Communications of the IIMA

Volume 9 | Issue 1 Article 3

2009

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ABSTRACT

For the implementation of Business Process Management and supporting information systems there are many methodologies available. However, most of these methods consist of an 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.

IMPLEMENTING INFORMATION SYSTEMS

Lately Business Process Management (BPM) has gained much attention by management and IT departments in organizations as a means to increase flexibility and agility. To realize this goal, it is important to have a flexible information system in support of processes. The most promising approach to achieve this is service oriented architecture (Krafzig, Banke, & Slama, 2005; Lippert & Govindarajulu, 2006). However, implementation of business process management systems that support integrated BPM and SOA paradigms is complex. Also, BPM-systems are still in their early development stages and many have only done pilot implementations (Kamolvej, Sirisuk, & Tungchitipunya, 2007). Each implementation should, therefore, be carefully considered in the context in which it is carried out; and that is why the used method is important. There are many methodologies available for implementing information systems, such as business process management systems, 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 methodologies. Table 1 gives an overview of 22 different implementation methods for business process management. The list was constructed based on an assignment to 47 master students who were enrolled in a the business process management course. Each individual student had to search for three BPM-related implementation methods. This resulted in 141 methods, of which 22 could be uniquely identified (completely different method). Still this table is not exclusive because there are hundreds of methods available, although many are variations on the methods listed here. An analysis of the methods in the table shows that many implementation methods do not take into account the

context in which they are used. Of the methods shown, there are five methods that are based on scientific research (Jennings, et al., 2000; Rinderle, Kreher, & Dadam, 2005; van der Aalst & Van Hee, 2002; Brahe & Bordbar, 2007; Stoica, Chawat, & Shin, 2004; Fitzgerald & Murphy, 1996) but are not or are seldom applied in practical situations. Nine are based on professional best practices, while they are not or are only supported in a minor way by scientific research; and finally, eight methodologies are actively being used in practice, while at the same time supported by an extensive body of scientific research. Although most of the methods are developed for the implementation of BPM and related projects, some methods are based on process maturity models, project management methods or software development methods. These differences probably occur because of the different contexts in which these methods are used.

Although each of the 22 methods mentioned are in their own right unique, commonalities can be easily extracted. Basically, all BPM implementation methods consist of two phases. The first can be labelled the design phase; in this phase, 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 optimized processes. Also many of the newer BPM methods regard the implementation of BPM as a series of small projects that work towards a common goal. The reasoning behind this approach is that in most cases an organization that wants to implement BPMS will already have a standing organization structure with running processes, which will be the starting point for the implementation. Radically changing the entire organization is a big risk that can be limited by changing via several smaller projects. One of the key factors in many of the mentioned approaches is the availability of sufficient information about the processes that are going to be modelled in the form of key performance indicators. If this is not the case, a project should start by defining needed metrics and by making sure this information is available.

Table 1: Different BPM Related Implementation Methods.

No	Name	Scientific	Professional	Characteristics	Source
1	Pronto		X	DEMO, speech-acts	www.sogeti.com
2	Cordys@Work		X	Agile software development methodology	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 Business Process Management)	X		Agent based approach	Jennings et al. (2000) Rinderle, Kreher and Dadam (2005)
5	Interactive, process-oriented system	X		Business process reengineering	Van Der Aalst and Van Hee (2002)

	development (IPSD)				
6	Process Innovation Method	X	X	Business process reengineering and process improvement	Davenport (1993) 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	Rajafopal's BPMS approach	X		Business process management	Rajagopal (2002)
10	Strategy Driven Approach	X	X	CMMI	Jeston and Nelis (2006)
11	SCOR (Supply Chain Operations Reference)	X	X	Supply chain management	Harmon (2003)
12	Smart BPM		X	Business process management systems	www.pegasystems.com
13	Pattern based approach	X		Business process reengineering	Brahe and Bordbar (2007)
14	Business Process Maturity Model (BPMM)	X	X	CMMI, BPR and TQM	Curtis and Aalden (2006)
15	RACI methodology		X	Project management	http://www.gordiantransformationpartners.com
16	A Systems Approach to BPM		X	BPR and enterprise architecture	Ramesh .(2007)
17	Bizzdesign's BPM approach		X	Process modeling and BPR	www.bizzdesign.com
18	Nine-step approach (Capgemini)		X	Process maturity based	www.capgemini.com
19	Goal driven BPM		X	Business process management	www.tibco.com
20	Fitzgerald and Murphy's implementation Methodology	X		Business process reengineering	Stoica, Chawat and Shin (2004) Fitzgerald and Murphy (1996)
21	BPM Implementation methodology		X	Workflow management and BPR	Burlton (2001)
22	BPR methodology		X	Business process reengineering	Hammer and Champy (2001)

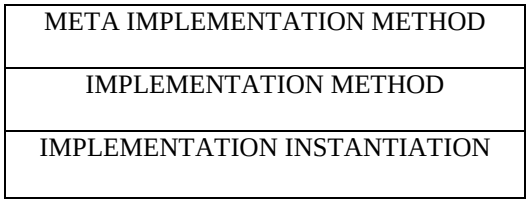
The methods in Table 1 basically propose a one-size fits all approach and do not take into account the specific situation of the organization in which business process management and supporting information systems or software applications are to be implemented. Although many

providers of implementation methods and tools do acknowledge the need to custom tailor their methodology to the situation at hand, they do not provide techniques to do this. In general, it is possible to say that this is the domain of the consultants lacking a scientific foundation; they are the professionals that should decide in which way a methodology should be used. This gives a lot of room for error because these consultants cannot be expected to have the experience and knowledge to be able to tackle every situation. Therefore, it is proposed that implementation methods are made more contexts dependent. This means that an implementation method should provide activities and steps that cater to many different situations. Also, such a method should provide analyses tools that help in tailoring the implementation methodology. Therefore, the research question is: How should a business process management systems implementation method that takes into account the situation in which it is used be developed?

As mentioned, one of the technologies to automate BPM is the state-of-the-art business process management systems that are used increasingly to support BPM and SOA implementation. This trend causes some organizations to think of BPM as an IT project instead of the implementation of a management strategy. Therefore, the use of a BPM system implies deep and enterprise-wide process analyses; and the inclusion of process performance measurement for continuous process monitoring and improvement (quality). Current contributions to academic and professional journals are more focused on what the BPM concepts is and why organizations start BPM projects (Aalst, Ter Hofstede, & Weske, 2003; Fremantle, Weerawarana, & Khalaf, 2002; Weske, van der Aalst, & Verbeck, 2004; Karagiannis, 1995; Ravesteyn & Versendaal, 2007). And while there is research on the maturity level of organizations that use BPM (Rosemann, de Bruin, & Hueffner, 2004; Harmon, 2004; Rosemann & de Bruin, 2005; Lee, Lee, & Kang, 2007; Hammer, 2007), the question of how a BPM system can be implemented and what business value it can bring continues to be unclear.

Figure 1 shows different levels of the generic implementation methodology concept (cf. Weske, 2007) and is used to clarify the importance of context. At the meta level, the language/ontology that is used to describe the implementation method is described. For instance, the implementation method can be described using different concepts, such as the terminology used by the ISO standard. A process modelling language, such as Petri nets or plain English text, could be used without any reference to existing models or methods. On the meta level, method engineering is a proven technique to develop a model (Brinkkemper, 1996) and will be used in this paper for the construction of implementation fragments. At the second level, the implementation methodology itself is described. All the phases, activities, roles, deliverables etcetera that are part of the method are explained in relation to each other. Often the methodology consists of tutorials, training material, decisions sheets and several templates that can be used to record information needed during the project or that is a deliverable. The third level is the actual implementation (project) in an organization. Often analyses of the specific organizational circumstances determine the best way to approach the implementation.

Figure 1: Three levels of an implementation methodology.

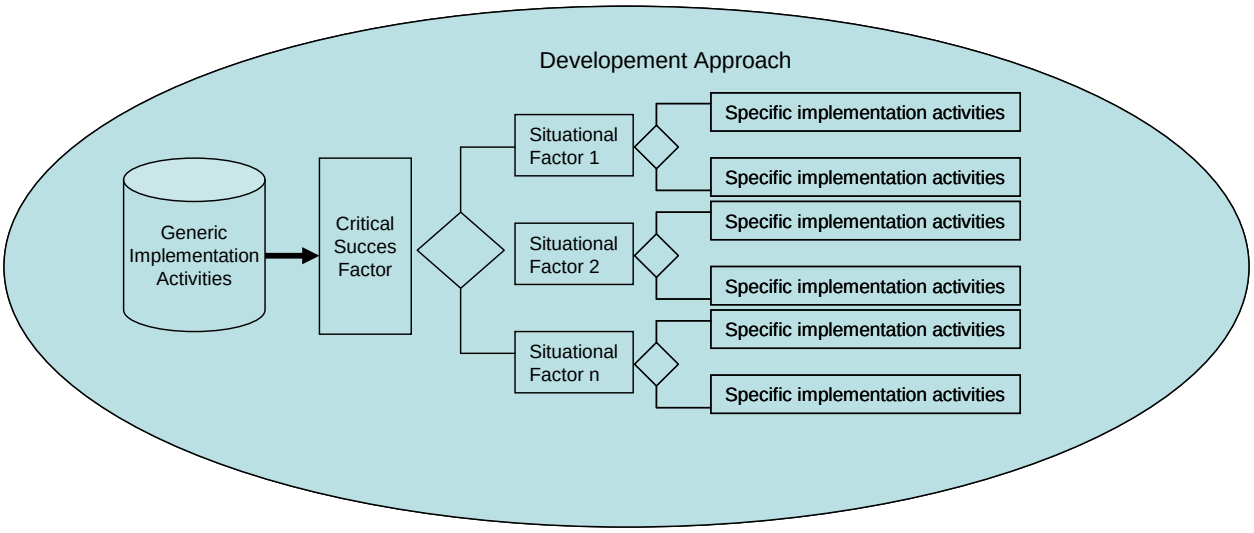


The remainder of this paper describes the development of a business process management implementation method that differentiates in use depending on the context in which it is used. The following section describes the development approach that was used; section 3 then gives an example of an implementation fragment; in section 4, the fragment is validated; and finally, conclusions and discussion give preliminary thoughts regarding this research and an overview of the work that still has to be done.

RESEARCH APPROACH

To develop a business process management systems implementation method that takes into account the specific context in which it is used, three major activities were performed (see Figure 2). First, critical success factors when implementing BPMS were defined. 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 & Peppard, 2002).

Figure 2: Approach taken to develop a context dependent BPM implementation method.



The list of factors is a first indication towards the context in which an organization is starting its BPM project. The list of critical success factors is based on the research by Ravesteyn and Versendaal (2007), see Table 2 for an overview.

Table 2: Critical Success Factors When Implementing BPM.

Critical Success Factors	
1	Know-how and experience with Project Management
2	Experience with Change Management
3	Understanding the Business Process Management 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 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

Secondly, a list of situational factors was developed. Situational factors are not necessarily BPM related, while success factors are. 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 basic, for instance the size of the organization in number of 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. Besides, these factors can also be BPM specific instead of generic. An example of this is the level of knowledge the organization's software developers (or more generally the people in the IT department) have with the development of web services. The use of web services in creating information systems 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 have been taken into account before the implementation starts.

The final activity is building a repository of implementation activities that is linked to the 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 business process management system. The different activities are found by analyzing existing implementation methods for BPM and other types of information systems and listing the different steps and activities that are proposed. Subsequently, these activities are added to different combinations of critical success factors and situational factors.

In this research, Method Engineering is used for the development of the BPM contextual implementation methodology because Method Engineering is used to study the extraction of method fragments from existing information system development methods to create new methods that have situational applicability (Brinkkemper, 1996).

BUSINESS PROCESS MANAGEMENT IMPLEMENTATION FRAGMENTS

In this section, the critical success factor, understanding the business process management concept, is used as an example to explain how implementation fragments are developed based on situational factors. As a first step, several situational factors were defined that can occur at a specific organization and that influence the activities that are done during the implementation of BPM.

The first situational factor that was defined was to determine the type of mindset by which the organization is organized. This factor is formulated as: 'Which kind of mindset about the business architecture is present in the organisation?' With this kind of mindset, the focus is on the way organizations look at the functions within their boundaries. There are two global ways of looking at the organizational functions; in a silo or process centric. When employees see their activities as processes and look further than their own department, understanding BPM becomes easier. When organizations function more like silos, more effort to promote understanding of BPM is needed (Jeston & Nelis, 2006). In the implementation method fragment, this situational factor influences the activities that are taken to implement BPM. In a silo-oriented organization, one must first gain understanding of the concept of processes and process ownership. Also, searching for industry standards or best practices is an activity that is to be undertaken. In a process-oriented organization, on the other hand, employees will understand the fundamentals of BPM a lot quicker. Process ownership will be partially in place or at least the importance of processes is recognized by management. This means that the activities in the implementation fragment (see Figure 3, first decision point) are different depending on the context.

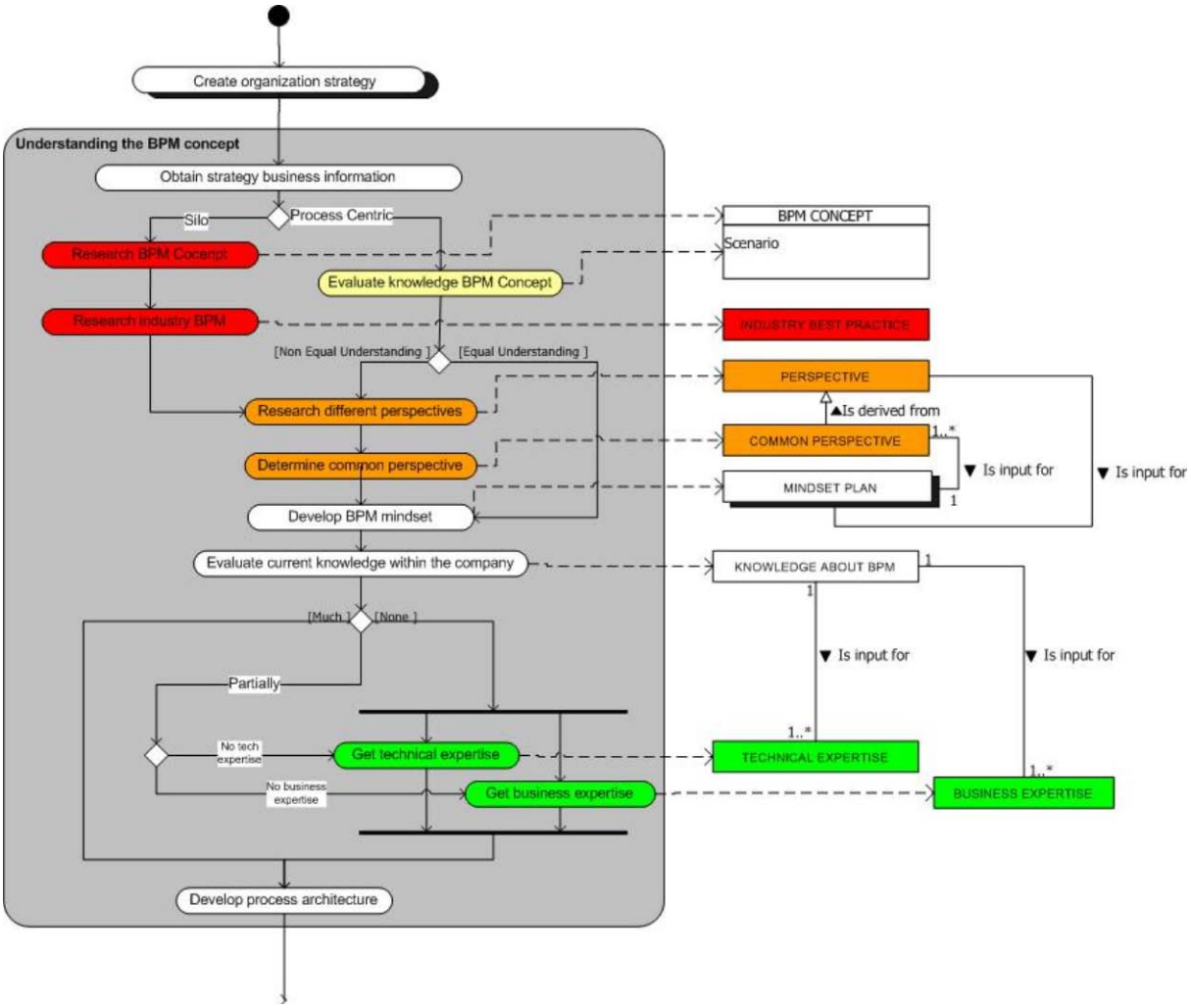
The second situational factor that is important is to determine whether there is a common understanding of the BPM concept? Although the mindset of an organization can be process centric, it is not necessarily implemented throughout the organization. There are many different definitions and opinions on BPM; and although these partially overlap, a commonly shared view is currently omitted (Jeston & Nelis, 2006; Ravesteyn, Batenburg, & De Waal, 2008). While there is not one "best" definition of business process management, it is important that everyone within an organization has a common language before implementing BPM. This is supported by Weske (2007), who states that having a common understanding of BPM concepts is important. Jeston and Nelis (2006) state that when there is a common language, most issues within processes can be resolved within a fraction of time. When common understanding is missing in the organization, an important implementation activity is to compare different perspectives and develop a common language regarding BPM. If this is already present within an organization, it is possible to skip these steps (see Figure 3, second decision point).

The third situational factor is the level of knowledge about the business and technology sides of BPM in the organization. It is possible to distinguish different levels of knowledge within an organization. In this research, the following three levels were defined: low, medium and high. When the level is low, the organization has no employees with knowledge or former experiences on either the business or technology aspect of BPM implementations. A medium level organization has employees that have knowledge and experience with one of the two aspects (business or technology) of BPM implementation; and a high level means that the organization has experienced employees in both the business and technology aspects of BPM

implementations. In Figure 3, the third decision point determines which implementation activities are relevant.

In Figure 3, a product deliverable diagram (according to method engineering) of the critical success factor "understanding the BPM concept" with the three situational factors integrated, is shown. The situational factors have been made visible in the diagram through decision boxes from which different routes can be taken based on the different situations. The method consists out of eleven main activities, which contain multiple sub-activities and concepts. Only the activities related to this critical success factor are shown in detail; furthermore, the rest of the model is based on the implementation framework of Jeston and Nelis (2006).

Figure 3: BPM implementation fragment for the CSF 'Understanding the BPM concept'.



As can be seen in figure 3 the first activity is 'Create organization strategy'. This activity is not a part of the Understanding the BPM concept implementation fragment. It is included to illustrate how different implementation fragments can be combined to form a context dependent

implementation method. Here, it used to ensure that project team members clearly understand the organization strategy, vision, strategic goals, business and executive drivers before trying to get a grip on the concept of BPM.

We will now explain the activity 'Understanding the BPM concept' in more detail. As a first step information about the business strategy is obtained. This is necessary to ensure that any BPM-systems implementation is aligned with the organizations strategy. After this is done the next step depends on the situation at hand. When the organization is still organized according to functions (silo oriented) and there is little to no active knowledge on BPM this should be obtained first. Researching information on process management such as definitions, industry standards and best practices are the activities which should be executed. If there is already sufficient information and knowledge on BPM this should be evaluated to determine if there is just one perspective on BPM or whether there are several. In case of the later one common mindset should be decided upon because for a BPM project to succeed one common vision on BPM (called mindset plan) is needed. Before being able to develop the business architecture it is important to also evaluate the knowledge and skills available on the methods and techniques for implementation of BPM. It is important to do this for both the business and technology domains. If any or both of these domains have a lack in skills than employees should be trained or expertise brought in from outside the organization. Finally when there is a common vision on BPM and the for the project available knowledge and skills are sufficient, it is possible to develop a business architecture for the specific project.

In table 3 a detailed description of the different deliverables (concepts) during the project is given.

Table 3: Concept table - "Understanding the BPM concept."

Concept	Description
BPM concept	A document that describes the best BPM scenario for the organization. For instance, based on the four scenarios as described by Jeston and Nelis (2006).
industry best practice	An industry best practice describes success stories for the implementation of BPM.
Perspective	A perspective is a view that can be from the governance, customer, product, IT, organization and management side.
Common perspective	A general perspective that has been chosen and documented.
Mindset plan	The mindset plan is a change management strategy that contains the chosen mindset towards business process management. This document also describes how to create common understanding between the employees.
technical expertise	Technical expertise is the knowledge and experience on a specific technical matter, which usually gained from experts--for example knowledge about SOA, this can be obtained by hiring an external party and/or training your own employees.
business expertise	Business expertise is the knowledge and experience on a specific business matter which usually gained from experts.

Above one example is given of an implementation fragment based on one critical success factor, for the remaining thirteen critical success factors implementation fragments have also been developed. The complete set of implementation fragments is available upon request to the

author. Together, the fragments form the basis for a context dependent business process management implementation methodology. The next section describes how the implementation fragments are validated.

VALIDATION

To validate the implementation fragments, several existing cases of BPMS implementation done at customers of the Cordys Company were used. Cordys is a global software company based in the Netherlands with offices across North and South America, Europe, China and India. They help companies to create more efficient and collaborative business environments by enabling IT systems to be integrated with new business processes using Web-services. This enables IT systems to rapidly respond to changes in business processes and to new business initiatives. While different case studies were used, we will only elaborate on the two cases that were used in validating the implementation fragment that was developed in relation to the critical success factor Understanding the BPM concept. The cases are referred to as International Financial Services Company (IFSC) and Car Services Company (CSC).

Case: International Financial Services Company

IFSC is an international financial services provider active in banking and insurance. The company offers its private, business and institutional customers a comprehensive package of products and services through its own distribution channels in cooperation with intermediaries and through other distribution partners. Its multi-channel distribution strategy gives IFSC the flexibility to meet its customers' needs for optimum availability and user-friendliness. A subsidiary of IFSC is the Local Insurance Company (LIC). LIC is a leading provider of disability income insurance, health insurance and pension plans in the Netherlands. The company employs over 600 people and runs complex financial insurance products through 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 the Cordys BPMS application. The BPMS implementation has to provide improvement of both business process management (BPM) and business activity monitoring (BAM) capabilities that already exist, as well as providing the flexibility and agility the organization needs to effectively manage its response to new legislative change. In a first project, the implementation of the Cordys platform 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 intuitive 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 in the Netherlands. The company also plans to leverage Cordys technology to better manage third party organizations, such as employers, by integrating business processes with Web Services and Portals using open standards. The company has a number of other projects in the pipeline that will see the creation of composite applications that combine existing and new functionality to improve various business processes.

If the implementation fragment (see Figure 3) as described in the former section is used for this second project, the implementation activities will be different than that in the first project.

Second time round the situation of the company has changed. The organization is already process oriented (which was also the case during the first project), it has developed a common understanding / language regarding the BPM domain; and during the first project, it has acquired the necessary skills in both business and technological issues for this BPMS implementation. Therefore, during this project, the company can start developing the process architecture based on the existing strategy and BPM mindset immediately. Because the participants in the process that will be improved in the second project are not necessarily the same as in the first project, it might be necessary to do some on the job training. However, the core of the BPM project team already attained the critical knowledge and experience needed for the project so in this part of the implementation fragment no further activities are proposed.

Case: Car Services Company

Since its founding, over 30 years ago, CSC has grown into the largest European car-service chain: it has 2,300 service points and 11,000 employees. All its activities in the Netherlands are controlled from the central office. There are 180 branches in the Netherlands, and this number is still growing. The company also has branches in the United Kingdom, Germany and France. Customers can stop by at CSC for maintenance, as well as new products for their cars. The combination of garage and retail activities requires a dynamic environment in which new services can be quickly developed and introduced.

CSC has selected Cordys as the basis for its new application architecture: a platform for linking and developing new and existing applications based on a SOA paradigm. The requirements for the new applications included quick implementation, additional functionality, transparency into the cost structure and the possibility to extend the solution to branches across other countries. Among others, the new application environment must offer greater flexibility in introducing new services, such as a full-service check and windscreen repairs. It also supports customer administration within all branch offices. The deployment of BPMS enables CSC to offer these types of services in a quicker and a more efficient way to improve the level of service it provides its customers. Because CSC does not have an in-house development department, they selected a third party for application development and hosting. This partner worked closely together with Cordys during the implementation of the BPMS.

Although CSC has had a long history of using IT to support functions within the organization, it has historically always been silo oriented. In regard to the Understanding the BPM concept implementation fragment, this means that before implementing BPMS the company (more specifically its management) should research the BPM paradigm and understand how it is different from the more traditional and hierarchical organizational model. There are a lot of standards available for the car industry (for instance product numbering) that are also used by CSC. However, the company did not have any knowledge on BPM standards and best practices within their sector and, therefore, had to explore them before continuing with the BPM initiative. Due to silo orientation, CSC had little experience with BPM, let alone a common language. In this case, it was decided to adapt the definitions from partners that were selected during the BPM exploration phase. Although the company had extensive knowledge on the legacy applications that were in use, they did not have the needed knowledge on web services development and BPMS. During the implementation, this knowledge was attained by training employees of CSC in both BPM business and technology issues. For instance, people were trained in how to

continuously improve processes by defining key performance indicators to measure performance and determine improvement alternatives. Also, the maintenance of the BPMS system and developed applications were part of the training program for part of the employees. These different implementation activities correspond with the developed implementation fragment and the route it suggests within this context.

This section described the validation of the BPMS implementation fragment that is related to the critical success factor Understanding the BPM concept. This implementation fragment is the first to be validated in this way; and currently, we are in the process of validating all the implementation fragments in the same manner. However, the first validation outcomes suggest that the implementation fragments are rich enough in different activities and routes to enable context dependent implementation approaches for business process management systems.

CONCLUSIONS

In this paper, it is shown that there are many different implementation methods available for business process management (systems). However, most of these methods do not provide a contextual approach to the implementation project and can be considered a one-size fits all. Because organizations operate in different contexts, they also need different ways of implementing business process management. Therefore, a context dependent BPM(S) implementation methodology is proposed that is based on critical success factors of BPM projects and situational factors that are company specific. Both the critical success factors as the implementation activities used in this research are based on earlier research and existing implementation methods. Situational factors are based on commonly known differences with organizations.

In total, 14 business process management systems implementation fragments have been developed. Each fragment takes into account several contextual factors and thereby enables the development and use of a tailor made BPM(S) implementation methodology for a specific organization. This paper describes the process of development of implementation fragments and illustrates the results by an example based on the critical success factor Understanding the BPM concept.

The validation suggests that the fragment is able to foresee in different situations and can realize added value by lessening the chance of failure in a BPM(S) project.

DISCUSSION AND FUTURE RESEARCH

The objective of this research was to develop a context dependent implementation methodology for BPM(S). Currently, the proposed method contains 14 implementation fragments. However, this is just the foundation. Although the critical success factors on which the method is based guarantee that the most important implementation activities are included in the method, the method still needs to be extended. There are many more factors (both success- and situational factors) that can be included together with their corresponding implementation activities. While future research will extend the methodology, it will never be completely ready; there will always be possibilities for extensions with more activities or to other sectors, cultures, etc. To get this

implementation approach broadly accepted, it could be turned into an open source research project were both scientific researchers and professional practitioners can add new parts to the method.

Besides adding more content to the methodology, the current implementation fragments need more validation. Each fragment should be tested in several projects before it can be considered completely validated and usable. Furthermore, the fragments are developed using method engineering but because several people were involved in the research project the quality of the fragments differ. Extra effort is needed to control all fragments and if necessary update them to maintain a consistent level of quality.

REFERENCES

Aalst van der, W. M. P., ter Hofstede, A. H. M. & Weske, M.(2003). Business Process Management: A Survey. In *Business Process Management, Proceedings of the First International Conference.* Springer Verlag.

Aalst van der, W. M. P., & Van Hee, K. (2002). Workflow Management Models, Methods, and Systems, The MIT Press Cambridge, ISBN: 0-262-01189-1

Brahe, S., & Bordbar, B. (2007). A Pattern-based Approach to Business Process Modeling and Implementation in Web Services. Danske Bank & IT University of Copenhagen, Denmark.

Brinkkemper, S. (1996). Method engineering: engineering of information systems development methods and tools. *Information & Software Technology,* 38(4), 275-280

Burlton, R. T. (2001). *Business process management: profiting from process* (1 ed.). Indianapolis: Sams publishing

Curtis, B., & Aalden, J. (2006). Business Process Improvement Guided by BPMM, BPTrends Column, November 2006. http://www.capabilitymeasurement.com/downloads/11-06-COL-BPM&OrganizatonalMaturity-Curtis-Alden-Final.pdf

Fitzgerald, B., & Murphy, C. (1996). Business Process Reengineering, The Creation and Implementation of a Methodology. *The Canadian Journal of Information Systems and Operational Research.*

Fremantle, P., Weerawarana, S., & Khalaf, R. (2002). 'Enterprise Services: examining the emerging field of web services and how it is integrated into existing enterprise infrastructures', *Communication of the ACM*, 45(10), 77-82

Hammer, M. (2007). 'The Process Audit', *Harvard Business Review*, april 2007

Hammer, M., & Champy, J. (2001). *Reengineering the Corporation: A Manifesto for Business Revolution*, updated and revised, New York, Harper Business.

Harrison-Broninski, K. (2005). *Human Interactions: The Heart and Soul of Business Process Management*, Meghan-Kiffer Press (www.mkpress.com)

Harmon, P. (2004). Evaluating an Organisation's Business Process Maturity. *Business Process Trends*.

Harmon, P. (2003). Whitepaper: An Introduction to the Supply Chain Council's SCOR Methodology. Business Process Trends.

Jennings, N.R., Faratin, P., Johnson, M.J., Norman, T.J., O'Brien, P., & Wiegand, M.E. (1996). Agent-based business process management. *International Journal of Cooperative Information Systems* 5(2&3), 105-130. Retrieved February 17, 2008 from: http://kuba.korea.ac.kr/~ixix/Article/agent/ijcis96.pdf

Jennings, N.R., Faratin, P., & Norman, T.J. (1998). ADEPT: An Agent-Based Appraoch to Business Process Management. *SIGMOD Record*, 27,4,32-39. Retrieved February 17, 2008 from: http://www.springerlink.com/content/fnlv8ngne0w0fgl4/fulltext.pdf

Jennings, N.R., Faratin, P., Norman, T.J., O'Brien, P., Odgers, B., & Alty, J.L. (2000). Implementing a Business Process Management System Using ADEPT: A Real-world Case Study. *Applied Artificial Intelligence*, 14, 421-461.

Jeston, J. & Nelis, J. (2006). *Business Process Management, Second Edition: Practical Guidelines to Successful Implementations*

Joseph A. De Feo & William Barnard. (2005). *JURAN Institute's Six Sigma Breakthrough and Beyond - Quality Performance Breakthrough Methods*, Tata McGraw-Hill Publishing Company Limited.

Kamolvej, P. Sirisuk, P. & Tungchitipunya, K. (2007). Workflow Engine for Enterprise Process: System Integration via XML Webs Srvice. *Communications of the IIMA*, 7(3), 25-36

Karagiannis, D 1995, 'BPMS: business process management systems', *SIGIOS Bull*, 16(1), 10-3

Kettinger, J.W., Teng, J.T.C., & Guha, S. (1997). Business process change: a study of methodologies, techniques, and tools. *MIS Quarterly*, 21**,** 55-80.

Krafzig, D., Banke, K., & Slama, D. (2005). *Enterprise SOA : service-oriented architecture best practices.* Prentice Hall Professional Technical Reference, Indianapolis, IN.

Lee, J., Lee, D., & Kang, S. (2007). *An Overview of the Business Process Maturity Model (BPMM).* APWeb/WAIM 2007 Ws, LNCS 4537, pp. 384-395.

Lippert, S.K., & Govindarajulu, C. (2006). Technological, Organizational, and Environmental Antecedents to Web Services Adoption. *Communications of the IIMA,* 6(1), 146-158.

Malone, T.W., Crowston,K., & Herman, G.A. (2003). *Organizing Business Knowledge: The MIT Process Handbook.* MIT Press

Rajagopal, P. (2002). An innovation-diffusion view of implementation of enterprise resource planning (ERP) systems and development of a research model. *Information & Management*, 40(2), 87-114.

Ravesteyn, P., Batenburg, R., & De Waal, B. (2008). In Search of Competencies Needed in BPM Projects. *Communications of the IIMA,* 8(2), 23-30

Ravesteyn, P., & Versendaal, J. (2007). Success Factors of Business Process Management Systems Implementation. In Toleman, M. (Ed.) *Australasian Conference on Information Systems.* Toowoomba, Australia, University of Southern Queensland.

Rinderle, S., Kreher, U., & Dadam, P. (2005). Adaptive Process Management with ADEPT2. *Proceeding of the 21st International Conference on Data Engineering*.

Rosemann, M., de Bruin, T., & Hueffner, T. (2004). A Model for Business Process Management Maturity. *In Conference Proceedings of ACIS 2004*.

Rosemann, M., & de Bruin, T. (2005). Towards a Business Process Management Maturity Model. *Proceedings of the 13th European Conference on Information Systems (ECIS 2005)*. Regensburg, Germany. 26-28 May 2005.

Scheer, A.W., & Nüttgens, M. (2000). *ARIS Architecture and Reference Models for Business Process Management*. Lecture Notes in Computer Science, 1806, 301-304. https://www.myuu.nl/http://www.springerlink.com/content/fnlv8ngne0w0fgl4/fulltext.pdf

Stoica, M., Chawat, N., & Shin, N. (2004). An Investigation of the Methodologies of Business Process Reengineering, School of Computer … - 2004 - isedj.org

Ward, J., & Peppard, J. (2002). *Strategic Planning for Information Systems*. 3rd edition, John Wiley & Sons, Chichester, England.

Weske, M., Van der Aalst, W.M.P., & Verbeek, H.M.W. (2004). Advances in business process management. *Data & Knowledge Engineering*, 50, 1-8.

Weske, M. (2007). *Business Process Management: Concepts, Languages, Architectures*. Springer 2007.

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