A Situational Implementation Method for Business Process Management Systems

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ABSTRACT

For the integrated implementation of Business Process Management and supporting information systems many methods are available. Most of these methods, however, apply a one-size fits all approach and do not take into account the specific situation of the organization in which an information system is to be implemented. These situational factors, however, strongly determine the success of any implementation project. In this paper a method is provided that establishes situational factors of and their influence on implementation methods. The provided method enables a more successful implementation project, because the project team can create a more suitable implementation method for business process management system implementation projects.

Keywords

Implementation, BPM-systems, Situational factors.

IMPLEMENTING INFORMATION SYSTEMS

Lately Business Process Management (BPM) has gained much attention from management and IT departments of organizations as a means to increase agility and flexibility. To realize these organizational goals it is important to have flexible information systems that support the organizations processes. In dynamic environments where processes change often the most promising approach to achieve this is, is by applying the concept of service-oriented architecture (SOA) (Krafzig, Banke and Slama, 2005). Implementation of BPM-Systems (BPMS) that that enable support of both the BPM and SOA paradigms, however, is highly complex. During each implementation the specific situation of the organization must be carefully considered.

There are many methods available for implementing information systems such as BPMS, Enterprise Resource Planning, Business Intelligence, Customer Relationship Management, and others. Both researchers and practitioners have developed overarching frameworks based on existing methods and this is no different for the BPM domain. Multiple efforts have been made in constructing overall methods for implementation. Kettinger, Teng and Guha (1997) have developed a business process reengineering (BPR) implementation framework based on different BPR implementation methods. Table 1 gives an overview of 21 different implementation methods for BPM. The list is constructed based on an assignment to 47 master students that followed the BPM course at the Utrecht University. Each individual student had to search for 3 BPM (-related) implementation methods. This resulted in 141 methods of which 21 could be uniquely identified. This table is not exclusive, however, because there are many other methods available.

An analysis of these implementation methods in table 1 shows that many methods do not take into account the context in which they are used and those that do only state that the context should be analyzed but don't provide specific context dependent implementation activities. Furthermore there are only five methods that are based on scientific research (Brahe and Bordbar, 2007; Fitzgerald and Murphy, 1996; Jennings, Faratin, Norman, O'Brien, Odgers and Alty, 2000; Rajagopal 2002; Rinderle, Kreher and Dadam 2005; Stoica, Chawat and Shin 2004; Van Der Aalst and Van Hee 2002) but these are seldom applied in practical situations. Ten methods are based on professional best practices without scientific foundations. Finally, six methods are actively being used in practice while at the same time supported by an extensive body of scientific research.

Although each of the 21 methods mentioned are in their own rights unique, commonalities can easily be extracted. Generally, BPM implementation methods consist of two phases. The first can be labeled the 'design' phase, during which the organization is analyzed (often by the means of process models of the as-is and to-be situations). The second phase is the 'development phase' and this is when the organization actually has to change and work with the optimized processes.

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No.	Name	Scientific	Professional	Characteristics	Source
1	Pronto		X	DEMO, speech-acts	www.sogeti.com
2	Cordys@Work		X	Agile software development method	www.cordys.com
3	ARIS House of Business Engineering (HOBE)	X	X	Based on ARIS architecture	Scheer and Nüttgens (2000)
4	ADEPT (An Agent-Based Approach to BPM)	X		Agent based approach	Jennings et al. (2000), Rinderle, Kreher and Dadam (2005)
5	Interactive, process-oriented system development (IPSD)	X		BPR	Van Der Aalst and Van Hee (2002)
6	Process Innovation Method	X	X	BPR and process improvement	Malone, Crowston and Herman (2003)
7	Six Sigma	X	X	Six Sigma, lean manufacturing	De Feo and Barnard (2005)
8	Goal-Oriented Organization Design (GOOD)	X	X	Human interaction management	Harrison-Broninski (2005)
9	Rajagopal ERP implementation	X		BPM	Rajagopal (2002)
10	Strategy Driven Approach	X	X	CMMI	Jeston and Nelis (2006)
11	Smart BPM		X	BPMS	www.pegasystems.com
12	Pattern based approach	X		BPR	Brahe and Bordbar (2007)
13	Business Process Maturity Model (BPMM)	X	X	CMMI, BPR and TQM	Curtis and Aalden (2006)
14	RACI method		X	Project management	http://www.gordiantransformationpartners.com
15	A Systems Approach to BPM		X	BPR and enterprise architecture	Ramesh .(2007)
16	Bizzdesign's BPM approach		X	Process modeling and BPR	www.bizzdesign.com
17	Nine-step approach (Capgemini)		X	Process maturity based	www.capgemini.com
18	Goal driven BPM		X	BPM	www.tibco.com
19	Fitzgerald and Murphy's implementation method	X		BPR	Stoica, Chawat and Shin (2004) Fitzgerald and Murphy (1996)
20	BPM Implementation method		X	Workflow management and BPR	Burlton (2001)
21	BPR method		X	BPR	Hammer and Champy (2001)

<div align="center">

Table 1. Different BPM Related Implementation Methods

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The methods in table 1 propose a one size fits all approach and do not take into account the context of an organization that implements both BPM and supporting IT. Although many providers of implementation methods and tools do acknowledge the need to custom tailor their methods to the situation at hand, they do not provide any means for method customization. Due to strong consultant influences, who are the professionals that should decide in which way a method should be used, it is assumed that consultants generally have the skills to customize implementation methods on the fly. This introduces room for error because we cannot expect consultants to have the experience and knowledge to be able to tackle every situation. For that reason we propose that implementation methods are made more context-dependent. This means that an implementation method should provide variable and conditional activities and steps that cater to many different situations. Also such a method should provide analyses tools that help tailor the implementation method. The research question of this paper is: *Can a situational implementation method be developed for BPM systems?*

An aspect in relation to BPM is the state-of-the-art BPMS that are used increasingly to support integrated BPM and SOA implementations. This trend causes some organizations to think of BPM as an IT project instead of the implementation of a management strategy. We state that that the use of a BPMS implies deep and enterprise-wide process analyses, and the inclusion of process performance measurement for continuous process (quality) monitoring and improvement and therefore the implementation should consider both IT and management aspects. Current contributions to academic and professional journals are more focused on what the BPM concept is, and why organizations start BPM-projects (Fremantle, Weerawarana and Khalaf, 2002; Karagiannis, 1995; Ravesteyn and Versendaal, 2007; Van der Aalst, Ter Hofstede and Weske, 2003; Weske, Van der Aalst and Verbeek, 2004). And while there is research on the maturity level of organizations that are using BPM (Hammer, 2007; Harmon, 2004; Lee, Lee and Kang 2007; Rosemann and de Bruin 2005), the question of how a BPM-system can be implemented, and what business value it can bring, continues to be a grey area. All the more if during the implementation project an organizations context is taken into account.

In figure 1 the different levels of the generic implementation method concept (cf. Weske, 2007) are shown to clarify the importance of context. At the meta-level the language/ontology that is used to describe an implementation method is defined. For instance, an implementation method can be described using the terminology used by the ISO–standard, a process modeling language such as Petri nets, or with plain text. In this research method engineering is used to describe our proposed implementation method on a meta-level. Method Engineering is a proven technique to develop meta models (Brinkkemper, 1996).

| META IMPLEMENTATION METHOD |
| IMPLEMENTATION METHOD |
| IMPLEMENTATION INSTANTIATION |
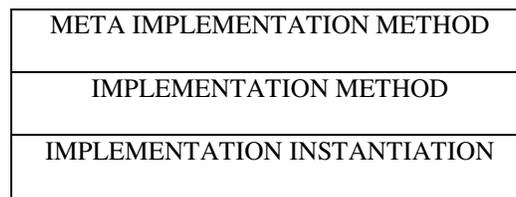
Figure 1. Three levels of an implementation method

At the second level the implementation method itself is described. All the phases, activities, roles, deliverables, etc. that are part of the method are explained in relation to each other. Frequently the method consists of tutorials, training material, decisions sheets and several templates that can be used to record information that is needed during the project or that is a deliverable. In this paper the process deliverable diagram (figure 3) is an example of a method on level 2. When a method is used to actually implement a BPMS in an organization that method is instantiated, which is level 3 in figure 1. In practice each implementation (instantiation of the method) will not necessarily be the same as earlier implementations because an analyses of the specific organizational circumstances will determine the best way to approach the implementation. It is on this level that situational factors will determine the use of the implementation method. As stated before this is currently the domain of the consultants because most methods do not provide different implementation activities, the method proposed in this paper does.

The remainder of this paper describes the development of a situational BPM implementation method. The following section describes the research approach, section 3 then gives an example of an implementation fragment; in section 4 the fragment is validated and finally sections 5 and 6 give preliminary conclusions regarding this research and an overview of the work that still has to be done.

RESEARCH APPROACH

As a starting point in the development of a situational dependent BPMS implementation method we chose the Information System Research Framework of Hevner, March, Park and Ram (2004) as shown in figure 2. The most important reason for this is that Hevner et al. (2004) propagate that studies in the IT as well as the IS research domain are both about descriptive and prescriptive research.

The descriptive part of the research (knowledge-producing activity) aims to understand, explain and predict why certain phenomena in the IT are occurring, while the prescriptive approach (knowledge-using activity) aims at improving performance to meet the business need (Hevner et al., 2004; March and Smith, 1995).

Although the framework of Hevner et al. primarily focuses on technology-based design, the model can also be used for other practices than technology-design approaches. This holistic approach with its clear boundaries and guidelines enables the framework to serve as a basis for this research.
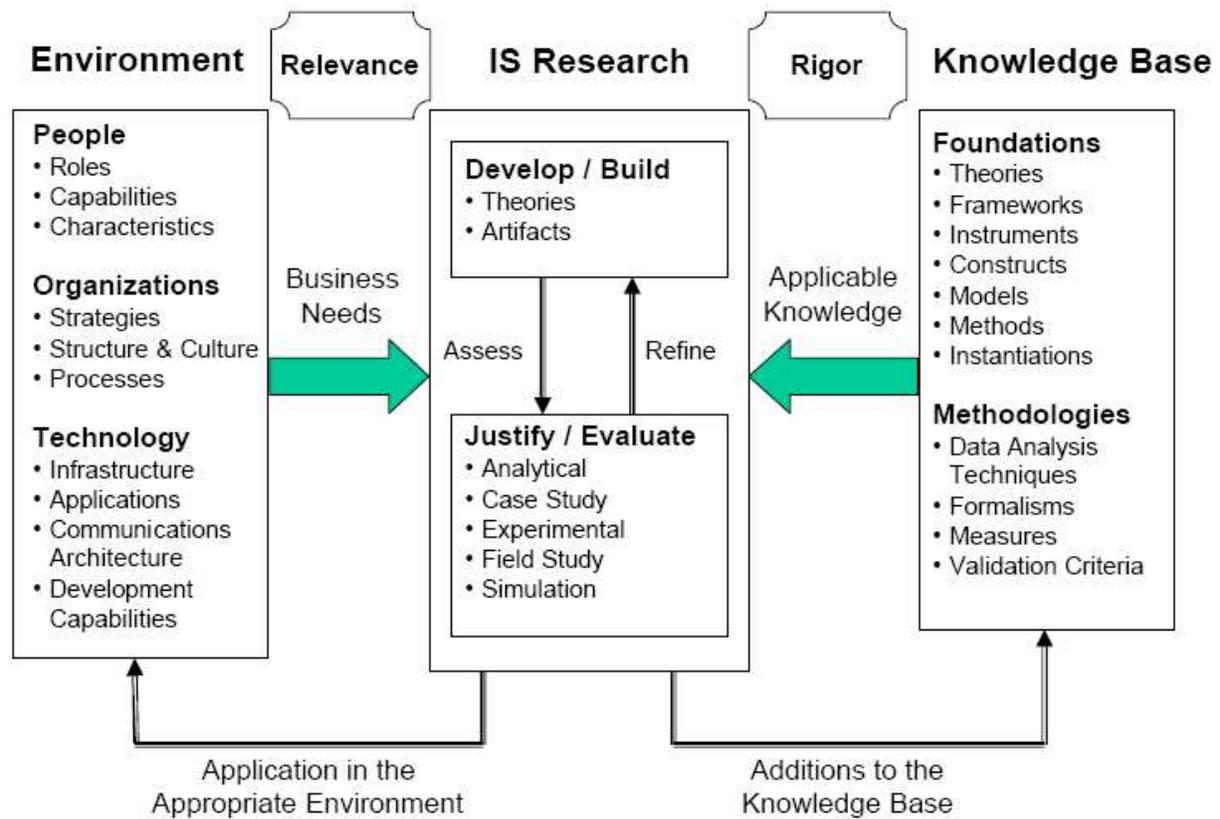

Figure 2. Information Systems Research Framework (Hevner et al. 2004)

The research consists of four major activities based on the framework. First, critical success factors of BPM-systems implementation were collected from existing research (*the knowledge base*). In the BPMS domain critical success factors can be defined as those areas where 'things have to go right' for a BPMS implementation to succeed (Ward and Peppard, 2002). The list of factors is a first indication towards the context in which an organization is starting its BPM project and contains both management and IT related aspects. The list of critical success factors is based on the research by Ravesteyn and Versendaal (2007), table 2 gives an overview.

Secondly a list of situational factors is constructed based on experience from business (*the environment*). A situational factor can be any factor, such as an environmental factor that contributes to the set of conditions to which an organization acts or reacts. Situational factors can be very basic for instance the size of the organization in employees or revenue. A factor such as the number of employees gives an idea about the amount of different roles and responsibilities that are related to the organizations processes. Also factors can be BPM specific instead of generic. For example the level of knowledge the organizations software developers (or the IT department) have in regards to service development. The development and use of web services in creating a service-oriented architecture in support of the organizations processes is important to the agility and flexibility of these processes. When the IT department has little or no knowledge of how to correctly develop web services, this should be taken into account before the implementation.

The third activity (*develop/build*) is building a repository of implementation activities based on combinations of critical success factors and situational factors. An implementation activity is a task or series of tasks that have to be executed by actors to realize the goal of a successfully implemented BPM-system. The different activities are based on an analysis of the identified implementation methods from both business and sciences (table 1). Finally the constructed implementation

fragments are validated (*justify/evaluate*). Different validation techniques are available but in this research only case studies are used as means of validation.

Critical Success Factors	
1	Know-how and experience with Project Management
2	Experience with Change Management
3	Understanding the BPM concept
4	A well organized design phase (modeling)
5	Understanding the processes of the company
6	Using the 'best' modeling standards and techniques
7	Understanding interdependencies and integration of data sources
8	Well organized maintenance and (quality) control of the process models
9	Understanding how processes and data are linked together
10	Understanding how to develop and use web services
11	Involving the right people in the project
12	Having a set of key performance indicators and measuring the change (improvement)
13	Ensuring that the BPM project is part of a continuous optimization effort
14	Creating a culture of attention to quality within the organization

Table 2. Critical Success Factors When Implementing BPM

BPM-SYSTEM IMPLEMENTATION FRAGMENT – AN EXAMPLE

In this section we will use the critical success factor 'Understanding how to develop and use web services' as an example to explain how implementation fragments are developed based on situational factors. This factor is both about understanding the concept of SOA as how to actually develop web services. As a first step we defined several situational factors that can occur at a specific organization and that influence the activities that are done during the implementation of BPMS.

There are several important contextual aspects that influence the success of using web services. First there is the degree of involvement of different stakeholder's (in- and external) in the project. Is there agreement on the function that web services will have? Are there already web services available inside or outside the organization that can be used? How about service level agreements on services? And what about pricing? The project team alone cannot tackle these questions.

Closely related to the involvement of stakeholders is the availability of reference models for the organizations processes and related specifications for data models or web services. In many large industries there are already standards available that can easily be adopted. In many cases, however, organizations that are implementing BPMS do not use these standards because the first processes to be implemented are internally orientated. By not adhering to standards from the start, seeds are planted that will cause problems for later projects. As soon as web services need to communicate with services outside the organizations boundaries, existing industry standards will have to be followed and 'old' services from earlier projects can no longer be (re)-used.

Another factor that influences implementation activities is the SOA maturity of the organization. Is there technical knowledge available in the organization? Should partners be involved? Does the organization have a SOA strategy or perhaps even (parts of) a SOA in place? Are there any methods and tools available for web services development? Do business people understand the SOA paradigm? Again these are questions that influence the SOA delivery strategy (Terlouw, Terlouw and Slinger, 2009) and which should be tackled if BPM-systems implementation is going to be successful.

In figure 3 part of a process deliverable diagram (consistent with method engineering) belonging to the implementation fragment that is constructed based on the critical success factor 'Understanding how to use web services' is shown. To keep

the figure comprehensible not all of the situational factors that have been discussed are included. In this example only the SOA maturity of the organization is discussed.

There is a distinction between activities that should be done when the organization has a low maturity or when it has a high maturity. In the diagram the different paths are created through decision-boxes that create different routes that can be taken depending on the maturity. The method consists of four main phases that contain multiple sub-activities and concepts. Just the two phases with activities related to this critical success factor are shown in detail with there sub-activities.
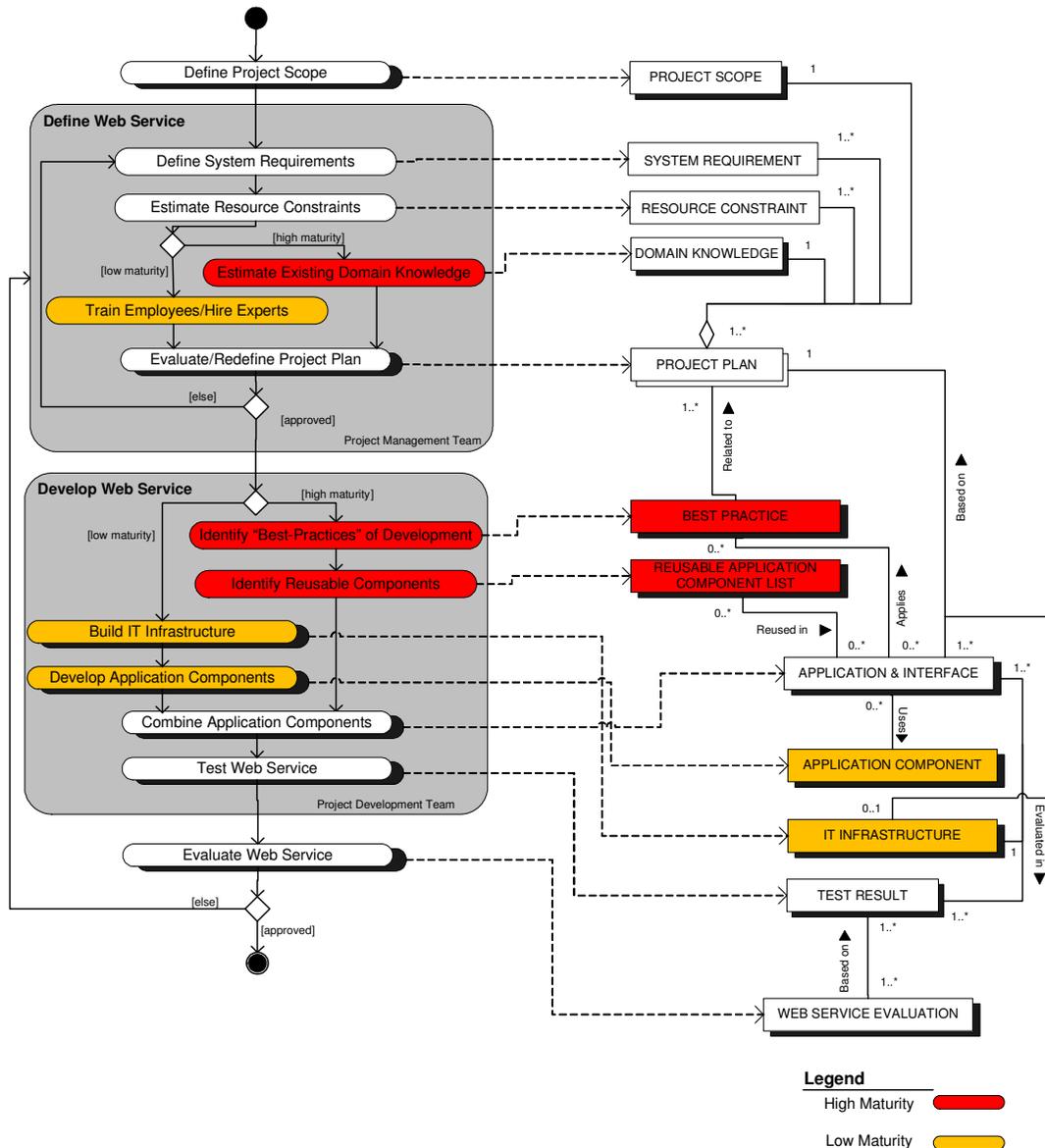
Figure 3. BPMS implementation fragment for the CSF 'Understanding how to use web services'

In the 'define project scope' phase the feasibility, nature and range of service solutions in the context of this project are defined (Papazoglou and Van de Heuvel, 2006). This is followed by the 'define web service' phase which contains 5 possible activities. The first two activities 'define system requirements' and 'estimate resource constraints' have to be executed for each project. In these activities resources' consumption, boundaries and limitations are defined for the development of a web service (Moor and Van de Heuvel, 2004) and also the availability of resources within a company in relation to the required consumption for the development need to be determined (Jeston and Nelis, 2006). Then depending on the maturity of the

organization either the 'estimate existing domain knowledge' or the 'train employees/hire experts' is undertaken. When there is a high organizational maturity the existing domain knowledge is analyzed in order to locate the internal experts who will be involved in the project (Croft, 1986) while in a low maturity situation employees should be trained and/or domain experts should be hired. The final activity in this phase is 'evaluate/redefine project plan' and should deliver a detailed report of the required activities and processes to be followed for the accomplishment of the services development project (Jeston and Nelis, 2006).

The 'develop web service' phase contains the actual development activities. Again these depend on the maturity of the organization. In a low maturity environment the technical infrastructure in terms of hardware and networking systems (Jeston and Nelis, 2006) should be built or made ready for services first (e.g. decisions on integration technology). Subsequently application components must be developed. "A component is a binary unit that exports and imports functionality using a standardized interface mechanism. The underlying component infrastructure supports composition of services by providing mechanisms for introspection, event handling, persistence, dynamic linking and layout management (Broy, Deimel, Henn, Koskimies, Plášil and Pomberger, 1998)." In general, application frameworks are required for building services as well as for composing them. If there is a high level of maturity several "Best Practices" of past projects can be identified and be reused also reusable services can be integrated into the new project. Finally the new web services can be developed and the corresponding documentation (a description of the self-contained, modular applications used in the web service along with a protocol interface description (Fensel and Bussler, 2002)) are delivered and then tested.

The final phase 'evaluate web service' consists of an overall assessment of the developed services and if this is not accepted several iterations may occur before a final approval. The assessment of the web services are based on its functionality in relation with the predefined requirements (Fensel and Bussler, 2002).

In a similar manner as shown here, we constructed implementation fragments for the remaining critical success factors. Together the fragments are the basis for a context dependent BPM-systems implementation method. In the following section the validation of the implementation fragments is described.

VALIDATION

To validate the developed implementation fragments we did case studies at customers of Cordys. Cordys is a global software company based in the Netherlands that develops and sells a BPMS. Here we describe one case study conducted at an 'International Financial Services Company' (IFSC).

Case: International Financial Services Company

IFSC is an international financial services provider active in the fields of banking and insurance. The company offers its products and services through its own distribution channels, in cooperation with intermediaries and distribution partners. A subsidiary of IFSC is the Local Insurance Company (LIC). LIC is a provider of disability income insurance, health insurance and pension plans in the Netherlands. LIC employs over 600 people and has a comprehensive national network of financial advisors in the Netherlands. To improve and better manage the complexity of its integrated product offering and process chains LIC decided to implement a BPMS application. The implementation has to provide improvement of both BPM and Business Activity Monitoring capabilities that already exist and provide the flexibility and agility the organization needs to manage its response to new legislative change.

In a first project the implementation of Cordys has already seen the required processing time for a new participant in a pension scheme reduced from a thirteen minute process involving 70 – 80 data input screens, to a two minute process involving a single interface. In a second project LIC will be using the platform to manage the complex process of changing the status of thousands of pension policies to ensure compliance with the latest financial legislation. The company also plans to better manage third party organizations, by integrating business processes with web services. LIC has a number of other projects planned to create composite applications that combine existing and new functionality to improve various business processes.

For this case study three interviews were held. All interviewees had roles as either project manager or department manager and were involved in the BPMS projects. Each respondent was asked to relate the activities in the implementation fragment (of figure 3) to there current practice and provide any perceived disadvantages and advantages.

Based on the interviews it was clear that there is no overall maturity that can be taken into account. Projects should realize that the maturity of departments can differ greatly within the organization. Therefore every project should start with a maturity analysis. Based on the outcomes, the respondents agreed that training people (as suggested in a low maturity situation) can be an effective implementation activity. However this might also be needed in some high maturity situations

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when new project members or employees with little knowledge of service orientation are added. Therefore this activity can not completely be ruled out. Also the activity 'develop web service' consists of two paths that are recognized but again a high maturity situation should not entirely rule out the low maturity activities (while a low maturity does normally mean that there are no services available to be reused).

Based on this validation we conclude that although the example fragment can be used in practice, more alternative paths based on different situations need to be constructed.

CONCLUSIONS

In this paper we show that there are many different implementation methods available for BPM and supporting IT. Most of these methods do not, however, provide a situational implementation approach. Because organizations operate in different contexts, variable implementation methods are needed. A context dependent BPMS implementation method is proposed consisting of implementation fragments that are based on critical success factors of BPM implementation and situational factors that are organization specific. The developed implementation fragments and their activities in this research are based on earlier research and existing implementation methods.

In total 14 BPMS implementation fragments have been developed. Each fragment takes into account several contextual factors and proposes corresponding implementation activities thereby tailoring a BPMS implementation for a specific organization. This paper describes the process of development of implementation fragments and illustrates the results by one example based on the critical success factor 'Understanding how to use web services'.

The validation suggests that the fragment is usable in practice and can add value to the implementation process by realizing that each organization operates in a different context. However more situational dependent paths are needed.

DISCUSSION AND FUTURE RESEARCH

The objective of this research is to develop a context dependent implementation method for BPMS. The current method contains 14 implementation fragments but should be extended to include more success factors. While future research will extend the method it will never be finished, possibilities for extensions are: more activities (sector specific), cultural context, etc.

Besides adding more content to the method, more validation is also needed. Not only does each fragment needs testing but also the entire implementation method should be validated in several projects to determine if this approach really adds value by increasing the rate of successful BPMS implementations.

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