Conducting Research in an SME Company: A Discussion of Success Factors and Risks

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Abstract. SME companies in the ERP domain are facing several challenges such as the functional growth of systems. Solving these problems is sometimes difficult as no off-the-shelf solutions exist. This also means that selected problems provide an excellent opportunity for applied research. In this paper, we describe the S³C research project which was conducted by an SME company in the ERP domain. We present the objectives and the outcomes of the project but also focus on a discussion on how the project was conducted. Particularly, the contribution of this paper is a discussion of lessons learned from conducting research in SME companies. We highlight success factors and risks which provide a guideline for SME companies in conducting research.

Keywords: Research Funding, Project Success Factors and Risks, ERP Systems

1 Introduction

ERP systems were initially introduced in material management [1]. Nowadays these software systems are comprehensive business management solutions. Typically, a software distribution is shared between a software manufacturer (e.g. Microsoft) and partner companies. The software manufacturer maintains the standard ERP product and provides new releases. Partner companies then sell an ERP system to customers. However, the partners provide an essential service – they customize the standard software system to the individual customers' needs [2]. The software manufacturer supports his partners with training materials, he arranges events and provides methodological support [3, 4, 5].

Although the given support provides guidance for SME companies, these are facing several issues. In the following we discuss key challenges which were raised by partner companies for Microsoft Dynamics AX, an ERP solution for medium and large companies provided by Microsoft:

Complexity: Microsoft Dynamics AX 2009 is a large system. It contains more than 2500 forms, 2700 tables and 6700 classes in 19 business modules. The large number of features within this system makes it hard to map requirements to system parts.

Functional growth: Microsoft covers more and more business areas with every release. Each new release contains additional features. Furthermore, existing features

are enhanced and legal updates are released as required. This makes it hard for consultants to keep the overview.

Tight release cycles: Microsoft releases new versions of the ERP software system in a three year interval [6]. Partner companies have to update their technical and functional knowledge with each release. As a result employees at partner companies are specialized on only a small part of the product.

Legacy systems: ERP implementation projects are time consuming and expensive [7]. While software manufacturers like Microsoft frequently release new versions, customers tend to keep an ERP system for about 10 years [8]. Therefore, partner companies have to maintain old versions for existing customers and provide solutions based on the current release to new customers.

While analyzing these problems, the authors came to the conclusion that some challenges are related to one significant change – the introduction of software services in the ERP domain. The service-oriented paradigm has changed the nature of ERP systems. They are no longer stand-alone products with minor interfaces for data exchange but integrated in cross-organizational business processes. As a consequence consultants need to be aware of all software services in a particular domain.

In 2009 we started the Semantic Service Search & Composition (S^3C) project to overcome some of the issues raised by the introduction of software services in the ERP domain. In this paper we give an overview of the project, but focus on the elaboration of challenges and risks SMEs are facing when conducting research. In Section 2 we give an overview on the S^3C project. We describe how the project was started and discuss how the research was conducted. Section 3 discusses issues we had to face when conducting the research. In Section 4 we present lessons learned in the form of success factors and risks. Section 5 concludes the paper.

2 The S^3C Project

The idea to start the Semantic Service Search & Composition (S^3C) project was raised by employees of Standard IT Services, a Microsoft Dynamics AX partner company. Initially, the employees at Standard IT Services started a task force to address their everyday problems in customizing Microsoft Dynamics AX. As a first step the employees developed a list of problems they were facing in their daily work. This list highlighted that the introduction of software services caused several problems they had to face in their daily work (see Section 1). The task force decided to overcome these issues and to identify adequate solutions. The management at Standard IT Services agreed the plan. However, they made clear that financial support would be limited. In a first step the task force members decided to review existing processes at Standard IT Services and to identify optimization capabilities. Furthermore, they contacted Microsoft and asked if any solution was available which would support partners in managing the growing number of services in ERP systems. Talking to other companies they figured out that neither Microsoft nor any third party provider could provide a solution to their problem. Performing these tasks the problem became clearer and the task force members agreed that as a first step to overcome their prob-

lems they would need a mechanism which allows them to (semi-) automatically map customer requirements to ERP system features.

As no state-of-the-art solutions could be identified, the task force members had the idea to start a research project. However, due to limited experience in conducting research they considered to contact local research organizations and researchers they have met before. This is where the first author of this paper also contacted the second author who was worked at the Centre for HCI Design[1] at City University London. The Centre for HCI Design was a partner in the EU-funded SeCSE Integrated Project, where City was exploring the problem of matching requirements and services [9]. The members of the task force at Standard IT Services were analyzing this work in more detail and figured out that the described research could be used to address the identified problems. A first meeting at the Centre for HCI Design was arranged and the different parties agreed on their joint interest to start such a project. Then the partners started to write a proposal and search for funding. The Austrian Research Promotion Agency (FFG)[2] is a public organization which provides funding for research and innovation projects. A particular program called "Basisprogramme" supports SME companies in conducting research. If an application is successful the FFG provides financial support covering the companies spending on research activities for up to three years. However, after each year a consecutive application for support is required. The program intends to enable SME companies to start research and to bridge the time until research results have turned into profitable solutions.

In our case the project was intended to last for two years. Both authors agreed that the project's scope should be exploring the issues raised by introducing services in the ERP domain. Furthermore, the goal was to align the company's internal processes with the Microsoft Dynamics Sure Step methodology.

After the proposal was submitted to the FFG, Standard IT Services had to wait for a couple of month to get feedback. However, based on the high relevance of this topic it was decided to start the project. The Open Unified Process (OpenUP) [10] was used to structure the research project. Although OpenUP was introduced for software development projects we have chosen to follow this process and to adapt it for our research projects. We added three additional disciplines: Management, Research and Funding to the process guide (see Figure 1). The Management discipline contains management and communication activities between research partners and company management. Activities in research complement OpenUP software engineering activities. Funding contains activities to gain and secure financial support during the project. The next sections briefly describe the purpose of each phase and highlight activities in these three disciplines.

2.1 Inception

The project actually started before we got feedback from the FFG on public funding. As the industry partner was conducting most of the tasks in this early phase, the decision to start without feedback from the FFG was risky for the industrial partner. In our

[1] http://www-hcid.soi.city.ac.uk/

[2] www.ffg.at

case this “Inception phase” took about two months. At this time we knew that if positive feedback is given we have to set up two contracts – one between the industry and the scientific partner and one between the industry partner and the research promotion agency. We also knew that in the worst case the project is canceled and the startup budget is lost. Figure 1 shows the activity flow in the Inception phase.

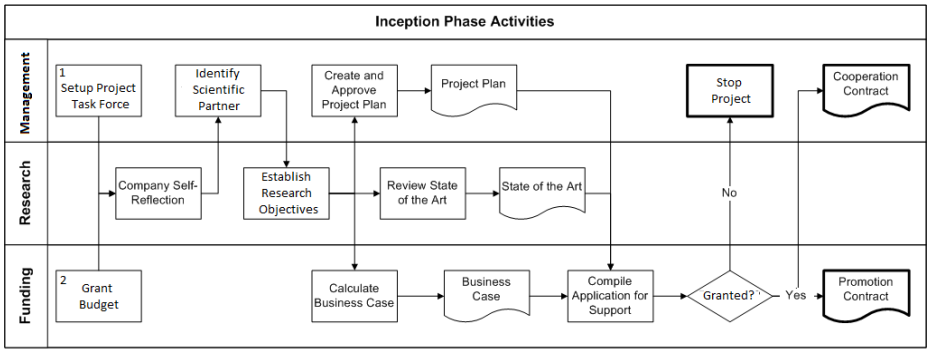

Fig. 1. Inception Phase Activity Flow

In early discussions employees at Standard IT Services mentioned several issues which would need improvement. To make these ideas more explicit we developed a questionnaire. This questionnaire, which we considered to be a “Self-Reflection Document”, contained a list of typical activities in an ERP project. Employees at Standard IT Services rated these activities using a scale from 1 (needs improvement) to 5 (no need for improvement). In total 10 employees participated in the survey, which highlighted that ”business process analysis and requirements elicitation” was rated to be the activity for improvement. These results and further discussion with our research partner led to the following research objectives:

(I) Identify the needs of consultants regarding requirements elicitation in ERP projects based on Sure Step.
(II) Adapt and extend relevant service discovery approaches to support ERP projects based on Sure Step.
(III) Evaluate the benefits and limitations of the developed tool-supported approach.

As we now had a detailed goal we started to develop a business case. Apart from applying the planned research results within Standard IT Services we assumed that the developed solution would also be relevant for other Microsoft Dynamics AX partner companies. Selling our solution to other partner and providing support to establish the novel process in a company was seen as a second source of income.

2.2 Elaboration

After two month of uncertainty, the FFG decided to support our project and to provide public funding. Based on this decision the company management agreed to start with the next phase. In the Elaboration phase we applied action research [11] to conduct the project based on the defined research objectives. Results from the Inception phase

indicated that the problems can be addressed based on the research results from the SeCSE FP6 Project. However, now our task was to identify and provide a possible solution. The Elaboration phase lasted about 5 months. We conducted two iterations and built prototype solutions.

In a first step we investigated if the combination of use cases and requirements (as done in SeCSE) would allow us to identify relevant ERP software services. Furthermore, we established a service repository prototype for ERP services and integrated the repository and the service discovery engine. These tasks were already based on input from Open Source tools developed within the SeCSE[3] project. In our project 50% of the budget was spent at the end of the first iteration. So we had to create an interim report for the FFG, which included an updated project plan.

2.3 Construction

The construction phase was conducted as described in the OpenUP and lasted about 2 months. Developers at Standard IT Services realized a solution based on the findings and prototypes from the Elaboration phase. The Construction phase took part at the time were marketing events were held. So we had the chance to present our findings and prototypes to Standard IT Service customers. Presenting the research results to customers supported strengthening the reputation as innovate company.

In the construction phase we developed adequate tool support. The S^{3}C tool environment consists of a variety of applications, services, prototypes and databases. The main technical contribution are the novel S^{3}C tools which were built on top of selected SeCSE components, developed at City University and now available as open source. The S³C Proxy Layer encapsulates calls to the SeCSE components. The S³C Solution Explorer supports analysts in requirements elicitation. It combines the use case and requirements descriptions with service discovery features. Furthermore, it links selected services to use cases and requirements for later discussion. The S³C Management Studio is an administrative tool designed for IT department members to manage the service registry and update service providers and service descriptions.

2.4 Transition

Transition was the last of four phases, we used it for project finalization. In the context of our research project we validated the results against the research objectives. We conducted a workshop where we invited Standard IT Services employees to present them our solution. In a second step we invited the employees to use the developed tools to identify candidate services for a particular use case. Afterwards we asked for feedback with the help of a questionnaire. Employees' response convinced us that we met their requirements although the usability of the tools needed improvement. Based on these results Standard IT Services decided to consecutively apply for a second year of support.

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[3] http://www.secse-project.eu/

3 A Successful Project!?

In 2009 the described project was awarded 3rd place in Gartner's Innovation Competition. However, in fall 2009 Standard IT Services was sold to Terna[4], another ERP company. Initially it was not clear if and how the project would be continued. In the very first weeks we talked to the new owners. With the business case at hand and the already implemented solution we convinced them to continue the project for another two years. For quite a long time Terna did not support our work on a consecutive application for the FFG. Due to the changes in management, a considerable number of employees left the company and in spring 2010 and it was decided to stop the project. Shortly after this decision the first author left Terna.

In summer 2010 InsideAx[5] was founded as a new Microsoft Dynamics AX partner, also hiring former Standard IT Services employees. Remembering the successful cooperation the two authors considered applying for funding again. In the meantime the second author has changed his affiliation as well. As a first step towards a new cooperation we conducted an evaluation of our findings from Standard IT Services in the new environment. Because the solution was built on Open Source tools and published as Open Source we were able to rebuild a test environment. Based on the former research and the new evaluation results we submitted a paper to CAiSE 2011. Furthermore, the positive evaluation results enabled us to convince the management at InsideAx of the value of research and we started to write a new proposal. The CAiSE paper was accepted and in March 2011 the promotion was granted.

4 Success Factors and Risks

In the following we present success factors and risks related to our project. We discuss these results from the viewpoint of an SME company:

Identify a relevant topic: In preparation for a research project an SME has to narrow down the research area. Due to limited resources for a research project, the company has to pick the topic with the most significant impact on the company's success. Furthermore the SME has to ensure that there is no existing (commercial) solution available addressing this topic.

Create a sound business case: A business case is essential for conducting research in an SME. It is one of the main arguments to ensure management support. Furthermore, it is essential for a proposal and for public funding. In addition it provides a good basis for validation.

Ensure management support: We consider management support to be a key issue for research in an SME. When our project started we had full support from the company management. The company's owner encouraged us to start a research project. He even provided a startup budget to bridge the time until the research promotion agency decided to support the project. When the company was sold the new owners questioned the project. We spent a lot of time and effort to convince the new owners

[4] www.terna.at
[5] www.insideax.at

to continue the project. However, employees leaving the company changed the situation.

Identify relevant research partners: An important issue is to identify a research partner who has expertise in the problem domain. Particularly, at the beginning of the project qualified input is required to write a competitive proposal. Later in the research project it is the scientific partner's duty to support the SME in identifying related research, creating a conceptual solution, and defining an evaluation and dissemination strategy.

Get your own funding: Research projects are a burden for SME companies. Most of them cannot afford long-term research without support. Fortunately research promotions agencies support SMEs in funding research projects. This external funding helps an SME to create a stable environment for the research project.

Communicate information you are not allowed to know: Promotion agencies often ask for information the employee submitting the proposal is not allowed to know (e.g. salaries). However, the company's management considers this task to be low priority and may not respond accurately. We strongly advice to approach the management as soon as possible regarding this task to make sure that all the requested information can be delivered on time. Missing a deadline can delay the promotion for months.

Identify relevant work: Although challenges in SME companies can be quite specific a research partner might be aware of more generic and relevant research. These research results can be important for the company to develop a conceptual solution which has the potential to overcome the initial problem.

Consider research outputs to be prototypes: Existing research results can help to guide an SME, but it might be risky to expect high quality software output from another research project. In our case the results from SeCSE supported us in developing an idea for a solution. Although the software developed within SeCSE was available as Open Source, it took us about two months to get things up and running.

Stick to your original research objectives: Conducting research is an eye opener. Although it is alluring to address other interesting topics too, it is important for a researcher in an SME to keep the original project scope in mind. Resources for the project are limited and the promotion agency as well as the company management expects a result which covers the originally stated issues.

Promote your research project: We advise researchers in an SME to actively promote their research project. Continuously highlighting the relevance of the research project for the SME ensures management support. Furthermore, communicate the expected benefits for future projects to colleagues and customers. Knowing that the research project is addressing their needs makes your work valuable to them.

Make the promotion agency your customer: A research project in an SME always competes with other projects. Whenever a customer requests urgent support the researcher is in danger too loose resources. To avoid this situation the research project has to have the same status as other projects in the company. This can be achieved by positioning the promotion agency as your customer.

5 Conclusion

Conducting research in an SME raises several challenges. The nature of these projects is different to research projects conducted at a university or research organization. We also see a lot of benefits as research results can be applied immediately. In our project we had the chance to conduct research on top of the results of an EU FP6 Project. Tools and mechanisms for service discovery developed in SeCSE served as a basis for a tailored and extended solution which could fulfill the needs of an SME. We found that conducting research in such an environment could be satisfying for the industrial and the scientific partners. While the industrial partner benefited from the actual results and gained a competitive advantage, the scientific partner had the chance to better understand a particular problem domain and real-life problems.

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References

1. Daneva, M., Wieringa, R.: Requirements Engineering for Cross-organizational ERP Implementation: Undocumented Assumptions and Potential Mismatches, 13th IEEE International Conference on Requirements Engineering, 2005
2. Finding a Microsoft Dynamics ERP partner, http://www.microsoft.com/en-us/dynamics/find-partner.aspx, Online 3.4.2011
3. Microsoft Dynamics Sure Step, http://www.microsoft.com/dynamics/support/implementation/success.aspx, Online 3.4.2011
4. Shankar C., Bellefroid V.: Microsoft Dynamics Sure Step, The smart guide to successful delivery of Microsoft Dynamics Business Solutions, Packt Publishing 2011
5. Microsoft Corporation: 80199, Project Managing Microsoft Dynamics AX, GP and NAV Implementations with Microsoft Dynamics Sure Step 2010, Microsoft 2010
6. Microsoft Corporation: Microsoft Dynamics AX, Statement of Direction, November 2009
7. West, R., Daigle, S.: Total Cost of Ownership: A Strategic Tool for ERP Planning and Implementation (2004), http://net.educause.edu/ir/library/pdf/ERB0401.pdf, Online 3.4.2011
8. Becker, M., Ortman J.: ERP Study, Hannover Messe 2010, April 2010, http://www. mondula.com/downloads/ERP-Studie.pdf, Online 3.4.2011
9. Zachos, K., Maiden N., Zhu X., Jones S.: Discovering web services to specify more complete system requirements, in CAiSE'07 Proceedings of the 19th international conference on Advanced information systems engineering
10. Open Unified Process, http://epf.eclipse.org/wikis/openup/, Online 3.4.2011
11. Davison, R. M., Martinsons, M. G., Kock, N.: Principles of canonical action research. Information Systems Journal. 2004
12. Nöbauer, M., Seyff, N., Maiden, N., Zachos, K.: S³C: Using Service Discovery to Support Requirements Elicitation in the ERP Domain, to be published in CAiSE'11 Proceedings of the 23rd international conference on Advanced information systems engineering