

# Synchronizing Enterprise Resource Planning Systems and Business Processes: A Case of a New ERP Development Approach

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**Abstract** – A major question in organizations is how to synchronize business processes with ICT in order to get the support they need from the adopted technology. Adoption of standardized software packages such as enterprise resource planning (ERP) systems aims at being the solution, demanding that either the system is adjusted to existing business processes or that the business processes are adjusted to the system's inherited processes. However, this is problematic, since organization's business processes as well as the technology used are continuously evolving, demanding synchronization. The question is then how synchronization could be achieved and if a development method building on a role based/persona approach could result in an ERP that supports synchronization. The paper presents an investigation and analysis of such approach from the enterprise architecture (EA) perspective. The main conclusion is that the role based approach definitely could be a way of developing ERPs that support synchronization between ERP systems and business processes, but also that EA could add some new thoughts to the ERP development approach.

**Keywords** – Business processes, Business synchronization, Enterprise architecture, Enterprise resource planning systems.

## I. INTRODUCTION

Organizations face the challenge of quickly responding to changes in market conditions, and therefore need to have high agility when it comes to their business processes, but also to the information and communication technologies (ICTs) they use. In addition, they also face a demand for high interoperability between internally used ICT and the ICT their partners, suppliers, and customers are using. One way suggested to meet these demands is by deployment of enterprise resource planning (ERP) systems. However, deployment of ERPs is a complex and costly endeavor which could result in lack of alignment between recommendations suggested by the software on how a specific business process should be done and the way the organization actually carries out its business processes. Great attention both in practice as well as in the academic field has been focused on how to solve this misalignment problem [e.g. 1, 2]. Implementing ERPs could result in a static alignment between business processes and a lock-in situation, where neither business processes nor systems can be changed once the system is implemented [3], resulting in a shift from misalignment at the time of implementation, to misalignment over time. But, creating total alignment may be impossible and even not desirable, since market conditions and technology are continuously evolving. Instead of alignment, synchronization is suggested as a better term denoting the desirable relationship between organization

and the supporting technology. As its basis, synchronization means that the organization's business processes and the supporting technology evolve in tandem so that when either of these parts changes the other part adjusts to the change. The questions are then if this is possible and if so how can ERP development be done so that the final ERP system increases organization-technology synchronization.

In a collaborative research project, a study of Microsoft's ERP system NAV 2009 and Microsoft's role based development approach took place. The approach was then evaluated from the perspective of enterprise architecture (EA) that seems to have the potential to address organization-technology synchronization. EA attracts high interest both among practitioners as well as among academics and it is often described as the universal solution to many problems. It is shown by, for instance, statements such as "EA is important because organizations need to adapt increasingly fast to changing customer requirements and business goals" (CFP for the TEAR 2007 second workshop) and "to make business processes visible and avoid sub-optimizing EA seems to stand out as a good tool" (CIO Sweden Enterprise architecture 2009-01-13) as well as "Enterprise Architecture has become a common practice for large IT organizations. For the first time there is a methodology to encompass all of the various IT aspects and processes into a single practice" [4]. The basic purpose of the research has been formulated as to increase the understanding of how to develop ERPs to synchronize or at least increase synchronization between the adopted ERP and business processes in organizations.

There are several contributions. First, a structured overview of ERPs and EA definitions that clarifies how these terms are used is provided which should help researchers to build cumulative knowledge on the matter. Second, a presentation of how one of the leading ERP system developers that sets the technological base line of a significant number of organizations is working, when it develops future ERPs. Third, new insights on the potential of how to improve organization-technology synchronization are presented.

The rest of the paper is structured as follows: the next section discusses and defines ERPs and EA as well as describes problems with misalignment between an organization and supporting ERP systems and suggests synchronization as a "better" concept for the desired relationship between ERPs and business processes. The section thereafter presents Microsoft's persona/role based approach and discusses how it is used in ERP development

aiming at organization-technology synchronization in adopting organizations. The penultimate section then provides an analysis of the development approach in relation to EA and business synchronization. The final section presents some conclusions and makes some suggestions for future research.

## II. ERPs, ENTERPRISE ARCHITECTURE, ALIGNMENT AND SYNCHRONIZATION

Enterprise Resource Planning systems (ERPs) are major investments for organizations that according to Morabito et al., [5] receive much attention both in practice, academic environment, and media, and they state that research around ERPs primarily focuses on two aspects: 1) organizational and economic impact of ERP implementation, and 2) how to best manage the implementation. There are a number of key characteristics that more or less all ERP systems include making them a unique subtype of the information system. Firstly, ERP is defined as a standardized packaged software [6] designed with the aim of integrating an entire organization [7-9] and its business processes and ICT into a synchronized suite of procedures, applications and metrics which transcend organizational boundaries [10] that can be bought (or rented) from an external provider and adapted to specific requirements of an organization.

The fact that ERPs are assumed to integrate the organization (both inter-organizationally as well as intra-organizationally) and its business process into one package, feeds the complexity of ERPs when it comes to development and implementation as well as usage [11]. Millman [12] posits that ERPs are the most expensive but least-value-derived implementation of information and communication technology (ICT) support. The reason for this, according to Millman, is that a lot of ERPs functionality is either not used or is implemented in the wrong way. The fact that it is wrongly implemented results from ERPs being customized to fit the business processes, instead of changing the process so that it fits the ERP [12], described by Hammer and Champy [13] as “paving the cow path”.

Several studies on inspiring success [14], but also failures [15, 16], associated with implementation and utilization of ERPs [17] exist. Benefits are only related in part to the technology, and most come from organizational changes such as new business processes, organizational structure, work procedures, integration of administrative and operative activities, and global standardization of work practices leading to organizational improvements, supported by the technology [18]. It can definitely be said that implementation of ERP systems is a difficult and costly organizational “experiment” [17], and implementation of ERP systems can be described [19] as “perhaps the world’s largest experiment in business change” and for most organizations “the largest change project in cost and time that they have undertaken in their history”. The implementation is a necessary but insufficient prerequisite for benefits and value, at least for having competitive parity [20].

Despite the fact that ERP systems are considered as a necessity for organizations to implement, there is a great

interest among ERP vendors/resellers in how to improve alignment and thereby increase diffusion of their specific products. This interest could be explained by the fact that each vendor/reseller wants to increase their share of the market. It can also be said that each vendor/reseller wants the specific ERP to be successfully implemented in the organization. ERP developers have therefore started to adopt methods, such as personas and roles, in the development work aiming at both understanding for whom they develop and what potential users want, but also to better describe for potential customer what they could expect from the ERP system. The research presented below deals with the question of the use of personas in the development of ERPs and how that can be related to EA and synchronization between ERPs and business processes. The next section will define EA and the reason for doing so is to be able to analyze the development approach from the perspective of EA.

## III. DEFINING ENTERPRISE ARCHITECTURE (EA)

Enterprise architecture (EA) is a concept that addresses the issue of alignment between overall structure of an organization and supporting ICT. It can be stated that EA offers solutions to many problems involving the relationship between business and ICT in general and especially the integration between the two. Shah and El Kourdi [21] describe EA as a widely adopted approach for coping with the ever-increasing complexity and ensuring that technical resources are used in an optimal way in organizations. This is clearly shown in the description of the maturity level regarding EA described by Ross and Weill [22].

Many EA definitions take a starting point in the Zachman framework [23], which describes architectural principles for creating an information system (IS) architecture, stating “it is necessary to use some logical constructs for defining and controlling the interfaces and the integration of all of the components of the system”. Bucher et al., [24] describe EA as consisting of five architectural layers: business, process, integration, software, and technology or infrastructure. EA could be said to integrate these layers by formulating different operating models [25]: diversification, unification, coordination, and replication. Ross [25] claims that these operating models could be related to EA, since they all are related to different ways of alignment between ICT and business strategy.

EA is also described as the organizing logic for business processes and IT infrastructure that are reflected in integration and standardization of requirements into organization’s operating model [26]. This describes EA as a way for organizations to go from an as-is situation to a to-be situation, and Ross [27] states that EA is something that organizations could use as recognition of the need for change. The description Ross [26] gives can be interpreted as that EA is either a process or a result. Seeing EA as a result that is gained from a process is supported by the description of EA from a maturity perspective. Ross [27] states that organizations can be at four different maturity level regarding EA. The four levels are: 1) Business silos, 2) standardized technology, 3)

optimized core, and 4) business modularity. Ross and Weill [22] describe these different stages of the architecture level in the following way. In business silos EA means that ICT applications serve local business needs. In the standardized technology case EA consists of clearly articulated technical platforms limiting choices and increasing efficiency. The optimized core means that EA consists of standardized data or processes increasing organizational discipline. The last stage, the business modularity case means plug and play business process modules enabling business agility.

Ross et al., [28] give a similar description of EA describing it as the organizing logic for business processes and IT infrastructure. They state that the aim of EA is to provide the organization with a long-term view of processes, systems and technologies so that individual projects can build capabilities avoiding that projects just fulfill immediate needs. It can be argued that this description of EA is to a great extent what organizations want to have when implementing ERPs.

Sessions [29] definition of EA is as follows: “An enterprise architecture is a description of the goals of an organization, how these goals are realized by business processes, and how these business processes can be better served through technology.” He claims that this definition gives a clear description of what the ambition with EA is and how an EA process can be improved. He also states that it is important to understand that there is no such thing as a finished EA, instead he claims that EA should be seen as a living set of documents guiding the use of technology. Sessions [30] concludes that none of the four EA approaches (The Zachman framework, the Open Group Architectural Framework, the Federal Enterprise Architecture, and the Gartner Methodology) are complete and the best advice for an organization is to use a blended approach of these four.

In summary EA has been defined as a) a method [21], b) a collection of architectures [24], c) an organizing logic [26] or strategy [28], d) or a description of the structure of the organization and its related resources [29]. The article does not aim at selecting one of these definitions for further use, but at investigating how Microsoft’s role based approach for development of ERPs when being implemented improves the possibility of synchronizing ERPs and business processes and at analyzing it considering the described EA definitions. The next section will describe Microsoft’s role based approach in developing ERPs.

#### IV. A CASE OF A NEW WAY OF DEVELOPING ERPS

This section shortly describes Microsoft’s approach when developing ERPs that aim at better align implementing


customers’ organizations business processes. The model and the discussion are presented from the perspective of how the approach could increase synchronization between ERPs and business processes. The methodological approach could be described as an interpretive case study [31], and empirical data for analyzing the ERP development approach originate primarily from document studies and workshops with Microsoft employees at the Microsoft Dynamics development centre. Data was collected as an iterative sense-making process with document studies, workshops, and informal discussions rather than formal interviews. Microsoft employees were also involved in the analytical process in which the approach and its potential to increase organization-technology synchronization were addressed. The research presented is part of a larger collaborative research initiative between academia and practice. Microsoft and their role based approach for developing ERP acted as research object, at the same time they were an active partner in shaping and targeting the research initiatives.

#### V. THE ERP DEVELOPMENT APPROACH

The ERP development approach that has been adapted by Microsoft Dynamics for developing what Microsoft describes as the future enterprise resource planning (ERP) system builds to a high extent on personas. Using personas at Microsoft is a significant part of the Engineering Excellence Guide (EEG), which is described as being “best practices” when developing software, and is an important part of the official way to develop software at Microsoft. The basic assumption which made Microsoft start using personas in the development was the idea that personas help to understand for whom they develop the product or functionality.

The persona approach at Microsoft was first described as User Archetypes by Mikkelsen and Lee [32]. Later Grudin and Pruitt [33] described their approach with personas, which is the basis for the “Microsoft persona strategy”. The Microsoft personas are developed from a huge number of interviews and observations of end-users. Table 1 shows an overview of the main information used to describe a specific persona. Another important point that Grudin and Pruitt make is that personas are not the “silver bullet” solving all problems, instead, they claim that they need to be complemented with other usability methods [33, 34]. As the methods of Grudin and Pruitt [33] correspond with what is explained in the EEG, Grudin and Pruitt’s statement seems to be relevant since it reflects attitudes and argumentation for persona usage at Microsoft.

TABLE I  
PERSONA INFORMATION [35]

Information	Comments
Name	• A fictive name of the Persona
“Slogan” or “One-liner”	• Expressing a central view or statement
 Picture of persona	

Information	Comments
Title	• Job title
Department	• The department(s) that the persona works at
Demographics	• Age • Educational background
Market size and influence	• Influence on the decision making process of buying an ERP system • Key viewpoints on the acquisition of an ERP system
Environment	• The Persona's physical working conditions
Goals	• Key goals the Persona is trying to reach during work
Roles	• The various roles the Persona is fulfilling
Cores activities	• Core activities the Personas is carrying out
Communication, Collaboration and Interactions	• Interaction with other Personas or roles outside the organization
Persona variables	• Variations of the Persona depending on the size of the organization or industry
Pain points	• Key issues that prevents the Persona from reaching its goals or complicating its activities
Values, Fears, and Goals	• General or abstract emotions and feelings of the Persona related to work

The general template for personas used at Microsoft Dynamics is shown in Table 1, a specific example of a persona is "Susan". Susan who is a "typical" order processor is described shortly in the following way:

*"Susan - Order Processor - Susan enters orders and performs sales support tasks. She takes orders from sales reps and repeat orders directly from customers. She works closely with the sales reps as she may talk to the customer more often than they do".* [36]

Susan as persona can be said to be an "important" persona in the development of the ERP, and one reason is that she to a high extent performs a work activity that is a major work task which the ERP system should support. Susan as a persona has been developed over several years and there is a lot of background information related to the Susan persona. All this information is stored at the persona website which is available for developer at Microsoft. The idea of this is that developers when getting the work task to develop a specific functionality should directly or indirectly relate what they develop to a specific persona. The idea is also that developers should be inspired from the persona and the information at the persona's website. A specific persona is enhanced all the time and there is one employee for each persona who has the specific ownership over development of that persona.

Personas are presented to developers at Microsoft in several ways. The most comprehensive presentation is the persona website, which also holds the customer model. The customer model is a collection of personas that together form the staff of a model-company that is to be designed at the development center. The number of personas has increased to a high degree during the latest years; at the moment (2009-07-15) there are 67 personas described in the customer model. The customer model also holds a collection of fixed processes that do the tasks performed in the model company. This collection of processes is called the work model. Each persona in the customer model has direct connections to one or more processes in the work model. Two other main persona artifacts are the work model poster and the persona poster. The persona poster has a picture of each of the customer model's personas as well as the personas' names and job titles. Each persona also has a very short description of what that persona does in the model company. The persona poster is seen in corridors, cafés, and offices across Microsoft's development sites.

Furthermore, the posters are distributed during partner and customer conferences and are publicly available through the website [microsoft.com](http://microsoft.com)<sup>1</sup>.

The persona website and the customer model should provide developers with information so that they better understand for whom they develop and how they should develop a specific functionality. It gives developers the possibility to be acquainted with all information related to a specific persona. The persona website contains in addition to the persona specification also information about the development of that persona and interviews and observations used to create the persona. The persona-related information has been used for building the "Microsoft Customer Model" which is described in the following way:

*"The Microsoft Dynamics Customer Model describes how people in departments do work within and across organizations. It is the repository for all of the Microsoft Dynamics division's information and research regarding processes and people and is used to ensure that we are focusing on a common set of people and processes when we build software"* [36].

The Customer Model is used as a repository for gathered data about a particular persona, and it aims at being a general unified model. General since it is an aggregated abstraction based on "typical" enterprises rather than on one specific company, and unified since the same model is used for both SMEs and large enterprises and covers several different industries. The customer model consists of three types of entities: People, Departments and Work. The relations between the three types are depicted in two parts. The first part, called "People and Departments", aims at describing the general organizational structure of departments. The customer model consists of the following departments: Marketing, Sales, Design & Engineering, Operations, Customer Service, Human Resources, Project Management, and Finance. This part also describes the typical roles of the people in the departments by means of personas and that each and every persona belongs to a specific department. The second part of the customer model is named "Departments and Work" and it consists of the departments, mentioned above and the typical

<sup>1</sup> <http://www.microsoft.com/customermodel>

business processes in these departments. In total there are 32 different business processes described. These business processes are divided into activities and the activities are divided into tasks that are carried out by the various roles (personas) in the departments. In total there are 153 activities presented in the departments and work poster, while the tasks are not described at all on the poster, neither are they described in an extensive way at the persona website. Departments are described in a general way as follows:

*“Departments are the entities organizations form to organize people, reporting relationships, and work in a way that best supports the accomplishment of the organization’s goals. The departments in the Customer Model are representations of how we have seen real customers organize their organizations” [37].*

The sales department is one of these specific departments and it is described as:

*“The sales department is grouped by sales processes: Companies with simpler sales models have salespeople who perform both account management and lead gathering. For sales that are project-based or take a very long time to close, these functions are split between two specialists. Departments grow horizontally by adding the same type of salespeople”[37].*

## VI. THE PERSONA-BASED ERP SYSTEM

The customer model has been used by Microsoft Dynamics to create a “role-tailored” user interface in the ERP system, Microsoft Dynamics Navision 2009. Each user-profile is associated with a “Role Center” that holds frequently used activities and tasks for that particular role. There are 21 predefined Role Centers, each based on a persona in the customer model and the idea is that these should be able to be configured and customized by users to match individual needs.

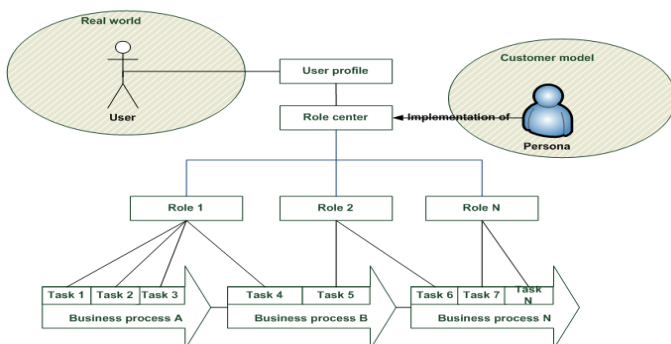


Fig. 1. The role based approach in NAV 2009, based on [38]

Figure 1 shows a conceptual illustration of the role-based approach in Navision 2009. Even though Role Centers can be configured, they are still somewhat static in their nature, in the way, that they can only be changed manually and only at the activity or task level, not at the business process level. Hence, there is no direct relation to the remaining EA of the organization, in which the system is implemented, in the sense that if the organization changes e.g. its business processes or

organizational structure, the system will not be synchronized with the organization, unless a manual configuration of the specific Role Center is carried out.

## VII. ANALYSIS

Analyzing the ERP development approach from EA as a method [21] it can be claimed that it is unclear how the ideas of personas/roles are implemented in the actual development of the ERP system as well as in the organization that implements the ERP system. There exists some guidance, but it could probably be more guidance on how it could or should be used in the development process.

Comparing the development approach from EA as a collection of architectures to the five layers of EA as defined by Bucher et al., [24] it is clear that it includes the perspectives of business and processes but lacks the perspectives of integration, software and technology or infrastructure. It could however be argued that the Role Centers in NAV 2009 implicitly address the perspectives of at least software and technology or infrastructure. The lack of a direct dynamic relation from NAV 2009 back to the development approach, which could be defined as lack of integration, does make it hard to qualify the development approach as an EA approach with regard to the five layers of Bucher et al., [24].

The disqualification of the development approach as an EA approach based on the five layers alone could seem a little rigid, and since the ERP system NAV 2009 has been developed on the basis of the approach there is definitely a connection. The lack of integration between the business processes and the system does however entail a lack of synchronization between the two and it could be argued that the two are only aligned at the immediate moment after a (re)configuration.

Defining EA as an organizing logic or as a strategy [28] is relatively similar to defining EA as a method. However, it can be claimed that it focuses more on the result than on the way how to get the result, and when analyzing the development approach from this perspective there are parts in the model that definitely have an ambition of showing an ideal structure of the organization and in that way the development could be an EA approach focus on being an organizing logic or a strategy for implementing ERPs.

Sessions [30] in his definition of EA states that there is a set of questions that need to be answered if technology should have a possibility to add value: 1) what the overall goals of the business are, 2) how the business is organized into autonomous business processes, 3) how business processes are related to each other, 4) which of the business processes or relationship between processes seem particularly amenable to improvement through technology, and 5) what plans exist for making improvements. This way of defining EA is probably the definition that describes the development approach in the best way. However, the definition focuses to a high extent on business processes and it can definitely be said that the development approach lacks the view of business processes to some extent.

### VIII. CONCLUSIONS AND FUTURE RESEARCH

Above it was noted that the EA perspective that best described the development approach was a description of organization structure and related resources. Matching the development approach as an EA method and organizing logic were only limited, having consequences for its ability to lead to organization-technology synchronization. Being an instant description, the development approach is a static description that does not recognize the dynamic evolution of an organization or technology. This is manifested in that once NAV 2009 is implemented, the automated integration between organization and technology cease to exist. The development approach does not include any functionality for automated or at least supported evolution over time. The result is that changes in the organization would entail a new implementation of NAV 2009 in order to maintain alignment, which means that the development approach in its current shape is more a tool for alignment rather than for synchronization.

A major conclusion from the analysis of the development approach is that it can be seen as an EA approach. However, it is not that clear what type of EA approach it is. To some extent that could be seen as a good thing at least when relating it to the statement made by Sessions [30] that the best way for an organization is to use a blended EA approach, and it could be suggested that the development approach is a blended EA approach.

It can also be concluded that even if the development approach could be seen as a way forward when it comes to increase synchronization between implemented ERPs and organizations business processes there still is a gap. When analyzing the ERP system (NAV 2009) and the development approach used for developing it, it can be concluded that from a synchronization perspective there still exists problems. One problem is related to what Ross [25] describes as a risk with focusing too much on EA and the risk is that EA focuses on alignment. The risk means that ICT as such becomes reactive instead of being proactive and thereby focus on fulfilling implemented business strategy and not creating new possibilities for the organization. This could be described as a lack of synchronization between the ERP system (NAV 2009) and organization business processes when implementing ERPs. However, this does not necessarily mean that the development approach should be discarded as a prospect for an EA. A mutual reference between the approach, the ERP system and the organization is however needed to ensure that the ERP system can adjust to the surrounding organization and not only vice versa. The lack of adjustment from the system side is by no means a new challenge within IS, but the dynamic nature of organizations and business processes and the often high dependence on the ERP systems does amplify the challenge of having a rather static ERP system. Introducing a dynamic reference in the model from the system to the business processes in the organization could be a proposal for enhancing synchronization after the ERP system has been implemented, which means that dynamics reference should be introduced also in the development approach.

For future research, it can be stated that there is a need for more research on organization-technology synchronization, not only from an EA perspective, but also from other perspectives that can shed light on how organizations are supposed to evolve in tandem with the technology and how development of standard software package can support this.

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