Modelling and Optimisation of Warehousing Processes during an ERP System Migration

Diplomarbeit

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1. Introduction

Information technology, especially Enterprise Resource Planning (ERP) systems are far from being innovative. On the contrary, Carr argues in his widely cited article "IT Doesn't Matter" that IT has long reached the peak of its strategic potential and has now become a matter of risk management instead of generating strategic advantage in competitive markets[1].

Although his argumentation is deemed to be conclusive as well as convincing, the authors Smith and Fingar disagree with his position. In their book "IT Doesn't Matter – Business Process Do" they explain that strategic advantage is created through efficient customer oriented processes[2]. Thus, end-to-end processes, which can indeed be streamlined by integrated systems, become the major focus of strategic management. Unless a certain market standard is met, it is not IT that defines whether companies succeed or vanish. But it is the ability to make use of IT as a commodity good in such a ways that the process excellence is achieved.

1.1. Motivation and Research Problem

Process changes caused by implementation or migration projects need to be planned and managed efficiently in order to result in process improvements. However, it is a thin line between adaption of reference processes and process optimisation. In the course of ERP implementation or migration, both approaches need to be merged in order to achieve process improvement by making use of best practices inherent to ERP systems. The ultimate objective is to select relevant business processes offered by the ERP system and adapt them to the individual needs of the company[3].

Due to the complexity of this task, IT projects are costly and have a high risk of failure. On average about one third of investment costs for an ERP systems in 2008/2009 were created in implementation and customisation[4]. These costs have increased by 8 percent compared to the previous year and rank highest compared to costs created by hardware and middleware acquisition, software licensing and staff training expenditures. The reasons for the miscalculated costs are underestimation of time requirements, deviations from standard system functionalities and miscommunication between functional units and IT departments. When considering preliminary cost estimation, more than a third of responding companies declare that they have

[1] see Carr (2004), p. 48
[2] see Smith, Fingar (2003)
[3] see Davis, Brabaender (2007), p.10
[4] see Konradin (2009), p. 104

exceeded their planned budget[5]. Implementation and customisation seem to be the least predictable of all categories.

Nevertheless, ERP system implementation or migration projects are undertaken by most companies in order to improve business processes. Most managers consider standard software to be the best solution to adapt best practice and boost process performance (see Fig. 1). Only few believe that processes can be optimised without their automation.

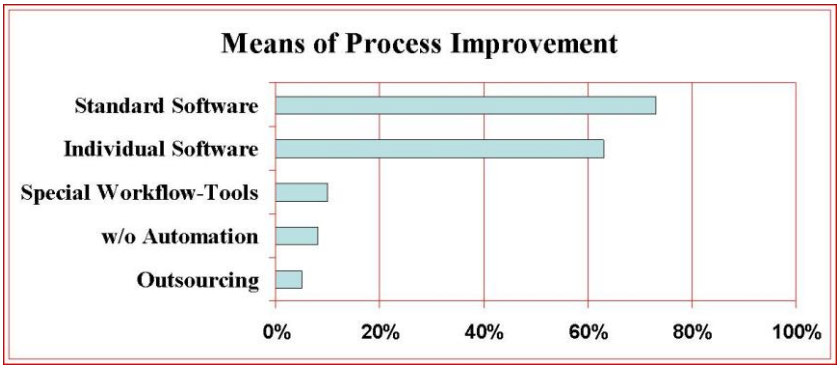

Fig. 1 Means of Process Improvement in European Companies (own illustration; adapted from Fritsch (2008))

A project and process management tool considered to be able to reduce the risk of failure is business process modelling. In practice, however, only very few companies use modelling tools. The vast majority settles for good old paper and pencil or in the best case simple drawing tools (see Fig. 2).

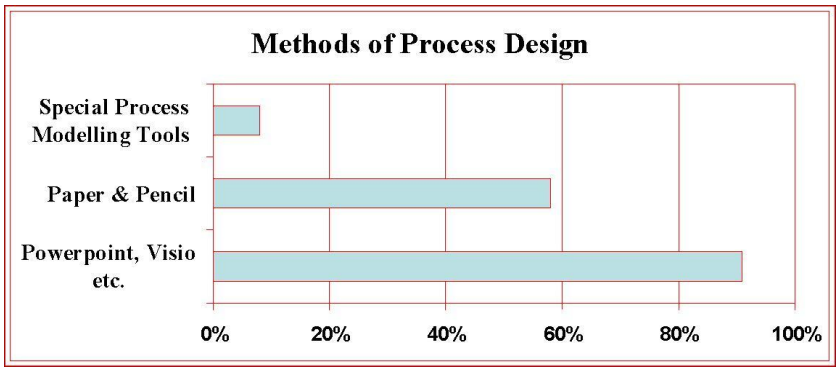

Fig. 2 Application of Process Modelling Tools in European Companies (own illustration; adapted from Fritsch (2008))

There is therefore an interest to conduct a practical business process modelling project during an ERP system migration, in order to examine how modelling can support ERP system cus-

[5] see Konradin (2009), p. 106

tomisation in form of functional requirements definition as well as process optimisation and redesign.

1.2. Research Methodology and Limitations

The main focus of this thesis is the practical modelling and analysis of the warehousing processes of the involved organisation. As this task is embedded in an organisational ERP migration project with system deployment scheduled for beginning of 2010, the primary interest of the organisation is to achieve conclusive reporting on the execution of warehousing processes in the new ERP software based on Oracle technology. Furthermore, modelling should provide for a comprehensive and formal documentation of expected bottlenecks which may result from poorly anticipated process flows and missing data integration. Through the timely examination of detailed aspects of the warehousing processes, these possible malfunctions of the system can be addressed already before productive operations are transferred from the legacy system into the new ERP package.

Additionally, process models should be used to analyse legacy processes and identify potential for process optimisation within the framework of the reference processes of the new ERP system. Alternatively, a redesign of current processes in conjunction with requirements of the new system has to take place as changes to the standard ERP system have been declared as a last resort by project management. Being integrated into the context of the migration project which, at this point, is still to some extent in the requirements definition phase, modelling activities of future processes are subject to various limitations. As project organisation involves external consultancy services, availability of information on Oracle reference processes is limited and no reference model has been presented to the organisation at this point in time. The current status of the project, especially the lack of a reliable test environment makes it difficult to verify standard system functionalities in practice. Also, the specialisation on warehousing processes which is necessary to meet the official time constraint creates a narrow picture of functional requirements. Where possible, however, aspects from related functional disciplines, such as accounting have been considered.

In order to reflect the greater context of this specific occupation with process modelling and optimisation the second chapter deals with IT project management theory. The relevant aspects of project management will be highlighted with respect to ERP system fundamentals. In particular, the Oracle ERP system is introduced and the critical process of ERP customisation is addressed.

In the third chapter, business process modelling is introduced as a method of business process optimisation which in turn is classified as a sub-discipline of business process management. This broad approach aims at providing a deeper understanding of the benefits process modelling, particularly modelling with the help of a business process modelling tools, offers in ERP migration projects.

The practical approach to process modelling as an IT project management tools is presented in the fourth chapter. The as-is and to-be warehousing processes are modelled in ARIS Business Architect, a tool widely accepted among business process managers. In conjunction with the modelling of to-be processes standard Oracle processes and terminology are explained and embedded within the context of hands-on process optimisation.

The static process model presented in the previous chapter is verified in form of a dynamic simulation in the fifth chapter. ARIS Simulator, a module of the ARIS product family group is used to identify bottlenecks which need to be addressed before process planning can be finalised. Moreover, the use of ARIS Business Architect and ARIS Simulator will be appraised and recommendation for an efficient implementation will be given.

In conclusion, findings from the process and project analysis are summarised and a brief outlook presents issues which require further investigation as well as the possibility to implement a BPM tool.

Fig. 3 visualises the aforementioned scope and structure of this thesis:

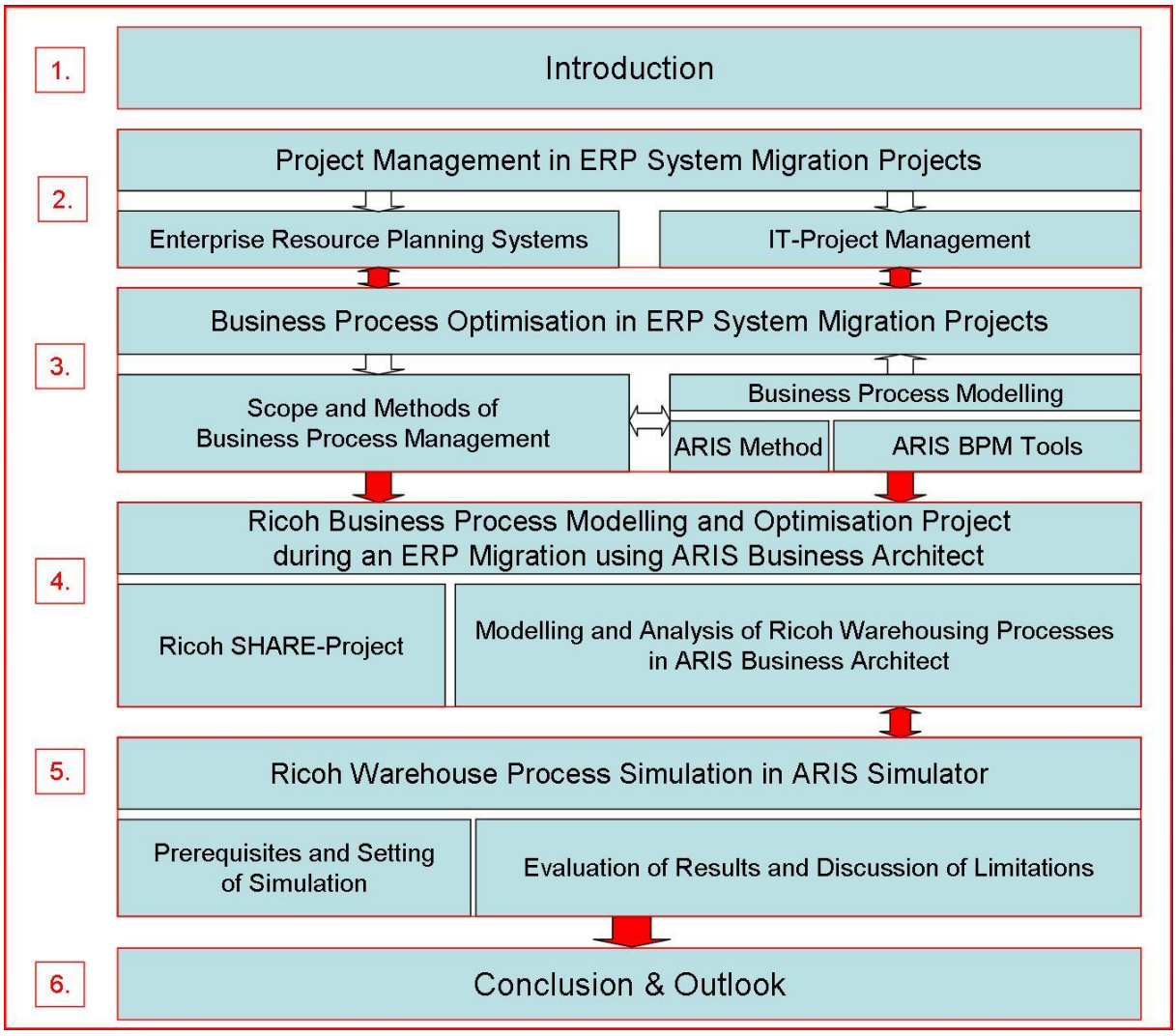

Fig. 3 Scope and Structure of Thesis

1.3. Definitions of fundamental terms and concepts

In the course of this thesis fundamental terms and concepts will be used as a basis of research methodology. Their precise definition and explanation will be deducted from relevant academic literature in the following introductory section.

1.3.1. The Terms Process and Business Process

A process "is an integrated set of activities that uses resources to transform inputs into outputs"[6]. Processes can run in sequences, parallel, alternative or repetitive[7] and can be described

[6] Praxiom (2008)
[7] see Steinbuch (1997), p. 29, Aichele (1997), p. 16

using attributes such as lead-time, costs and frequency of handling. Attributes are measurable qualities of a process for which as-is and to-be values can be defined[8].

On an abstract level business processes are complete, chronologic and factually logical sequences of functions which are necessary for the processing of business objects[9]. Functions are tasks that create or alter business objects and can be organised into a hierarchy to the point of non-decomposability[10]. Business objects are commonly defined as information carriers which possess attributes and can be modified in predetermined ways[11].

In a nutshell, Staud defines business processes as follows:

> *"A business process is an interrelated sequence of functions which are necessary for the realisation of the business task. These functions are performed by operators which belong to organisational units and use production factors for the fulfilment of the functions. Business processes are supported by Information and Communication Technology implemented within the organisation."*[12]

However, from a more integrated perspective business processes incorporate customer orientation and are defined as "a collection of activities that takes one or more kinds of inputs and creates an output that is of a value to the customer"[13]. Beck and Mathera point out that a business process possesses interfaces to upstream and downstream supply chain partners, suppliers and customers[14]. This interpretation is based upon the understanding of end-to-end processes which include every activity regardless of functional or organisational borders from the very process initiation to its ultimate completion. End-to-end processes incorporate strategic process goals which are derived from strategic business goals[15] .

In academic research and practical process management business processes are subdivided into three categories according to their value for customers and business performance. The standard categories are management processes, core processes and support processes[16].

[8] see Gernert, Koeppen (2006), p. 198
[9] see Becker et al. (2005), p. 6 and Wyssusek (2001), p. 210
[10] see Becker (2001a), p. 207; Gernert, Koeppen (2006), p. 197
[11] see Staud (2006), p. 6
[12] Staud (2006), p. 9 (own translation)
[13] Hammer, Champy (2005), p. 38
[14] see Beck (2008), p. 7; Mathera (2006), p. 172; also Boehn et al. (2006), p. 12; Schmelzer, Sesselmann (2008), p. 65
[15] Schmelzer, Sesselmann (2008), p. 64
[16] Liappas (2006), p. 46f ;Staud (2006), p. 11; Becker, Kahn (2005), p. 7; Gernert, Koeppen (2006), p. 197; Snabe et al. (2009), p. 115

- *Management processes*: All management disciplines including strategic planning and control as well as communication processes of an organisation. These processes create input for core and support processes
- *Core Processes:* Processes which directly participate in the creation of value for the customer from identification of customer requirements to their fulfilment. This category incorporates supply and innovation processes.
- *Support Processes:* Internal processes which do not directly participate in value added and support the organisations infrastructural activities. Typically these processes are related to human resource or accounting and finance and are linked to core processes via Service Level Agreements (SLA).

Processes can be viewed on multiple organisational levels from top-management's visionary goals which are translated into high-level business processes to operational goals which provide business drivers on the operational level. For this purpose business processes can be divided into sub-processes[17] for which subordinate process goals can be defined.

1.3.2. The Term Workflow

A workflow is "the automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules"[18].

Workflows represent detailed activities which can be manual or automated in the system logic of the underlying application. In terms of modelling, workflows can be categorized into general, case-related and ad-hoc workflows (see Tab. 1).

[17] Steinbuch (1997), p. 30; Mathera (2006), p. 173
[18] WfMC (1999), p.

Tab. 1: Classification of Workflow (own illustration; adapted from Gadatsch (2008), p. 44)

Workflow Category	Level of			Modelling possible
	Structurability	**Repetition**	**Variance of Processing**	
General Workflow	high	high	low	+
Case-related	middle	low	middle	+
Ad-hoc	low	very low	high	–

1.3.3. Customer and Process Orientation

Market requirements have always been the driver for product and service design as well as innovation processes. During the times of supply shortages and scarcity of choice, demand structures ranged at the bottom of management's priority scale.

With the high degree of saturation of markets, excellence in functional performance is an insufficient measure for business outcomes[19]. Since the 1980ies the concept of customer orientation prevails in research and practice. Customer requirements and their fulfilment rank highest in the definition of performance indicators and operative goals.

Customer-oriented business processes usually span across functional divisions thus integrating activities from various departments towards a successful process outcome. In order to support the new customer orientation in terms of customer satisfaction, product or service quality, lead-time levels and costs[20] the concept of process orientation emerged. Process orientation is primary concerned with "the alignment of [the company's] structures and management with their business processes"[21] and represents the general perception of the business reality as a collection of interlinked business processes[22]. Since process orientation found its way into practice, business processes became the focus of management activities on all levels. The actual driver of customer value is seen in process structures and performance and not, as originally thought, in functional productivity. The natural flow of business processes across the supply chain and within the organisation required horizontal integration in terms of organ-

[19] see Gaitanides (1994), p. 13
[20] see ibid., p. 14
[21] Walter (2008), p. 3
[22] see Staud (2006), p. 20

isational structure, processes, functions and data[23]. This integration is supported by interfaced information technology (IT) applications[24]. The role of process orientation in integrated systems will be discussed in paragraph 2.2.4.

1.3.4. The Terms Project and Program Management

Patzak and Rattay define a project as a nonrecurring, innovative, goal-oriented, usually complex and cross-functional business plan[25]. Projects have precise descriptions of initiation background and target results. However, project organisation, schedule, methods and tools yet have to be predefined. This attributes are also the main distinctions of projects from processes which are well defined and repetitive sequences. In the course of this thesis, project management is used in term of IT project management.

In contrast to project management, program management is defined as strategic management of multiple projects[26]. Program management deals with effective coordination of all simultaneous projects undertaken by an organisation.

[23] see Staud (2006), p. 20
[24] see Mertens (2005), p. 7
[25] see Patzak, Rattay (2004), pp. 18-19
[26] see PM (2009) and Patzak, Rattay (2004), p. 404

7. Final Conclusion and Outlook

"In the long run you can only be successful, if you know the origin of your success"[263]

Business processes are the key to a company's success. Their design, measurement and controlling as well as continuous optimisation are prerequisites of process excellence, customer satisfaction and growth. However, business process management requires consistent strategic alignment of processes, IT and the company's overall process orientation.

A well customised ERP system gives the opportunity to improve business processes by adapting the "good practice" within the reference processes of the system but only in so far as individual business process and the origin of their success or failure is understood thoroughly. Integration and automation of inefficient processes can never generate the desired results.

In the present thesis, the role of process management and in particular process modelling has been explored within the practical project environment of an ERP system migration. On the one hand, the topic was motivated by the need to manage warehousing process redesign and on the other hand, it is desirable to show how business processes can be optimised based on a system migration and beyond.

The participation in the migration project revealed not only the difficulties associated with the customisation of standard ERP software but also the challenges IT projects pose in regards to restrictions in time, scope and costs. The requirement to preserve reference processes of Oracle EBS to the largest extent possible and the need for harmonisation between processes of all European operating companies restrict process optimisation activities while at the same time offering a high potential for process redesign. The geographical separation of the core process team and the central project management caused communication inefficiencies due to lack of commonly agreed timelines. Furthermore, project management was not supported by project management tools which made it difficult to keep track of solved problems and open issues. In the course of requirements definition and solution design process models have only been used for initial process capturing and for high-level end-to-end process design. Modelling has not been conducted with an integrated modelling tool.

The objective of this work was modelling and comparison of as-is and to-be warehousing processes in ARIS Business Architect and at the same time identification of process im-

[263] own translation according to a citation by Rupert Lay

provement potential generated through restructuring and adjustment of legacy processes to the reference processes of Oracle EBS. Furthermore, benefits of the use of an integrated BPM tool, such as ARIS, should be highlighted. The theoretical background presented in the chapter 2 and 3 was able to show in which way project management and business process management fit together. While process modelling can be seen as a project management tool addressing all CSF of IT project management, it is also a BPM discipline that can help fostering a culture of process orientation long after the successful completion of a migration project. Especially the use of an integrated BPM tool, such as ARIS Business Architect, can facilitate end-to-end process optimisation through a holistic view of business processes across functional boundaries. In practice, however, the use and benefit realisation of ARIS reached its limits where the constricted scope of warehousing processes and lack of process documentation hindered a more holistic perspective. Most functionalities of the system can be utilised when all integrated processes, IT systems and data models are deposited in ARIS. Only when consistently implemented as an organisational standard ARIS business architect and other tools of the product family can unfold their positive influence on BPM.

Nevertheless, project accompanying modelling of processes has helped to identify improvement potential and address the issues for customisation planning. Although the state of the project did not allow conclusive modelling of to-be processes, it was still possible to draft preliminary models that incorporate process improvement suggestions. With the help of the modelling activity understanding of the logic of reference processes could be furthered. In an exemplary simulation of the goods reception process in ARIS Simulator the positive impact of the changes suggested for the processes could be validated. Moreover, the necessity for more detailed and reliable process data became apparent. The new ERP system and the data warehouse will certainly be able to deliver more accurate data for process modelling and simulation. Though it will not replace the creation and maintenance of a separate integrated process database, if process performance is to be measured, controlled and continuously optimised.

Resulting from that findings and the experience of the benefits of a BPM tool, and the limitations encountered during the work with ARIS, an implementation roadmap has been suggested in 6.2. Based on a BPMM self-assessment the implementation of the ARIS platform can be a beneficial initiative to maximise positive outcomes of the current ERP migration project and to go about the remaining gaps. In spite the efforts associated with the establishment of a company-wide process database, the introduction of ARIS could facilitate and en-

hance change management which will be necessary in the Run & Maintain phase of the project and for continuous process improvement. Furthermore, a BPM tool in use will have a positive effect on any future project related to reorganisation of the IT landscape, process redesign, optimisation or integration.

Further research supporting the practical use and implementation of ARIS platform needs to establish a department-wide process database in order to be able to present benefits resulting from tool-supported process controlling and bridge gaps between logistics processes before addressing the company as a whole. Through its supporting role the logistics department is in the core of the process landscape with many correlations to internal departments and supply chain partners. It is for that reason that a successful introduction of a BPM tool in logistics first could swap over to the rest of the organisation. However, due to the interrelations, logistics processes are more complex and networked which makes process database creation a decisive task.

The running migration project is a prerequisite for a successful introduction of integrated BPM through the updated IT applications, the data warehouse and freshly documented processes. At the same time, pursuing both projects together holds, despite the synergy effects, the risk of failure. It is therefore advisable to start with accurate process documentation as explained in chapter 6 and address the BPM project subsequently.