# Situational Method Engineering in ERP implementation methodologies

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**Abstract.** Enterprise Resource Planning (ERP) implementation is a complex and active process, one that involves a mixture of technological and organizational interactions. Often it is the largest IT project that an organization has ever launched and requires a mutual fit of system and organization. Concept of an ERP implementation supporting business processes across different departments in organization is not a generic, rigid and uniform process - it is a vivid one and depends on number of different factors. As a result, the issues addressing the ERP implementation process have been one of the major concerns in industry. Therefore ERP implementation process receives profound attention from practitioners and scholars in its academic or industry papers. However, research on ERP systems so far has been mainly focused on diffusion, use and impact issues. Less attention has been given to the methods/methodologies used during the configuration and the implementation of ERP systems; even though they are commonly used in practice, they still remain largely unexplored and undocumented in Information Systems research domain. This paper is useful to researchers who are interested in ERP implementation methodologies and frameworks. We will briefly reference current main stream developing's in academia and industry regarding ERP implementation methodologies and frameworks and discuss it through ideas and concepts developed in Situational Method Engineering's current practices. At the end, this paper also aims at the professional ERP community involved in the process of ERP implementation by promoting a better understanding of ERP implementation methodologies implementation methodologies in general and frameworks, its variety and future development.

## 1  Introduction

Implementing an ERP system is a major project demanding a significant level of resources, commitment and adjustments throughout the organization. Often the ERP implementation project is the single biggest project that an organization has ever launched [1]. As a result, the issues surrounding the implementation process have been one of the major concerns in industry. And it further worsens because of numerous failed cases include a few fatal disasters which lead to the end of some companies.

In previous studies can be found that almost 70% of ERP implementations fail to achieve their estimated benefits [2]. Although ERP can provide many benefits for organization, goals are often changed to getting the system operational instead of realizing the goals [3]. Reflecting such a level of importance, the largest number of articles in literature belongs to this theme. It comprises more than 40% of the entire articles [4]. Many of these articles share implementation experiences from various companies. Also, various models of implementation stages and different implementation methodologies are presented and will be discussed more in the next section.

## 2 ERP Implementation Methodologies In General

ERP implementation methodologies have similar factors with software development life cycle or framework on developing software. However, the main difference is, in the ERP implementation methodology, we do not talk about how to develop ERP system. We are mainly discussing how to adopt ERP system with the organization [5]. Perhaps the biggest distinction between ERP systems and "traditional systems" is the way they are developed and implemented. Simplified, the traditional way means that the company hires a consulting company, a requirement specification is developed and then the system is developed according to that specification as well as the organizations business processes. Either from an open template or from scratch, all parts are customized to fit the particular business. On the other hand, an ERP is a packaged software application that is bought "off the shelf" [6]. It consists of modules for different business functions such as finance, HRM, accounting and Inventory Management. Instead of the system being created with respect to what the business processes looks like, an ERP is developed independently and it's up to the organization to adapt to the ERP. However, it's not "plug and play" software and do generally require some degree of customization in order for the organization to enjoy full benefits. Due to these issues, some research has been conducted on creating frameworks for reaching success when implementing an ERP system [7]. ERP implementations are modeled in order to structure such a large entity into pieces capable of being controlled, i.e. stages or phases. A similar approach has been used in modeling e.g. software engineering projects. The phases can then be described by the objectives, activities, and stakeholders involved. Several models of ERP implementation methodologies are provided in literature (and in practice) and they vary according to e.g. the number of phases.

The phases in ERP implementation frameworks are often counted as between three and six [8]. Within the method engineering research discipline it has been recognized that there is no "one-size-fits-all" method for a problem domain. Instead, so called situational methods which are adaptable to a specific problem situation need to be developed. Regarding the fact that the implementation/rollout of an ERP solution is a complex problem as it is an integrated approach that is related to organizational and IT aspects, the need for a comprehensive methodological support for the implementation of ERP solutions, described in academic literature, becomes obvious. Situation Method Engineering seeks for utility by developing innovative artifacts. [9] Such

artifacts can be in the form of constructs, models, methods, or instantiations. Based on the all information provided in previous paragraphs the following research question arises: *How could the ERP implementation methodologies/frameworks be supported systematically; where the type of the implementation project, stakeholders of ERP projects and the specifics of the ERP solution (domain) are taken into consideration)?* In other words, could the ERP implementation methodologies benefit from the use of Situational Method Engineering concepts? In next chapters we will try to provide landscape which we need in order to find answers for this research question.

## 3 ERP implementation: Activity is what matters

Nowadays, number of ERP methodologies are described in academic and professional IS domain. Common for both domains (professional and academic) is that they strive to describe ERP implementation methodologies as sequence of activities required for ERP implementation process. In these methodologies (academic and professional), all relevant (as author perceive relevant) activities are described and defined in terms of goals, results and necessary resources. Several authors provide research that is based on the assumption that a range of activities exists which represents the most relevant activities in an ERP implementation project. Although several authors showed the phases in an ERP project (and activities in these phases), a complete list of all relevant activities in an ERP implementation project was not found, unfortunately. Several authors pointed out activities which where relevant according to their point of view in their papers, but none of them intended to collect all possible relevant activities [10].

By examining papers with different views the authors expect to have found the most relevant activities. Guy Janssens1, Rob Kusters1 and Fred Heemstra tried to lay a foundation for defining the size of an ERP project. They organized activates in clusters which contribute to the same intermediary product or products. For instance, an intermediary product such as 'trained users' can be achieved by a cluster of activities such as: 'prepare training material', 'train the trainers', 'set up training infrastructure', 'train users' etcetera. [10] A literature search was performed aiming at finding papers in which activities within an ERP implementation project were listed. From these papers a collection of names and expressions of activities was retrieved. The papers were retrieved from a collection of about 200 papers which were composed of papers selected from 'A Comprehensive ERP bibliography - 2000-2004'. Next table shows the list of clusters and sub clusters of activities and the classification into the three categories (Group view). [11]

**Table 1.** Clusters, Sub-clusters and Group View (fragment)

| Clusters | Subclusters | Group view | | | |
|---|---|---|---|---|---|
| | | Project | System | Organization | Number of unique activities |
| Selection | Vendor selection | | ✓ | | 4 |
| | Product selection | | ✓ | | 16 |
| Project configuration | | ✓ | | | 19 |
| Project management | Management | ✓ | | | 4 |
| | Communication to organization | ✓ | | | 4 |
| Organizational and system design | Current state analysis | | | ✓ | 5 |
| | Organizational requirements | | | ✓ | 7 |
| | Requirements ERP system | | ✓ | ✓ | 8 |
| | High level Design | | ✓ | ✓ | 6 |

# 4 ERP Implementation Methodologies in Literature

Research on ERP systems has so far been mainly focused on implementation CRF/CSF and impact issues. Less attention has been given to the methods used during the configuration and the implementation of ERP systems, even though they are commonly used in practic they remain unexplored in ISD research. Several models of ERP implementation methodologies are provided in literature and they vary according to e.g. the number of phases. The phases in ERP implementation frameworks are often counted as between three and six, according to Somers and Nelson [12]. However, the Umble model [13] includes 11 phases and it gives practical checklist-type guidance for an ERP implementation. On the other hand, the models of Markus and Tanis, for example, or Parr and Shanks are are very general, and are merely used for analyzing ERP implementation projects. The models are useful in studying, analyzing and planning ERP implementation.

The selection of ERP implementation method mentioned in paper is based on the degree of "institutionalization" in the scientific community. Livari and Hirschheim described six criteria to determine institutionalization: including 1) the existence of scientific journals, 2) scientific conferences, 3) textbooks, 4) professional associations, 5) informational and formal communication networks, and 6) citations. There are number of different ERP implementation methodologies mentioned and described in literature. However, there is an issue with methodology scope, context and its ambiguity. For example, some methodologies treat the phases before the acquisition of an ERP system (and are focused on it), while some methodologies put stress on phases after the ERP system has started to be used (production phase). Different authors

provide different sequence of phases and diverse naming practice. The preliminary phases are, for example, initiation and requirements definition defined by Kuruppuarachchi, project chartering by Markus and initiative and selection by Makipaa. [14] It is obvious that there is no ground based ERP implementation methodology, widely accepted and tested. Even though they are commonly used in practice (ERP implementation methodologies) they still remain largely unexplored and undocumented in Information Systems research domain. Next table summarize list of proposed implementation methodologies followed by the degree of institutionalization in scientific community.

**Table 2.** ERP implementation models and Author(s)

| Author(s) | ERP implementation model |
|---|---|
| Bancroft et al. (1998) | (1)Focus, (2)Creating As – Is picture, (3) Creating of the To-Be design, (4) Construction and testing and (5) Actual Implementation |
| Kuruppuarachchi et al. (2000) | (1) Initiation, (2) Requirement definition, (3) Acquisition/development, (4) Implementation, and (5) Termination |
| Markus and Tanis (2000) | (1) Project chartering, (2) The project, (3) Shakedown, and (4) Onward and upward |
| Makipaa (2003) | (1) Initiative, (2) Evaluation, (3) Selection, (4)Modification, Business process Reengineering, and Conversion of Data, (5) Training, (6) Go – Live, (7) Termination, and (8) Exploitation and Development |
| Parr and Shanks (2000a) | (1) Planning, (2)Project: a. setup, b. reengineer, c. design, d. configuration and testing, e. installation (3) Enhancement |
| Ross (1999) | (1) Design, (2) Implementation, (3) Stabilization, (4) Continues improvement and (5) Transformation |
| Shields (2001) | Rapid implementation model of three phases and 12 major activates |
| Umble et al (2003) | (1) Review the pre-implementation process to date, (2) Install and test any new hardware, (3) Install the software and perform the computer room pilot, (4) Attend system training, (5) Train on the conference room pilot, (6) Established security and necessary permissions, (7) Ensure that all data bridges are sufficiently robust and the data are sufficiently accurate, (8) Document policies and procedures, (9) Bring the entire organization on – line, either in a total cutover or in a phased approach, (10) Celebrate, and (11) Improve continually |
| Verviell and Halingten | (1) Planning, (2) Information search, (3) Selection, (4) Evaluations, and (5) Negotiation |

## 4.1 ERP Implementation Methodologies in Practice: Example of ASAP 8

Because of the high number of failed ERP implementation projects, ERP vendors have developed their own methodologies that best fit their packages. The selection of ERP implementation method (chosen to be described in this paper) is based on the degree of institutionalization in the scientific community. ASAP is one of the few ERP implementations methods addressed by the research community [15]. In addition, there are professional associations promoting ASAP and there are newsgroups on the Internet representing informal networks and are cited in case studies, such as Geneva [16]. Furthermore, ASAP is well established on the market as regards implementing a market leading ERP system and it is used in education via the university alliance program between SAP and about 400 universities around the world. Thus, the method has both practical and educational relevance and meets several of Kuhn's institutional assessment criteria. The success of SAP implementation is to a large degree determined by the speed and the effectiveness of the software to add value to your organization. That is why SAP has introduced Agile ASAP; a new, practical implementation methodology that allows you to implement operating functionality in short iterative cycles. In each cycle the team implements the most valuable and important functionality first. This enables you to generate results faster, gain immediate insight into the value, increase the flexibility of the implementation and improve progress monitoring.
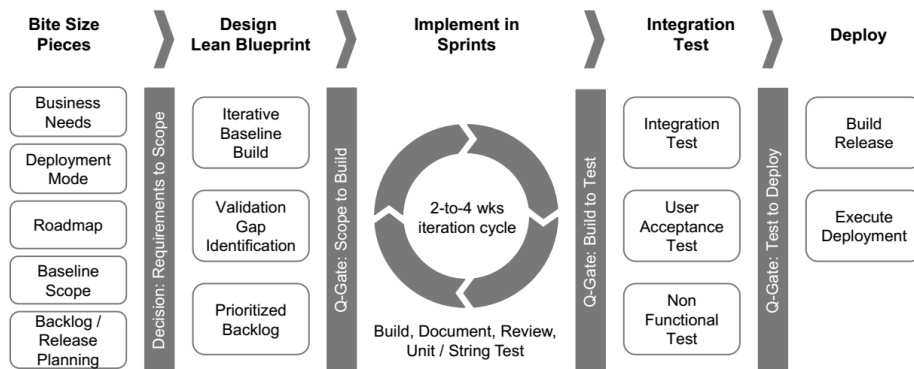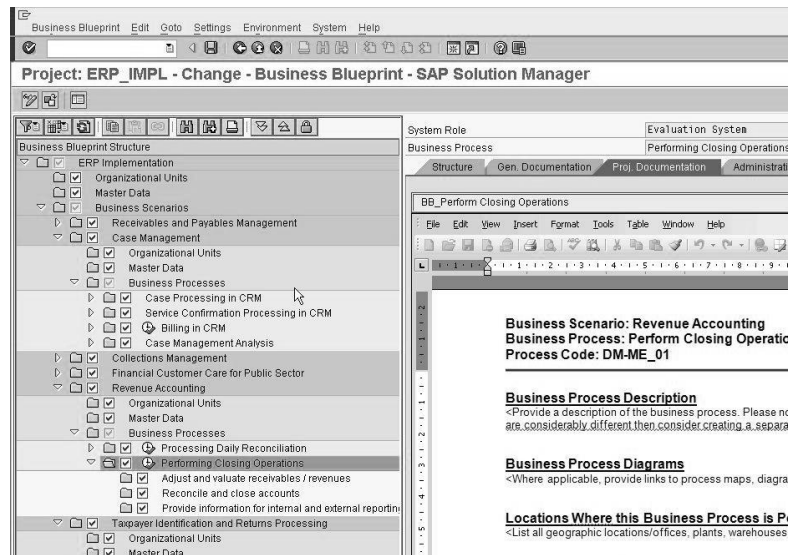


**Fig. 1.** Agile ASAP 8 Methodology Phases)

All phases in ASAP 8 are provided on SAP official website www.sap.com. It is important that each of these phases is developed in detail, down to its smallest bit – activity. Also, there are hundreds of different, industry specific, business scenarios and processes suggested as preconfigured ERP solution building blocks. Regarding the industry (situational factors), using the SAP product named "Solution Manager" you are able to build you process by connecting suggested activities and appropriate roles. Plan of this PhD research is to conduct comprehensive study of ASAP 8 as an industry leading ERP implementation methodology.  Next Figures shows a SAP Solution Manager screenshot.

**Fig. 2.** Agile ASAP 8 Methodology Phases)



# 5 Situational Method Engineering in ERP Implementation

As several authors [17] have stated, the implementation process of an ERP system is best conceptualized as a business project rather than the installation of a new software technology. Unfortunately, comparing to ERP vendor's implementation methodologies (its comprehensive structure and context based approach) academic literature in this domain mostly stayed idle – not progressing in order to, in best possible way, describe what is going on in professional ERP implementation practice. Structured recommendations or methods supporting the implementation are completely missing. In addition, traditional approaches from software engineering that address the implementation of software in general cannot be applied "as is" to ERP solutions because they do not consider certain ERP specifics. As mentioned previously, the fact that the implementation/rollout of an ERP solution is a complex problem as it is an integrated approach that is related to organizational and IT aspects, the need for a comprehensive methodological support for the implementation of ERP solutions, described in academic literature, becomes obvious. Situation Method Engineering seeks for utility by developing innovative artifacts . Such artifacts can be in the form of constructs, models, methods, or instantiations [18]. Within the method engineering research discipline, but also in other areas of research it has been recognized that there is no "one-size-fits-all" method for a problem domain [19]. Instead so called situational methods which are adaptable to a specific problem situation need to be developed. Methods/methodologies are considered to be Design Science Research artifacts. They "describe viable ways of

performing goal-oriented activities in order to solve a real-world problem" [20].Thus, situational methods should incorporate method configurations that allow for the user-/role specific configuration of a situational method [21].

In the literature, different terms and understandings are used for the method building blocks that are the basis of situational method composition approaches (e.g. method fragment, method chunk or method component. Activities describe the main units of work whereas techniques support activities by giving detailed and precise instructions. Each method fragment is characterized by exactly one result that is created by one or more activities which are supported by one or more techniques. [22].Identification of method fragments is one of the first steps of situational method composition. In order to increase their re-use, the identified method fragments are stored in a so called method base [23]. Thereafter, it is necessary to derive rules that allow for the composition of method fragments into situational methods in order to address the problem situation at hand. With the help of such rules, method fragments can be put in a temporal and logical order; they are also stored in the method base. Based on the identified situation and a method base, situational methods can be composed. Having on mind previous paragraph it is obvious that situational methods can be developed to address a specific problem situation. However, Mirbel and Ralyté [24] criticize that users of a situational method still have to "apprehend the method as a whole and understand all its concepts in order to use it, which can have some negative impact and discourage" the users from using the situational method. A user/role has to perform specific activities and thus needs his/her own configuration of the situational method [. To address this issue, Mirbel and Ralyté suggest combining situational method composition and situational method configuration. Each method construction approach starts with the aggregation of method fragments which implies that previously the situation has been characterized and the method base was filled with method fragments and corresponding rules. Thereafter, the obtained situational method can be configured for each user by only presenting those method fragments referring to his/her role and thus supporting his/her tasks [24]. This implies that roles and corresponding method configurations have been identified beforehand. Summing up, it should be noted that situational method engineering that meets the requirements of Mirbel and Ralyté (see above) is comprised of the following steps (Steps three and four could also be conducted in parallel):

1. Characterization of the situation

2. Identification of method fragments

3. Development of method configurations by assigning roles

4. Derivation of rules for the assembly of method fragments

ERP is implemented into the productive environment of a company (and it represents backbone of the modern transactional business operations). Discussion of related work in literature (academic) shows that there is no systematical support for supporting the implementation phase. That is why we would like to focus on the development of a situational method for the implementation of ERP system. Including the combined

method construction approach of Mirbel and Ralyté , we would firstly characterize the situation(s) in which the future situational ERP implementation method can be used. Next, we would derive method fragments that support the implementation of ERP solution. Thereafter, we would identify roles (types of users) that conduct portions of such a situational method. In addition, we would specify method configurations. They determine only those method fragments of the situational method that support the tasks of the different roles. Before identifying appropriate method fragments, the situation in which the fragments can be used has to be specified. We should assume that the use of a complex ERP solution depends on the size of a company, i.e. that such a solution will presumably more often be implemented in a large company than in a smaller one. Moreover, we assume that implementing such a ERP solution in a large company will require different support than implementing it in a smaller one. This is just one example of characterization of the situation in ERP implementation. In order to have a complete solution (described) it is needed to undertake execution of all steps that Mirabel and Ralyte suggested as part of developing situational method (in this case for ERP implementation method) [25].

## 6 Conclusion

ERP is the largest enterprise application software market with revenue projected to reach $26.9 billion in 2015 projected by Gartner. However, as mentioned previously in this paper, studies show that almost 70% of ERP implementations fail to achieve their estimated benefits. In this paper, which is part of PhD thesis work, we provided brief literature review of ERP implementation methodologies and its phase in IS research field domain. It is obvious that there is no ground based ERP implementation methodology (described in literature), widely accepted and tested. Even though they are commonly used in practice (vendor's ERP implementation methodologies) they still remain largely unexplored and undocumented in Information Systems research domain. Also we have briefly described one of the most advanced ERP implementation methodology provided by SAP (biggest ERP vendor) named ASAP 8 (agile methodology) which is the method that has both, practical and educational, relevance and meets several of Kuhn's institutional assessment criteria. It is methodology tailored to meet specific need of organization such as size, industry, business process settings etc. There is no need to dig deeply, it can be seen that academic literate is not following professional literature and progress in this part of Information Systems development (ERP implementation methodologies). Therefore, idea of authors of this work is to propose, develop and evaluate a situational method that supports the implementation of an ERP system. Additionally, method configuration should be specified that identify only those method fragments that are relevant for certain roles, e.g. project manager or ERP consultants.  Finally, the utility of the whole situational method consisting of method fragments, procedure model/rules and method configurations should be justified by using the method in actual ERP implementations and evaluating the integrated artifact's utility. All process of proposing, developing and evaluating should be based on rigid DSR foundations heavily supported by experience of ERP

professionals and ASAP methodology (ERP implementation methodology provided by biggest ERP vendor). At the end, synergy between academia and industry should be an advantage in developing Situational Method Engineering as part of DSR; proving its applicability and power to describe actions/activities in real IT industry.

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