terms of costs and benefits, and (ii) actually achieve the desired benefits within time and budget. Our future work will specify such guidelines, based on our benefit framework developed above.

Propositions: Dependencies between benefits

In both our SLR and our model (Figure 1) we found that benefits related to organizational factors and IT-infrastructure have a supporting role in ERP implementations. Further, literature shows that the realization of certain benefits is contingent on certain pre-requisites (Kumar et al. 2000). Having for example very well trained users would allow for the realization of more ERP implementation benefits than having users without training who might be resistant to change and thus anticipate the achievement of benefits. In this case, training would give support for the realization of operational, strategic and managerial benefits. Similar examples can be found for

other organizational benefits as well as IT-infrastructure benefits. This leads to the following sample of hypotheses for future research:

- H1: Organizational benefits enhance the realization of operational benefits.
- H2: Organizational benefits enhance the realization of strategic benefits.
- H3: Organizational benefits enhance the realization of managerial benefits.
- H4: IT-Infrastructure benefits enhance the realization of operational benefits.
- H5: IT-Infrastructure benefits enhance the realization of strategic benefits.
- H6: IT-Infrastructure benefits enhance the realization of managerial benefits.

This list of hypotheses is far from being complete, as we expect that IT-infrastructure and organizational benefits reinforce each other and that more dependencies between benefit categories can be discovered.

Validation of the framework

We plan to validate our framework in several ways. Card sorting will help us to validate the mapping of our benefits in Appendix 1. A survey among ERP consultants is currently conducted to research the state of the practice in benefits management and to analyze if our framework could possibly help in benefit identification, realization and assessment. We plan a study on factors that determine the quality of a BC and, based on it develop practical BC guidelines for companies to use.

Future research

Future research includes: (i) a more elaborate search on cross-organizational ERP, which are part of larger inter-organizational systems or electronic markets in specific areas, such as logistics; (ii) a study on benefit dependencies in cross-organizational ERP implementations; (iii) a survey among ERP consultants to assess the usefulness of the framework; (iv) an extended literature search on BC guidelines; (v) case studies analyzing the factors influencing the success of a BC and (vi) a theoretical study on the causal relationships between the benefits identified by the literature. In the long term, we also plan to assess the relation between costs and benefits in cross-organizational ERP implementations.

Conclusion

To implement a cross-organizational ERP, proper guidelines and frameworks are needed that successfully guide managers through their projects. This paper made a first attempt to provide a conceptual framework that can be used for benefits management. We performed a SRL and formulated starting points for future research on benefits management in cross-organizational ERP settings. Our results brought us to a conceptual framework for benefit identification, realization and assessment, which we believe fills some of the research gaps observable in our SRL.

| | | | | | | | | | | | | | | | | | | | |
|--------------------------|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IT-Infrastructure | Building business flexibility for current and future changes | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | 0 |
| | IT cost reduction | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | 0 |
| | Y2K | 0 | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | 0 |
| | Increased IT infrastructure capability | = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Increased user-friendliness | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Application integration | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Changing work patterns + improved co-ordination | = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Facilitating organizational learning | = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Empowerment | = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Building common vision | = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Organizational | Shift work focus to core work | = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Increase employee morale and satisfaction | = | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Standardization (?) | 0 | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | = | 0 |
| | Improved internal communication | ~ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | | | | | | | | | |

= equal benefit description
 0 benefit not mentioned
 + new aspect of same benefit mentioned
 ~ about the same, but not completely, most often part of the benefit is covered
 / combination of above symbols

Appendix 2: high level comparison:

| Shang | Staehr | Murphy | Spatis | Chand | Al-Mashari (03) | DeLone (03) | Koh | Davenport | Love | Cruijssen |
|-------------------|--------|--------|-----------------------------------|----------|-----------------|------------------------------|-----|---|----------|-----------------------|
| Operational | = | = | Effective logistic | = | = | Cost savings | = | Savings from new work approaches | = | Cost and productivity |
| Managerial | = | = | Effective communication function | Tactical | = | Incremental additional sales | = | Savings from dismantling legacy systems | Tactical | Customer service |
| Strategic | = | = | Effective decision-making process | = | = | Expanded markets | = | Revenue enhancement benefits | = | Market position |
| IT-Infrastructure | = | = | Efficient data processing | | = | Reduced search costs | = | | | Other |
| Organizational | = | = | Effective IS | | = | Time savings | = | | | |

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