Building a Composite Model of Business Process Management with System Development Life Cycle: An Action Research on Multiple Systems

Shari Shang
Assistant Professor, National Chengchi University
NO.64,Sec.2,ZhiNan Rd.,Wenshan District,Taipei City 11605,Taiwan (R.O.C)
886-0229393091*88085
shari_shang@yahoo.com

Ya-Ling, Wu
Ph.D, National Chengchi University
NO.64,Sec.2,ZhiNan Rd.,Wenshan District,Taipei City 11605,Taiwan (R.O.C)
886-0229393091*81048
94356502@nccu.edu.tw

Abstract

Business Process Management (BPM) methods analyze, assess and design business processes. Although it is praised for business alignment and adaptability, this kind of method is in its initial stage and has its shortcomings in regard to detail system development and execution. However, System Development Life Cycle (SDLC) methods, though lacking a cautious consideration of business strategies, carefully examine functional goals and provide detail guidelines for system development and implementation. To operationalize the BPM methods and to enhance the applicability of SDLC method in a higher business level, examining features of these two methods and proposing a proper model with complementary features incorporated, would be beneficial .By applying an action research, this study empirically validated and enhanced the proposed integrated BPM/SDLC method through: detection, planning, action and monitoring, as well as the reflection and evaluation processes. A spiral cycle of model development, modification and enhancement, was adopted with the installation of three different kinds of systems. The research result is a composite model which focuses on successful BPM. Study findings reveal that the most significant benefit of the involvement of SDLC for business process management is to provide a complete framework with instruments and guidelines for an executable process system.

Keywords: Business Process Management, System-Development Life Cycle, Action Research

1. Introduction

Businesses today are confronting the challenge of managing a highly responsive and flexible practice in a constantly changing environment. BPM methods with the objective of providing process adaptability include planning, designing and managing business processes in a changing environment (Charlesworth, 2004; Nurcan and Edme, 2005). Although many studies (Burlton, 2001; Khan, 2004) perceive the adaptive and influential power of the BPM approach in organizational management, until now, the application of BPM method is still at the initial stage of concept building and clarification; many methods and functions are still in development (Shang, 2005). In one hand, modern technology has actually matured enough to carry out data analysis and operation integration with a BPM methodology. In addition, the traditional SDLC methodology has been well applied in designing and implementing information systems for various kinds of organizations. However, SDLC method could not accomplish the goal of alignment with overall business objectives. Because of the complementary potential between BPM and SDLC methods and the mutual goal of designing executable business processes with advanced information technology, there is a need for a thorough study on the integration of these two methods. This study aimed to compare and integrate the BPM and SDLC methods with the objective of building a practical method for a business process management system. The study employed action research (Kemmis and McTaggart, 1988; Pan, 2005) to examine insufficient features of the BPM method in redesigning a lengthy operational process, and tested the proposed integrated BPM/SDLC method in two different systems with iterative modification and

enhancement to the proposed method. Through the processes of "detection or observation", "planning", "action and monitoring" and "reflection and evaluation" in action research (Elliott, 1991; Somekh, 1995), we applied a BPM System to implement the three systems and enhanced the method by offering a spiraling cycle with regard to the characteristics of the three different kinds of system. The result is the refined BPM implementation method with analysis of its applicability in business process management.

2. Business Process Management and System Development Methods

2.1 Business Process Management (BPM)

Differing with the traditional process automation and process quality improvements, Michael Hammer (1990) and Tom Davenport (1992) proposed the growing wave of process revolution and fundamental business process change through information technology. Ever since, the business environment has been increasingly competitive and continuously changing, and business processes were therefore, continuously experiencing new waves of management approaches. These changes were prompted by IT and Communication technologies (ICTs); such as the Internet, analytic tools of businesses, business integration interfaces, and enterprise systems (such as Enterprise Resource Planning (ERP) systems, etc.). In general, business process is a procedure for transforming the resources of an organization into a product or service to comply with all stakeholders' requirements (Rakich *et al*., 1992; Hammer and Stanton, 1995). To satisfy stakeholders, business processes have specific goals of organizing processes through an interrelated network of actor, activity and artifact (Davenport and Short, 1990). From the view of workflow, Gartner's research (Logan and Sinur, 2003) claimed BPM is the technology that deals with commercial affairs and manages related resources in the business process, from end to end. The BPM framework is also a method for improving specific processes and establishing business goals and managerial strategies (Poirier *et al.*, 2003). Although BPM, to date, is still in its early stage, its development is quite rapid. The users can comprehend BPM from the graphical form of business process flow and pattern, whereas MIS staffs can understand the process logic and its links with business goals (Charlesworth, 2004; Nurcan and Edme, 2005). Many researches (Chang, 2006; Harmon, 2002; Grover and Kettinger, 1995) had developed approaches which constitute the BPM framework with: analysis of business goals and current process, future process redesign, and improvement execution. Since Burlton's (2001) BPM method provides guidelines with respect to 'best practice' of the business process management, this study analyzed the BPM method based on Burlton's (2001) framework.

2.2 BPM Framework and System Development Methods

Table 1. Analysis of BPM Framework and SDLC

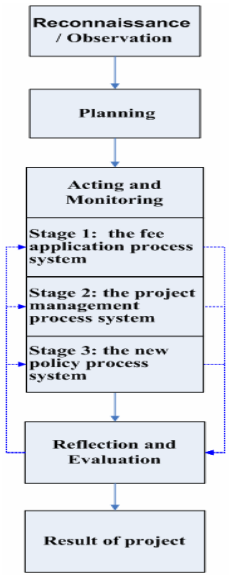
	SDLC	**BPM Framework**
Purpose	To develop an information system	To optimize and adapt their processes
Process	1.Planning development project and selecting the final project 2.Analyzing the selected project 3.Designing the project 4.implementing and operating Specific project	1. Defining the business context for change 2. Architecting processes and aligning business strategies 3. Creating the vision for change 4. Understanding the existing process 5. Renewing the process design 6. Developing enablers and support mechanisms 7. Implementing the change 8. Operating process and continuing to improve
Output	Information system	In the long term, BPM is a model which can constantly respond to change
Influence	The range of influence is directly related to the proportion of specific function to organizational operation.	The most critical influence is to allow the enterprises to have more flexibility when facing changes in the external environment.

Scale	The scale depends on the range involved with the function which might extend to the whole organization	1. Actor: organizational employees, suppliers, customers, organizations of the same industry, and partners 2. Activity: a process mechanism 3. Artifact: without the limitations
Target	Direct and indirect system users.	IT staffs of BPM, BPM teams, managers, and stakeholders
Possible difficulty	1.Conflict of interests and crowding effectiveness of the cost 2.the adaptable period might extend and influence organizational operation 3.Resistant behavior	1. Process management might be biased when being implemented from top to the bottom. 2. Resistant behavior 3. The practical aspect is too broad. 4. Trying best to involve BPM in corporate culture.

As for the system development and implementation models, in general, SDLC prescribes the process of system development which starts with feasibility analysis through system analysis, system design, system development, system implementation, to system evaluation (Silver and Silver, 1989; Hoffer *et al.*, 2002). Under this framework, from problem-finding to solution implementation (Monarchi and Puhr, 1992), it has maturely developed analytic and design tools. Nevertheless, with the speedy development of technology and complicated business environment, the request of all enterprises for system development has also reached highly flexible and speedy levels. Since passively responding to the customers' requirements for developing and renewing systems no longer kept up with the speed of business change, SDLC was in a predicament (Wu and Lin, 2004). Meanwhile, the BPM method provides the enterprise-wide view on processes and connects process flows with a higher level of organizational objectives.

3. Research methods

Table 2. The Process of BPM System Development

Process figure	Why	How	Result
	Focusing and analyzing problem	Exploring the facts and clarifying problems	The gap between the BPM framework and methods
	Planning possible solutions	Reading and analyzing the related information	SDLC and BPM can complement each other
	1. Finding the lack of BPM	1.Implementing the fee application process system	1.Can expect the result of revolution
	2. Confirming if our composite methodology can completely record the related information	2.Implementing the project management process system	2.Can not completely reveal the process aspect of the system
	3.Confirming if the modified methodology can be applied to more complicated enterprises	3.Implementing the new insurance policy process system	3. Can completely reveal each stage of the system development
	Confirming if the problem is solved	The research examines the completeness of the action as the criterion of recycle planning	By acting third system, this study had validated the feasibility of this method
	Showing the whole context of the research	Writing the research report	This methodology can efficiently assist with system development

Integrating the BPM framework and SDLC methods is a new approach. We need to explore features of both, with the design model incorporating both and test the method by repetitive validations and refinements. This study adopted action research (Lewin, 1946) to plan the dynamic process of model building and testing (depicted in Table 2). During the process, the researcher plans and executes solutions, and further evaluates and modifies the proposed solutions. Through the four processes in action research; "reconnaissance or observation",

"planning", "acting and monitoring" and "reflection and evaluation" (Elliott, 1991; Somekh, 1995),we used the reflective-spiral cycle to test and validate the three process design and implementations by a software tool, which is a workflow system and developed by Ultimus (2005). The three systems tested are: the fee application process, the project management process and the new insurance policy process systems (such as Table 3). The reason for the three cases being selected was that they reveal various patterns of business processes.

Table 3. Descriptions of the Three Process Systems

System	Organization	Industry	Process	Stakeholders	Technology applied
The fee application process	Non-profit organization	Educational industry	Sequential	Internal operational staff	Functional application
The project management process	Small and medium enterprise	Software consulting industry	Sequential and reciprocal	Interaction among internal staff	Connecting with ERP applications
The new policy process	Large-scale organization	Insurance industry	Sequential, reciprocal and network	Interaction among internal and external stakeholders	Connecting with customers through the Web

4. Acting process of BPM System development

4.1The First Stage: The Fee Application Process System

This process is a sequential process designed with multiple levels of approval in a university. Through structured analysis and in-depth observation of the linkage between business objective and actual procedure, we discover process and paper work redundancies in the flow. The related process was long and time-consuming, while containing repetitive procedures and unneeded information. After discussions with related stakeholders, we proposed a streamlined process with the steps of official document printing and verification removed, and several approval steps combined. The simulation function revealed that the new process time was considerably reduced. Guidelines and tables of BPM methodology (such as Table 4) were helpful in analyzing business issues, business barriers of implementation, critical factors for process success and user reaction to the new process. However, the gap between process system and stakeholders' requirements remained unsolved. This disparity has led to the need for a meticulous analysis of data and operation needs for proper system design.

Table 4. The composite Methodology of BPM System Development

BPM framework	Used SDLC components	Implementation content
Defining the business context for change	▪ Project charter	Detecting the change and accessing the business environment and goals
Architecting processes and aligning business strategies	▪ Project charter	Adjusting and analyzing the differences among stakeholders' requirements, organizational strategies and process
Creating the vision for change	This stage did not use the SDLC component	Proposing the final goal of improvement based on present problem
Understanding the existing process	▪ Business requirements ▪ Data requirements ▪ Functional requirements ▪ Access/Security requirements	Integrating the current process and discovering the improvement of the process
Renewing the process design	▪ Application design ▪ System design ▪ Technical design	Combining a change of vision and proposing the renewal process
Developing enablers and support mechanisms	This stage did not use the SDLC component	Developing the guideline, techniques and capacities of process renewal
Implementing the change	▪ General ▪ Screen layout ▪ Menu construction	Using logic design and physical design patterns to accomplish the implementation of BPM system
Operating process and	▪ Vendor testing	Executing and maintaining all systems to keep on

continuing to improve	▪ User acceptance test	strengthening the whole process

4.2 The Second Stage: The Project Management Process System

The project management process of a software consulting industry was in a semi-automatic form. The activities, such as filling in forms, dispersed asset management, etc., were based on paper. These data were not connected with the enterprise resource planning (ERP) system and the project members were only exposed to their own related functions. Therefore, this study divided current process into sub-processes and re-designed the process system with regard to extra, non-electronic, or dispersed processes. After the implementation of system, this study proposed process management plans, such as integrating the independent systems, adding performance examination, and the components of customer relationship. We then analyzed the completeness and compatibility of this methodology. As for compatibility, since SDLC method complements BPM method in the area of system development, the SDLC components were easily merged into the BPM framework and did not cause conflict in the implementation process. As for completeness, SDLC components could lead to systematic records in terms of the analysis and design during the system development process. However, the greatest difference between the process system and general information system was that information system development was function-oriented, whereas the process system focused on process across functions. Thus, the system analysis of SDLC method could not provide a complete view of the process with organizational structure and stakeholders' points addressed. From the implementation result of the second system, we found that current methodology would need to be enhanced with a complete view of the process. The following was the modified version of this methodology. This study has modified our integrated methodology and mainly focused on increasing seven components of the process aspect (see Table 5).

Table 5. Modified BPM System Development Methodology

BPM Framework	SDLC Components	Increased Components
Defining the business context for change	▪ Project charter	(1) Business change evaluation
Architecting processes and aligning business strategies	▪ Project charter	(2)Business process relation figures
Creating the vision for change	This stage did not use the SDLC component	(3) Change vision plan
Understanding the existing process	▪ Business requirements ▪ Data requirements ▪ Functional requirements ▪ Access/Security requirements	(4) Process analysis
Renewing the process design	▪ Application design ▪ System design ▪ Technical design	(5) Process design
Developing enablers and support mechanisms	This stage did not use the SDLC component	(6) Equipment renewal list
Implementing the change	▪ General ▪ Screen layout ▪ Menu construction	(7) System test log
Operating process and continuing to improve	▪ Vendor testing ▪ User acceptance test	

4.3 The Third Stage: The New Insurance Policy Process System

The third system is a reciprocal and network process of policy management in a large-scale insurance company. Through the observation of this organization, we discovered that its process consumed plenty of labor resource to examine the correctness of each form which went through departments many times for double-checking different sections of the policy. Therefore, the goals of the process management are to ensure accuracy and reliability as well as increase

efficiency for customers. In the redesigned process, we created a web-enabled contact center linking administrative units with sale agents, and insurers. This hub of stakeholders' contacts controlled the refined procedures of the policy evaluation and provided complete information on the policy. This study re-evaluated this modified methodology (see Table 5) from the aspects of completeness, compatibility, and efficiency of system development.

(1) Completeness: this study found that this methodology could completely cover the scale of actual development and considered process from diverse dimensions and increased the dynamic process aspect in system analysis. When facing a more complicated system, various needs and the roles of the stakeholders at each process should be analyzed. Hence, using this methodology to completely analyze the business context is helpful for the completeness and practicability of system design which could successfully accomplish system development and installation. On the other hand, a complete analysis of the business context is beneficial for mastering an effective process design and improvement. This methodology organizes functional processes under the structure with detailed system process analyzed; it provides a close link with the data and defined interfaces between sub-processes according to different users. Consequently, each stage of the system development could be completely revealed and evaluate the environmental changes and relationships among business processes. Hence, this integrated methodology could strengthen the responsiveness to business changes and control the integration of business and systems.

(2) Compatibility: In the third system implementation, we designed various specific components of process development into the BPM framework. Through the implementation of the third system, the two distinct methodologies were found to be more compatible in achieving the goal of process management success. The components designed by this methodology all started from the overall process and were elaborated with consideration of system design in sub-processes. They seem to work in concert in the process system implementation.

(3) Efficiency of System Development: Although the third system is more complicated, the duration of design and implementing stages in process system development is reduced. We suppose that the integrated methodology of the BPM framework and SDLC components allow the analysis of data to be more concrete. Hence, the percentage of the duration of data collection and analysis in the system development stage is reduced in the whole process system development cycle. Learning from the three system implementation, the duration of observation and analysis stages of process system development was gradually increased. Meanwhile the time taken for process system design and implementation was reduced. The business analysis stage seems helpful in the implementation of the system and future maintenance. Therefore, this methodology can facilitate the process integration of cross-organization.

5. Conclusion

The objective of this study was to propose a composite methodology of BPM method, with essential SDLC methods incorporated. Through action research, this study concretely implemented and installed systems for three different kinds of process in order to repetitively adjust and strengthen this methodology. Therefore, the composite model of PBM/SDLC methodology reveals that the value of the involvement of SDLC methodology was to provide a complete guideline for the design of the process system which can accelerate the efficiency of business process system implementation. The complete track of process design linking with system design and testing and implementation, is helpful for the knowledge management of the process system. On the other hand, process system development focused on the understanding and analysis of the current process, and created the vision for process revolution through process analysis. The view of organizational processes is a major part that permits SDLC methodology to

be enhanced. Consequently, this methodology has the characteristics of integrating different stakeholders' requirements, increasing the efficiency of system development, providing process extension, and upgrading business capacities for contingencies.

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