

# Costs, Benefits and Value Distribution – Ingredients for Successful Cross-Organizational ES Business Cases

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**Abstract.** This paper introduces my PhD research project on developing guidelines for creating successful business cases for ES implementations in network settings. Three important aspects that were found to be important in such business cases are: the costs, benefits and the value distribution within a network. Each of the three aspects is addressed in this paper and the relationships between them are pointed out. A research model is presented showing how all three aspects contribute to the main goal of defining successful business case guidelines.

## 1 Introduction

A Business Case (BC) is a structured proposal for business change that is justified in terms of expected costs and benefits [1]. The BC should ensure that, whenever resources are consumed, they are supporting the business. This applies in particular to business changes initiated during the implementation of large enterprise systems (ES). Thus, the BC should be reviewed at various stages during the enterprise system lifecycle. A survey by Ward et al. [2] shows that 65% of the companies are currently not satisfied with the BC's they make and the way it is used during the implementation. One reason for this is that current BC's often omit non-financial benefits. Including those could take away dissatisfaction. Literature further shows, that many businesses have an incomplete cost model, neglecting the costs related to realizing the benefits. BC's could be more useful if they would not solely be used to obtain funding approval for the huge financial investment, as it is done at the moment, but also for actively making decisions about project continuation [1, 3]. It is further largely unknown how BC's can be managed in networks, however, as a matter of fact many ES implementations occur in networks, and thus such BC guidelines for network settings are needed.

In this paper, we argue that specifying benefits and related agreements (e.g. ownership) and actions (e.g. organizational change) in the BC is important for the success of every IS implementation. If an ES adopter could get clarity on the ES benefits and costs early in the project, then the adopter should be able to manage those benefits and costs by making informed decisions on how to steer the project in a way that causes a desired effect on an important project outcome. Thus, a more comprehensive BC is

needed, one which (i) treats costs and benefits as equally important, (ii) covers value distribution in business networks, (iii) is updated throughout the ES life cycle, and (iv) provides IT managers with robust guidelines. It is further important to decide at each stage of the implementation whether or not to proceed with the ES solution.

In my PhD research, I am developing guidelines for creating successful business cases for ES implementations in network settings. Three important aspects that need to be addressed in such BCs are the costs, benefits and the value distribution within a network. We will present our first insights on each of the topics later in this paper. In the next sections, we will provide some definitions used in this paper and then sketch the problem and present the research questions we are set out to approach (Sect. 2). We present the context (Sect. 3) and a detailed discussion on our planned research design (Sect. 4).

## **1.1 Definitions and Background**

In order to enhance clarity we will provide definitions of those terms used in our paper that might be interpreted ambiguously.

We will use the term Business Case to describe a structured proposal for business change that is justified in terms of costs and benefits [1].

Enterprise Systems originate from back-office transaction processing systems and evolved into IS which support the entire range of business processes. They can be defined as having the following two core properties: Being a *commercial software packages* that enable *information sharing* across functions. A number of consequences for ES life cycle management follow from these two core properties:

- They are commercial packages, so the implementation involves bridging a gap with actual practice.
- Information sharing requires the integration and coordination of business processes.
- Information sharing across functions usually implies a large shared database with standard data definitions.
- By aggregating transaction-oriented information, management information can be delivered, allowing managers to make more accurate decisions.
- All of this can be done within and across several organizations in a network.

ES provide the foundation for a wide range of e-commerce based business models [4].

Implementing an ES results in the following life cycle management challenges:

- Implementing an ES comes along with the need for business process as well as people change;
- The length of the benefit payback period makes the management and assessment of the ES very challenging [5];
- Comprehensive functionality, makes the software very complex and complicated [6, 7] but also more rewarding [8].

Research by Gable et al. [9] showed that existing models of IS success may not be entirely appropriate measuring ES success. In our research we will adopt some IS models, such as the one by Ward et al. [10] to an ES setting. In our definition, enterprise

systems include enterprise resource planning (ERP) software and such related packages as customer relationship management (CRM) [11, 12].

Cross-organizational IS implementations are IS implementations, other than ES implementations, that result in changes to multiple business units or even organizations.

An ES life cycle also referred to as ERP lifecycle is defined to cover both implementation and post-implementation activities [12], starting with conception and ending with replacement (disposal).

Life cycle management is defined as the process of managing both implementation as well as post-implementation activities related to the system implementation.

We define a business network as a value web of profit-and loss responsible units which cooperate for some purpose. Used synonyms for business networks are: value networks, value models and value webs.

## 2 The Problem

A first literature search showed us that academic research on IS BCs is limited, especially with respect to defining characteristics of successful BCs. The practical problem dealt with in this PhD project is that ES implementations often run out of time and budget and do not deliver the benefits that were expected. This practical problem leads us to several related knowledge problems, as e.g. how can the benefits and costs of an ES implementation be estimated. This and further knowledge questions will be described in 2.1 explaining the research questions of this project.

We use literature survey methods and explorative case study research methods to analyze the problems experienced in the current ES BC development practice. Based on this analysis, we aim at developing BC guidelines that consider the costs of realizing benefits and help to i) accurately determine the financial value of an ES implementation in terms of costs and benefits, and ii) actually achieve the desired benefits within time and budget. We intend to validate these guidelines by focus groups and simulation.

Literature studies and some first interviews with IT consultants during the first year of my PhD show that there are multiple aspects that need to be addressed in a BC in order to be successful. Those three aspects that will be the focus in my research are i) the costs, ii) the benefits and iii) the value distribution within a network. Past research on each of these aspects is isolated and an approach integrating results in all three areas is missing. A solid body of research results has been obtained in the field of software cost estimation; however, little attention is paid to cost estimation of ES implementations especially in cross-organizational settings. Business scholars [1, 5, 13, 14] have proposed a variety of approaches to analyze different types of ES benefits. However, our observation from reviewing the published work by these authors is that relatively little research has been done on creating a complete benefit framework which could be used for the development of a successful BC. Research on networked business models emphasize the importance of revenue sharing models which show how goods, services or money are exchanged in a network. Such value exchanges can be specified by means of e.g. the e3value [15]

method. However, literature gives very little indication on how partners select, negotiate, and ultimately agree on the design elements of their revenue-sharing models.

There are still research challenges in all three areas with respect to cross-organizational settings, which is the focus in this research. ES implementations can serve as examples in such cross-organizational settings. For example, as being the core of supply chain management solutions ensuring the integration with company's suppliers. Therefore, we started this research having cross-organizational ES implementations in mind as our target problem that needs to be solved; however, we noticed that our guidelines and frameworks are very likely to be applicable for all kinds of cross-organizational system implementations. Thus, we use ES implementations in this research proposal as an example; we plan to conduct one case study of an ES implementation and at least one of another IS implementation. Comparing the results will show us if our guidelines are generalizable to general complex IS implementations.

IS implementations in network settings, become increasingly popular and are very complex to manage involving many research challenges. For example, one needs to think about e.g. benefits in systems-dynamics terms [16]. It is important to not look at the organization in isolation but understand how choices one firm does influence others in a network. Assuming that an organization wants to adopt an ES and use it as the coordination and cooperation vehicle that will connect this organization to its partners in a network, then it is important to take a cross-organizational perspective from the beginning onwards when planning an ES implementation. If a firm who participates in a network, would focus solely on their individual benefits this might negatively affect their partners, as their costs might rise. Having an uneven distribution of costs and benefits in a network, will lead to unsatisfied partners and might even lead to project failure. The mental goal to benefit at the expense of a partner that is often present in collaborations [16] needs to be challenged and turned around into a win-win collaboration. We address this problem when discussing how to successfully construct a shared value model that every partner in a network is agreeing on.

## **2.1 Main research questions**

Following the insights we presented in the above discussion, our motivation is to develop complete and easy to use BC guidelines that help to successfully implement cross-organizational ES, which are able to handle the complexity of such settings. Therefore, our research questions for this PhD project are presented in Table 1. The nested structure of our top-level design question is analyzed using the research framework of Wieringa [17]. In order to be able to answer our main research question, several practical (P) and knowledge (K) questions, related to the different parts of a BC, are specified.

RQ1: P: Design business case guidelines that help to manage a successful cross-organizational enterprise system implementation.

- RQ1.1: K: Design a comprehensive benefit model.
  - o K: Which benefit models exist?
  - o K: Integrate, improve and customize those models to ES.
  - o K: How do companies ensure that their planned benefits get realized?
  - o K: How early in the implementation process do they do this?
  - o K: How and when in the implementation cycle do companies know that their benefits have been realized?
  - o K: Validate the benefit model.
- RQ1.2: K: Design a cost model.
  - o K: Which cost models exist and are relevant for our research?
  - o K: Integrate, improve and customize those models to ES.
  - o K: Validate the cost model.
- RQ1.3: K: Find relationships between benefits and costs.
  - o K: Which benefits, in the benefit model, are dependent on organizational change and therefore result in additional costs?
- RQ1.4: P: Design a way to allocate costs and benefits to partners in a network in an economically sustainable way.
  - o K: How do companies decide with whom to collaborate in a revenue-sharing model?
  - o K: How do companies decide on the form of collaboration in a revenue-sharing model?
  - o K: How do business partners in a collaboration agree on a shared value network?
  - o K: How are costs and benefits allocated among business partners?
  - o K: Which techniques are used for cost and benefit allocation?
  - o K: Validate the value distribution model.

RQ2: K: validate the business case guidelines.

**Table 1: Research Questions**

### **3 Review of Literature**

In this short literature overview we will first discuss the concept of cross-organizational ES implementations. Afterwards a selected set of literature is used to introduce each of the three aspects of a BC and to identify under researched issues.

#### **3.1 Cross-Organizational Enterprise Systems**

As defined above, enterprise systems are packaged computer applications that support most of a company's information needs within and across functional areas in an organization. Going one step further in level of complexity, our research is focusing on cross-organizational, also referred to as inter-organizational [18], ES implementations that deal with the automation of process work flows and data control flows between multiple companies in a value web. In this proposal we call a cross-organizational ES to have the following contingent properties:

- Focus on linking the enterprise to their customers, e.g. customer relationship management (CRM) and vendors, e.g. supply chain management (SCM) [18, 19] instead of only integrating front- and back-office information systems;
- Offers solutions to all sectors opposed to traditional ES who are typically found in the manufacturing and distribution domain [18];
- Having a web-based open architecture (instead of a web-aware but closed architecture in traditional ES) [18];
- Evolves during multiple upgrades of existing ES, rather than as a one time implementation;
- Being dominated by different priorities and interests of the stakeholders in the different companies, which make coordination very difficult;
- Do not have an identified owner at cross-organizational system level, as the system is shared.

We will provide first steps and guidelines for successfully implementing such complicated system later in this paper.

### **3.2 IT Benefit Classifications**

Davenport [8] and Gattiker et al. [20] were among the first who initiated studies on the classification of ES implementation benefits. They grouped the benefits into four categories: (1) the improvement of information flow across sub-units, (2) administrative savings through centralization of activities, (3) reductions in IS maintenance costs and (4) an increase in the ability to deploy new IS functionality, such as the possibility to move away from inefficient business process towards accepted best practice business processes. Based on this ground work more detailed classifications schemes which also provide first guidelines for managers to achieve those benefits were developed. An example is given in Shang et al. [21] who propose an ES benefits framework based on five benefit dimensions: operational, managerial, strategic, IT-infrastructure and organizational. The first three categories can be traced back to the classic work of Antony [22].

**Benefit dynamics.** Because some ES benefits are more likely to arise early in the life cycle and others later or even are completely absent initially [8], it is useful to include the benefit time frame in an ES benefit framework. Our observation from the reviewed literature is, however, that very few authors recognize this time-dependency of ES benefits. Shang et al. [21] are among those few who approached this explicitly, namely in their research on patterns of perceived net benefit development. They show how different benefits vary during the system stages. They do not directly link the benefits to their position in the overall ES implementation life cycle of the company, meaning when exactly they are perceived to happen. However, they describe the development of a benefit from the moment onwards that the company experiences it. So, e.g. as soon as the company experiences operational benefits, no matter when in the ES life cycle, the development is likely to be similar to the pattern described by Shang et al..

**Intangible benefits.** Investments into large-scale systems as ES are very expensive and require justification in terms of returns and benefits. However, many of the benefits are intangible which makes it difficult to quantify all benefits from an ES project in

monetary terms. For this research, we use the definition of ‘intangible benefit’ given by the International Accounting Standards: “an intangible asset is an identifiable non-monetary asset without physical substance” [23]. Determining the intangible benefits of IS implementation has been a goal for many scholars since more than twenty years [24].

As intangible benefits are very difficult to measure and manage in practice, several researchers focused on the development of classifications which translate intangible benefits into measurable concepts. For example, Ward et al. [2] propose a framework which uses the degree of explicitness of benefits to identify financial, quantifiable, measurable and observable benefits ranging from high to low degree of explicitness, respectively. Explicitness is defined as the degree of how much is already known or can be determined about the benefit prior to the investment.

### **3.3 Cost estimation**

The success of networked ES implementations depends on adequate cost estimation. As part of preparing this research proposal, we used preliminary results published by other researchers [25, 26]. They found that “traditional software cost estimation methods do not yield accurate results in the [ES] context because they rely on a predefined set of factors that only partially describe this context, and they let each of the network partners incorporate their own biases and intuition into the estimate” [27]. Furthermore, these authors give an analytical argument which explains why the assumptions which one usually makes when estimating project cost would not hold in the ES context [8, 26, 28].

Research found that especially, for cross-organizational ES implementation projects, there is a shortage of both relevant metrics and historical project datasets, and an absence of proper methodologies to evaluate size, effort, productivity, and other cost factors for such complex settings [25].

**Research challenges.** Based on the above mentioned literature we detected several research challenges in cost estimation with respect to cross-organizational ES implementations, which will be dealt with in this project. First of all, one needs to adopt/design *suitable cost models* that allow the estimation of implementation costs by linking *multiple measures of size* and ES context factors together from a networked organization’s perspective. These cost models further should be based on *cost drivers suitable for cross-organizational ES implementations* and not on the main cost driver only, which is often size of the product. They also need to be able to deal with the inherent *uncertainty of ES cost drivers*. As the cost estimation is supposed to happen in a network setting, a cost estimation approach needs to allow the integration of cost estimation and analysis of different but related projects. Further, it should be able to deal with the incompatibility of data from different companies by using a measurement standard that each of the partners in the network can share and agree upon.

**Post-implementation stages.** If one maps existing software effort estimation models against the ES life cycle stages of implementation, operational use and replacement, it is evident that these effort estimation models provide answers to effort estimation questions that are asked in the system acquisition or implementation stages of the life cycle. One

might expect that the cost estimation challenges specific to the post-implementation stages have been a subject of study in the area of IS research. However, we found that one of the very few concepts being investigated in IS research is the total cost of ownership [29]. To the best of our knowledge we could not find any empirical research supporting its full successful application to ES. We found hardly any research targeted the development of either algorithmic models or analogy-based models for estimating costs incurred after the system is implemented and in use, thus the post-implementation period. This gives the hint that it might be a very difficult, if not impossible task. However, it would be interesting and useful to be able to do such post-implementation estimations to arrive at more realistic overall cost estimation, which includes the costs to realize benefits ensuring that the system is actually used in its desired way. Several questions result from this discussion: Which characteristics of the post-implementation context in a value web can be considered candidates for inclusion as cost drivers in a post-implementation cost estimation approach? Because we consider it useful to make a link between costs and benefits, we think it makes good sense to look at those configurations' of an IS implementation which would result in specific kinds of benefits. We deem this one of the many possible ways in which we can treat both ES benefits and costs from an integrated perspective.

Last but not least we plan to analyze how benefits can be quantified and to further determine the cost of realizing benefits.

**State of the art.** Before presenting our first ideas on solutions to the addressed research challenges we present below existing cost estimation approaches from the SE and IS field, and show why they do not work for the problem of estimating cost for networked ES implementations.

A broad body of research [30, 31] identified single (lines of code, function points) and multiple size measures (provided by Accenture's Global SAP Service and SAP Information Systems [28, 32]) as well as cost drivers in software cost estimation in general [32-34]. Those will be used as a basis for our research. However, in order to size cross-organizational ES projects within a TCO approach, we will need to complement the one-dimensional definition of size (e.g. function points) with dimensions which also account for those definitions of size applicable at the post-implementation stage.

Further, there are not many studies on cost drivers for ES implementations yet. The manufacturing paradigm (main cost driver = product size) is probably not the most adequate metaphor for portraying modern, especially cross-organizational ES solutions [35]. Thus, which factors are good estimates for ES implementations is a question for an empirical analysis.

In order to find out which cost models are suitable for ES and get closest to a cross-organizational network setting we need to compare existing effort estimation models. One way to do this is to look at the techniques used in software project estimation. Possible techniques to consider are non-algorithmic models such as expert-based estimation techniques and those algorithmic techniques which can be integrated with techniques for handling qualitative data and highly volatile values of project context

characteristics [36]. The latter are based on probability theory or fuzzy logic. Examples of approaches which include the joint use of parametric models, e.g. COCOMO [30, 37] and SLIM, uncertainty handling techniques, e.g. Monte Carlo simulation and portfolio management models are provided in [38]. However, we must note that approaches such as the COCOMO family of models [30, 31], are not directly suitable for cross-organizational projects. This is because any cross-organizational ES project is always part of a business transformation initiative, which implies that the project not only delivers business functionality, but also brings with it changes in organizational structures, data, and business processes. Therefore, effort, productivity, and cost modeling have to be multidimensional, just like the project outputs [26].

**Solution direction.** In this PhD project we plan to address the problems and research challenges discussed above starting from a total cost of ownership (TCO) perspective. TCO is a measure often used to assess the effectiveness of an organization [39]. Our goal is to extend traditional cost estimation methods (those from SE, and the early versions of TCO) to a) fit cross-organizational ES estimation and to b) include post-implementation costs and to c) find a way to quantify benefits.

As defined by the Gartner Group, TCO is “a holistic view of cost related to IT acquisition and usage at an enterprise level” [40]. It includes the direct capital investment in hardware and software and the indirect costs of installation, training, repairs, downtime, technical support, and upgrading. However, it considers only financial investments and does not include cost-benefit analysis. Many of the costs incurred in during the life cycle of a system are intangible, however little research is done on accurately accounting for them. In practice industry averages are often used to account for intangible costs in TCO calculations. Literature shows that, in order to benefit from TCO, a company should not just calculate TCO but actively manage it [41]. Further, the real value in TCO is in tying such costs analyses to business benefits [42]. However, this is only recognized in few new TCO models as traditional TCO estimates often fail to account for factors such as business benefits [43]. We therefore need to extend the traditional TCO to include benefits, a list of relevant cost factors (including non-financial and intangible costs) and to be connectable to cost-benefit analysis. We made the decision to use the TCO model because:

- It covers the whole life cycle, including acquisition, operation and replacement of ES in an organization;
- It is inclusive in the sense that TCO co-exists with any other effort estimation model for the implementation phase of ES;
- There is a wide set of published work from academia and practitioners on this topic, starting from accounting and reaching to example of CRM.
- The TCO theory itself has been 15 years in existence and good data by market research companies are already collected, allowing for meaningful conclusions;
- Last but not least, its level of abstraction allows a match to our benefits framework which we developed in earlier work. This match would allow accounting for costs of benefits and helping us to quantify the benefits.

### 3.4 Value distribution in Business Networks

As stated earlier, we define a business network as a value web of profit- and loss responsible units which cooperate for some purpose. Businesses in the network typically cooperate to satisfy a consumer need, and they cooperate by means of commercial value (goods, services or money) exchanges. If the network is to be economically sustainable for all partners, these exchanges should take place according to a revenue sharing model, which the partners in a value web should negotiate and agree upon prior to designing their coordination processes and building their coordination support systems. It is economically rational to make the revenue sharing model as early as possible in the cooperation; and for the network to continue to be sustainable it should be periodically updates. However, this is currently not happening in practice. We will address this issue and develop guidelines that help businesses to improve their practice. Such a revenue sharing model can be specified by means of the e3value method. Existing VITAL research [44] and literature on e3value [15] emphasize the importance of value models. However, it gives very little indication on how partners select, negotiate, and ultimately agree on the design elements of their value models. This will be the focus of my research.

We will include literature from logistics and supply chain management on collaboration modes to get a more elaborate picture on the different forms of collaboration within a business network. In order to answer RQ1.4 we will further study literature on business models, which describe the methods and form how revenue will be shared in a network.

## 4 Research Design

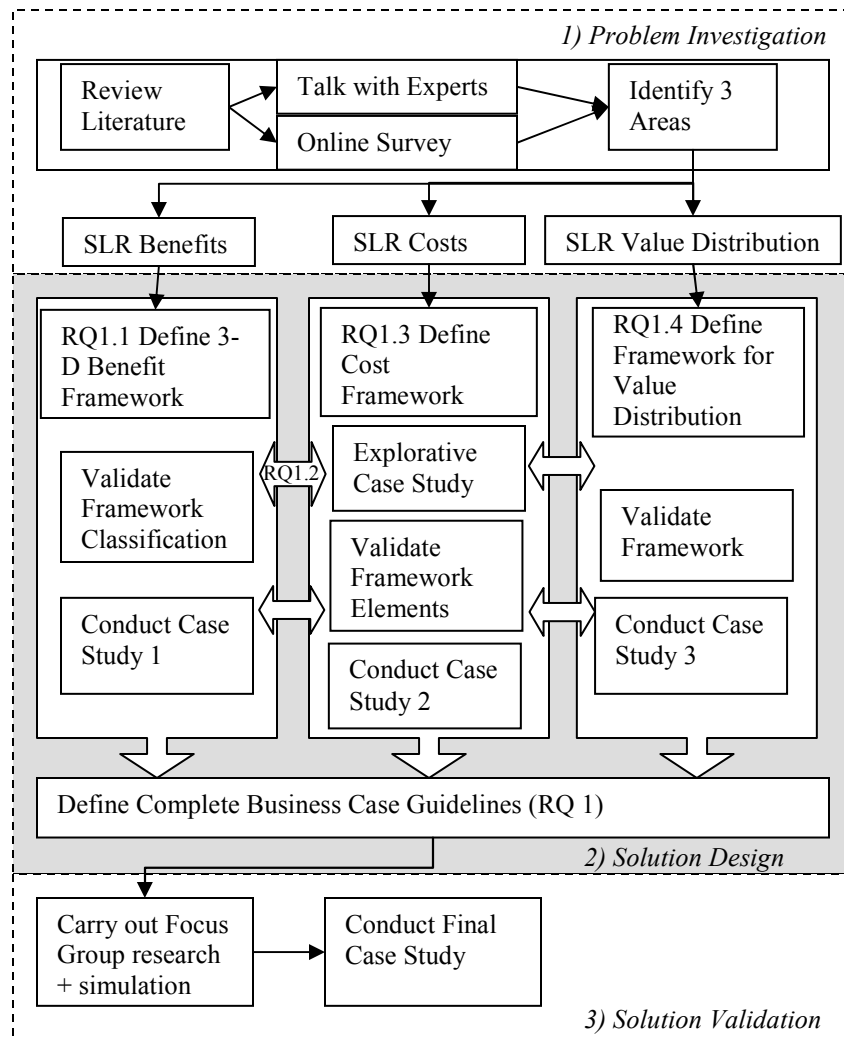
This PhD research can be defined as interdisciplinary and it includes elements from both conceptual [45] as well as empirical research. According to Mora et al. [45] each of these directions can be classified into behavioral and design science [46]. Classifying our main research activities in the problem investigation and solution design according to these 2 dimensions leading to the following 2 x 2 research classification matrix:

|                                  | <b>Behavioral research</b>  | <b>Design research</b>   |
|----------------------------------|---|--|
| <b>Conceptual domain</b>         | I) Problem investigation incl. SLR in all three areas                                     | II) Generate new frameworks based on theoretical elaboration         |
| <b>Empirical/ Reality domain</b> | III) Justification/ validation of the three frameworks based on empirical data collection | IV) Generation of a new artifact in a real situation → BC guidelines |

Research in the first three quadrants can be supported by the following philosophies: positivist, interpretative, critical and critical realism. This allows us to use multiple research methods such as literature review, case studies, action research, and survey research. Research in the last quadrant is supported by positivist and critical realism [45].

Our research is of interdisciplinary nature, as we use ideas and concepts from several disciplines to compose a solution to our main problem statement. These disciplines are: information systems, requirements & software engineering, organizational behavior, SCM and CRM. Each of these disciplines provides input for one of the three – costs,

benefits, value distribution – areas in the final complete set of BC guidelines. Figure 1 gives an overview of our planned research methodology for the PhD project. The research process can be defined into three phases: problem investigation, solution design and solution validation. However, not all research activities in each phase are decided upon yet and the research steps within the methodology might still change during the next years. As one can see in Figure 1 research in the second phase does not follow a single path but includes multiple parallel streams each of them related to on of the three topics. We also mapped our research questions to the different steps in the research process.



**Figure 1: Research Methodology**

The three phases can be described as follows:

1) Problem investigation

In order to gain general understanding of the problem domain, a first literature review was conducted. Further, interviews with IT-consultants and a survey was conducted, showing that a) the research problem is relevant and b) that research to arrive at complete IS business case guidelines needs to focus on at least three areas: the costs and the

benefits of an IS Implementation and post-implementation and the way value is distributed in a network. This general problem investigation provided input for the next parallel steps, namely a structured literature review (SLR) and concept mapping [47, 48] on all three topics. As there are several SLR done on cost estimation till 2007 [49], we will use those as a basis to complement them with sources published after 2007. Our SLR will end with a list of issues that need to be addressed in each of the three areas. Some of these are presented earlier in this paper. As benefit where the focus of this research in the first year of my PhD a SLR on benefits can be found in [50].

## 2) Solution design

Research will focus on designing solutions for the three components first independently (RQ1.1,1.3,1.4) and then see how they are related to each other (RQ1.2), which then can be used as input for designing the overall solution: guidelines for BC development and use throughout the ES life cycle (RQ1).

Based on the input from phase one, we are currently conceptually designing [45] the first benefit framework [51]. The next steps will be to define a cost framework to analyze those combinations of cost estimation techniques possibly fitting a cross-organizational ES setting. Further, we plan to analyze if those models can be used in the different ES life cycle stages. With respect to value distribution we plan to develop a framework that gives guidance on those conditions under which value constellation would work best. Afterwards, all three frameworks need to be validated and refined. This will be done using case studies [52-54]. We further plan to validate our benefit categorization in the framework using e.g. card sorting [55, 56]. However, the step-by-step validation process is not decided yet. All our case studies will focus on cross-organizational settings.

## 3) Solution validation

In the last phase we will validate our final set of BC guidelines, which is based on the three discussed aspects, using expert opinions. After possible refinements we plan to conduct a final case study validating the whole set of BC guidelines. This might be a longitudinal study showing how the guidelines can be used *before, during and after* the implementation.

# 5 Conclusion

The problem, of developing and using business cases during complex IS implementations in cross-organizational settings successfully, is challenging and under-researched. In this paper we discussed this challenge and provided first ideas for a solution. Among others we identified three important aspects that each BC should address. These are the costs, the benefits and the value distribution of an IS implementation. The cost and the financial benefit side is traditionally addressed in most BCs, however, application to ES cases is still lacking. However, non-financial benefits and value distribution are hardly addressed in practice or in academic literature. Thus, understanding and assessing the benefits of cross-organizational ES is still an under-researched topic and only few benefit measurement tools have so far been proposed. This paper also presents our research design for this interdisciplinary PhD project.

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