

Research Project Proposal for the Marianne and Marcus Wallenberg Foundation

# Improving effectiveness and efficiency in large Swedish firms through AIS

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An experimental research approach using design science methodology

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## 1 Research rationale and objective

Despite Sweden's long tradition of enhancing business through information technology (IT), Swedish firms are not realizing the expected benefits from using advanced IT (Dutta and Mia, 2012). Research shows that Enterprise-wide Information Systems such as Accounting Information Systems (AIS) are not sufficiently supporting the strive for more effective and efficient business (Berry et al, 2009; Granlund, 2011; Sutton, 2010), and an increased level of knowledge is needed (Grabski et al, 2011).

**The objective of this proposed research project is to provide an increased understanding of how AIS further can enhance the effectiveness and efficiency in large Swedish firms.** This will be operationalized through a design science methodology (Peppers et al, 2007) where AIS artifacts are created to meet factual business problems in a selection of case firms. These artifacts will then be evaluated using field- and laboratory experiments (Dilla, Janvrin and Raschke, 2010; Sprinkle, 2003).

The research project seeks to extend the current understanding of AIS as a technology (Kallinikos, 2011), but also to provide useful knowledge to Swedish managers in their efforts to manage organizations effectively and efficiently. In terms of quantifiable goals, the research project aims to establish both clear proof of improved efficiency and effectiveness in the selected case firms, as well as the internal and external transfer of knowledge. As for the internal transfer of knowledge, this will be achieved through increased knowledge among the participating practitioners. As for the external transfer of knowledge, this will be achieved through a series of strong academic publications in leading international journals.

## 2 Background

Enterprise-wide Information Systems solutions are the backbone of organizational value creation processes (Gupta, 1991; Brynjolfsson and McAfee, 2008) and a critical element of organizational life. Packaged software, such as Enterprise Resource Planning Systems (ERPS), is adopted by a vast majority of Swedish organizations (78% of larger firms with 250+ employees) (SCB, 2010). These packages are based on the idea and promises that business process efficiency and organizational effectiveness can be supported and enhanced by Information Technology (IT). It is recognized that ERPS have strengths in supporting the operational tasks and handling transactions. However, the promises were not fulfilled and the packages turned out to be systems for efficiency, not effectiveness (Davenport, 1998).

To address the broken promises, the supply side actors (Ax and Bjørnenak, 2007), like SAP, Oracle and Microsoft, has moved away from the view that ERPS packages encompass all necessary functions to support an organization (Rom & Rhode, 2007) and calls are made for adoption Accounting Information Systems (AIS) (see for example Steinbart, 2009, for a definition) packages<sup>1</sup>. AIS include integrated

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<sup>1</sup> AIS packages as used here refers to a sub-group of packaged software, primarily sold under the headings of Business Intelligence, Strategic Enterprise Management, Enterprise Performance Management and Business Performance Management (Granlund, 2011).

capabilities for decision making, management control and performance management (Baars & Kemper, 2008). Focus is on how this will improve company performance and, especially, how firms will improve their effectiveness and “make strategy everyone’s job” (Kaplan & Norton, 2008). Strong rhetoric is common in the diffusion of management innovations (e.g. Ask, Ax & Jönsson, 1996, Bjørnenak, 1997, Nørreklit, 2000 and Nørreklit 2003). So, delivering promises by promissory organizations (Pollock and Williams, 2010) backed up with strong rhetoric is the “state of the art” in the marketing of AIS packages that are claimed to improve business effectiveness and management efficiency.

Sweden has a long and rich tradition of using information technology (IT) to make work more efficient (Dutta and Mia, 2012) and Swedish organizations spend €15 Billion annually on IT (Radar Group, 2011). Also, the market for AIS packages is large and according to the major analyst firms, e.g., Gartner Group, Aberdeen Group and IDC, the world market spending on AIS is around USD 10 billion, with a growth rate of 10% in 2011. There is no sign that the recent financial crisis has diminished the importance. Evelson (2010) writes that the overall software market decreased by 8% in 2009, while the AIS market growth was 15%. The large interest from practice is evident in the Gartner annual survey of approximately 1 600 CIOs worldwide that for the fifth year in a row indicates that CIOs rank AIS packages as a top priority (Bitterer, 2010).

Alarming reports on global practices show that as much as 80% of IT implementation projects fail (Ganly, 2008) and that organizations only use around 10-30% of the available functionality (Aberdeen, 2006). Also, huge ERPS failures with severe consequences have been reported from governmental agencies in Sweden (Riksrevisionsverket, 2011) and we have anecdotal evidence of several major failures in the implementation and use of ERPS in large Swedish organizations (e.g. Ericsson, Swedish Armed Forces, The Swedish Police). Also Swedish organizations are using AIS to a large extent (Ask, forthcoming) and it is safe to conclude that the issues raised above are relevant for Sweden.

The rise of AIS packages has spurred numerous calls for research (e.g. Berry et al, 2009, Brignall and Ballantine, 2004, Chenhall, 2005, Grabski, Leech and Smith, 2011, Gaspar Alves, 2010, Granlund, 2011, Granlund and Malmi, 2002 and Rom and Rohde, 2007). One of the central tenets of these calls has been the aspired necessity of management accounting researchers to move closer towards technology, without losing sight of the practice of management control (e.g. Granlund, 2011). From the research calls we conclude that we now are in a situation where we don’t have scientific knowledge reporting the real effects of AIS packages on effectiveness and efficiency. All we have are claims that AIS packages will improve the execution of strategy, give improved information leading to a more efficient creation of value in the business and that it possibly leads to changes in the management role. From a business and practice perspective, where the global application market (license fees and maintenance) now exceeds \$13 billion per year (Sommer & Chandler, 2007) and against the alarming information on major failures in the implementation and use of IT, we believe it is vital to provide research based insight into how to design and use AIS solutions more efficiently. By studying (and reporting) the collective experience from pioneering firms that have adopted management accounting innovations we can create learning at a large scale (Bjørnenak, 1997).

Gothenburg has a long tradition of cross-departmental collaboration in education program and courses, research programs and infrastructural initiatives in the areas of Business Administration and Accounting. In 2005, the Centre for Business Solutions was formed as one of the strategic initiatives at the School of Business, Economics and Law. This involves an increased focus on Accounting Information Systems (AIS) related issues, and the creation of an inter-university platform for teaching and research within the area of AIS. In order to become an accepted part of the international community of AIS research and to establish University of Gothenburg as a center of excellence within the area the research project seeks to extend the current understanding of AIS, but also to provide useful knowledge to managers in their efforts to manage organizations effectively and efficiently

### 3 Previous research

We have identified several knowledge gaps that give rationales for the study of AIS as in this project proposal.

*The first rationale* relates to the changing business environment, the increased use of AIS, as a response to the shortcomings of ERPS, and advances in IT. In the beginning of the 21st century, to further enhance integrated accounting information systems infrastructure (Baars & Kemper, 2008), the large AIS vendors and Gartner Group introduced several new technology concepts for integrated AIS solutions. To address increasing business complexity, networks, globalization, shortening product life cycles and the need for cross-functional organizing firms started to use integrated (and sophisticated) AIS technology. The independent organization Technology Evaluation (2011) comment on this as: "*In the last four or five years, economic factors as well as the exponential growth of data volumes generated by organizations have forced the development of very sophisticated BI applications, and also expanded the kind of tools a classical BI system normally uses. The BI space is still growing and maturing, and large corporations are still demanding new solutions for new enterprise needs.*" (ibid, p. 6).

In this vein, Granlund (2011, p.17) states that "... researchers should increasingly follow the speedy development of IT and investigate the potential and realized changes it may cause for accounting and control practice...". These technologies were among the fastest-growing areas in the entire software industry (Chandler, 2010) and become the focus for many research calls on how technology creates new possibilities for management control and how they impact the role of the accounting and controlling function (e.g. Berry et al, 2009, Granlund and Malmi, 2002, Brignall & Ballantine, 2004 and Chenhall, 2005). Specific calls were made for understanding the effects of the most up-to-date technologies and on accounting (Gaspar Alves, 2010). But, Granlund (2011) also claims that the academic community has a limited understanding of these developments and calls for studies of the technology itself as it will change. The change in technology will, for example, change the vocabulary, meaning, and mediating effects.

Based on perspectives from socio-materiality (Orlikowski and Scott, 2008; Kallinikos, 2011), we regard AIS technology as inseparable from the social (most commonly manifested in organization and work). In this perspective, both technology *ex situ* and *in situ* matters. Understanding design and usage of AIS packages (technologies), based on socio-materiality, and their effects on effectiveness and efficiency must be based on rich real life case studies.

*A second rationale* start from the situation today, where promises of improved business effectiveness and management efficiency are delivered by promissory organizations (Pollock and Williams, 2010). Dehning and Richardson (2002, p. 27) write that IT play a very important role in firms, but that the *"overall impact of IT on performance remains largely an unexplained puzzle"*. Also, we lack knowledge on how AIS affects effectiveness and efficiency. Elbashir, Collier and Davern, (2008) conclude the total absence of a method to measure the realized business value of IT-intensive systems. Grabski et al (2011) conclude in their "future agenda for accounting information systems" that one of the primary unanswered research questions center on determining how an ERP system's strategic and control benefits can be achieved to realize firm efficiencies and support firm strategy. Further Grabski et al (ibid) claim that to achieve the full benefits of the use of integrated systems, ERPs are often augmented with BI and other analytics applications, i.e. AIS packages.

Previous research into the impacts and returns of ERP related investments have had a bias towards financial measures for firm performance (for major reviews, see Dehning and Richardson; 2002, Grabski et al, 2011; Poston & Grabski, 2001; Hunton et al, 2003; Matolcsy et al, 2005). The reason for this singular focus has been access-related restrictions for the researchers, where they to a large extent have been limited to aggregate data that is publically available, i.e. the annual reports. A second limitation accentuated by Wieder et al (2006), is the use of the time of ERP adoption as the dependent variable.

This project addresses the shortcomings of measurement by using inspiration from the models of Elbashir et al (2008), who developed a new measure based on an understanding of the characteristics of BI systems in a process-oriented framework, and Dehning and Richardson (2002) who developed a general framework for the benefits of IT investments. The latter framework was tested and further improved by Rom and Rohde (2007). This project aims at examining effectiveness and efficiency in both real life organizations as well as in a laboratory setting, from both a subjective and objective perspective.

*A third rationale* follows the call from Dilla, Janvrin and Raschke (2010), who made a review of literature related to information visualization in IS, AIS, and Accounting. *"Interactive visualization of accounting data is becoming more common, both in external disclosure and internal data analysis contexts. It is a potentially powerful tool for organizing and making sense of the volumes of data flowing between and within organizations. Therefore, it is important to understand when and how interactive data visualization can result in more effective and efficient decision making"* (ibid, p. 31). They found that there is a need of empirical research in the management accounting area around how advanced and interactive visualization technology can improve decision processes and judgments in accounting. They propose studies using cognitive fit theory to understand efficient information acquisition and accurate decision maker performance. It suggests that the effectiveness of a given information visualization technique depends not only on task and decision maker characteristics, but also on the decision maker's insight into which representation is best for a given task (ibid, p.31).

## **4 Project description**

In order to address the research question, we will apply a case based approach (e.g. Ryan, Scapens and Theobald, 2002) using a design science methodology (Peffer,

Tuunanen, Rothenberger and Chatterjee, 2007; Hevner et al, 2004) employing both field- and laboratory experiments (Dilla, Janvrin and Raschke, 2010, Sprinkle, 2003) for the evaluation phases (Peffer et al, 2007). This implies that we will identify the relevant problems through case studies, create AIS artifacts, and, evaluate these through experiments.

The research project is divided into three phases, covering the period Year 1 through Year 4. For an overview of the research project, see Figure 2 below.

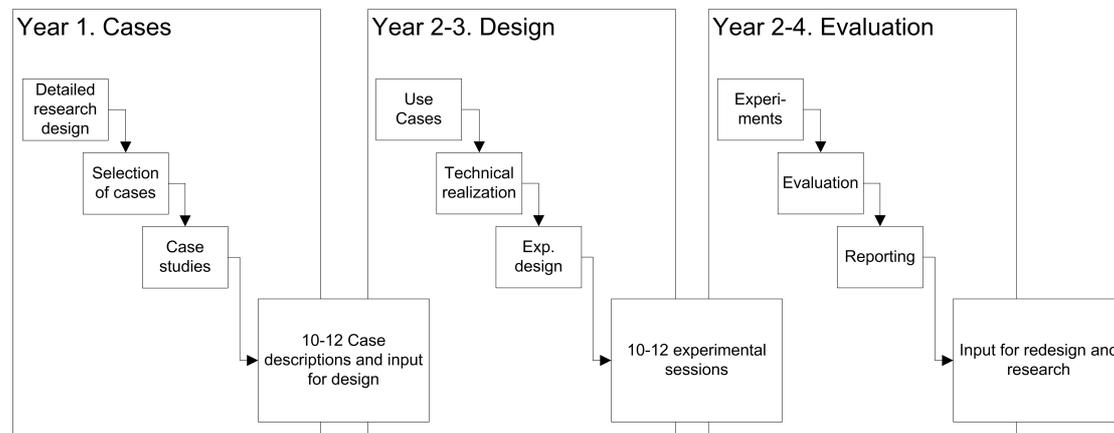


Figure 2. Overview of the research process

**Year 1: Case studies of large, Swedish firms.** The research will be targeted at large firms, based on the assumption that they are most likely to have the resources and competence needed to pursue a full scale AIS project. Based on the classification issued by the European Commission, large firms are defined as having more than 250 employees and €50 million in annual revenue. In the first step of the research process, we aim at researching 10-12 firms that recently have implemented an AIS package. In addition to this, we will further select instances of problems in each firm that are deemed to have a direct impact on efficiency and effectiveness.

With the case based approach influenced by design science, the aim is to provide a rich and detailed picture of the design and use of AIS artifacts. A qualitative approach will contribute to the triangulation (Modell, 2005), facilitation, and, complementary effects put forward by Hammersley (1996). The use of mixed methodological approaches (Orlowski 1993; Mingers, 2001; Brignall and Ballantine, 2004) have been noted to harbor great potential for uncovering and explaining different aspects of the effect that AIS has on effectiveness and efficiency. This requires full access to key personnel in real organizations and that the researchers understand their actions and intentions in real-life situations (Kasurinen, 2002). To achieve this we need to build trust with the actors, which, in this case, mean that the researcher will be involved in many daily activities of the organizations over a longer period in time. This kind of research has a flavor of action research and can be classified as interventionist research (Jönsson and Lukka, 2006). Busco, Riccaboni and Scapens (2000) used a similar approach in which they combine “the figure of the ‘researcher’ with the role of ‘helper-consultant’”. The “helper consultant” role included active involvement in internal activities, seminars, workshops, case analyses, and such. Busco et al (ibid) address this as a process of *holistic* interpretation, which they mean benefited from a “combination of the observations of outsiders, but with extensive knowledge about the organizational context, together with the critical analysis and contributions of a group of insiders” (ibid, p. 7). The choice of an interventionist research approach

gives opportunities in terms of meaningful representation of empirical, situation-specific viewpoints (Jönsson and Lukka, 2006).

The case studies will be based on the proposed contingencies of Dilla et al (2010) (see figure 1 below), focusing on task characteristics, decision maker characteristic as well as interactive data visualization characteristics from leading AIS artifacts.

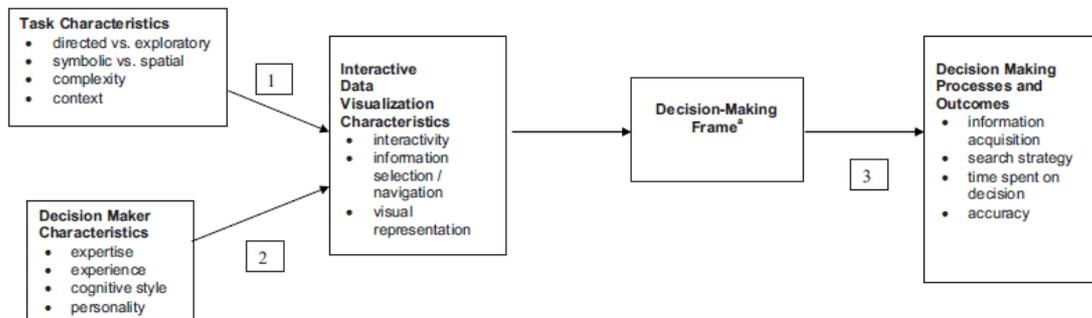


Figure 1. Framework for interactive visualization research (Dilla, et al, 2011, p. 6)

**Year 2-3: Design.** The second phase of the research project is aimed at delivering the artifacts and specifications for the forthcoming evaluation. This will involve creating Use Cases from the existing cases, and realizing these as design artifacts in conjunction with the existing technical architecture of the case firms. The research group, supported by a selection of practitioners with strong competence in relation to the various technical environments that are deemed relevant, will conduct this work. In parallel with this, the design of the experiments will involve establishing both criteria related to the evaluation per se (e.g. impacts on efficiency and effectiveness), as well as the criteria for contextual variables such as those proposed by Dilla et al (2010).

**Year 2-4: Evaluation.** The third phase of the research project is aimed at conducting the field- and laboratory experiments that constitute the evaluation. This will involve isolating the participants in environments than offer the possibility of control, conducting the experiments and gathering information that make an evaluation of the design artifacts possible. As previously noted, there will be two environments, field- and laboratory. In the field experiments, installations of the design artifacts will be done on site at the respective case firm. In the laboratory experiments, these will be hosted at the School of Business, Economics and Law in facilities specifically designed for this purpose. The laboratory experiments will also be reproduced with students taking on roles of practitioners, in order to further isolate the potentially influencing factors related to age and experience.

Table 1 summarizes the three phases of the research project, along with deliverables of the respective phases.

Phase	Description	Deliverables
Y1:Cases	Conducting of case studies	10-12 case descriptions of large Swedish firms 1 Academic journal article 2 Academic conference articles
Y2-3: Design	Conducting of design (artifact and experiment)	10+ Use Cases and experimental design 2 Academic journal articles

		2 Academic conference articles
Y2-4: Evaluation	Conducting of evaluation (artifact and experiment)	10+ Experiments (field and laboratory) 3 Academic journal articles 2 Academic conference articles 2 Popular science articles Final report

Table 1. Phases and deliverables

## 5 Relevance of the research project

The research project's relevance is two-fold.

First, the industry relevance of the research project is related to the previously mentioned current lack of impact and effectiveness of AIS related investments. Swedish firms are in a pole position when it comes to IT proficiency, yet the impacts on effectiveness and efficiency have not been realized. Through increasing the level of knowledge related to AIS, the research project will decrease the level of failures for AIS projects, and enhance the design and use of AIS solutions, thereby improving the competitive advantage of Swedish industry.

Second, the academic relevance of the research project is related to AIS in many aspects being uncharted territory in terms of research. The methodological approach and easy access through firm participation will result in internationally groundbreaking work being conducted and published by Swedish researchers. This will improve the competitive advantage of Swedish universities.

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