

BPM과 SOA기반의 비즈니스 프로세스 자동화와 분석기법

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Business Processes Automation and Analysis Techniques by Using BPM and SOA

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요 약

최근 대규모 비즈니스 시스템을 효율적으로 운영하고 자동화하기 위해 기법으로 BPM과 SOA의 융합이 제안되고 있으며, 운영데이터로부터 매일 의미 있는 정보를 생성할 필요성이 증가하고 있다. 본 논문에서는 BPM-SOA 융합을 통해 비즈니스 프로세스 자동화 방법론을 제시하고 실제 프로젝트 관리 비즈니스 프로세스를 구현하여 검증한다. BPM-SOA 융합은 약 결합된 시스템 구조를 통해 향상된 확장성과 생산성을 제공하며 잦은 변경과 프로세스 재사용에도 장점이 있다. 그 다음, 기존 시스템에 새로운 비즈니스 프로세스가 추가될 때 시스템의 확장성을 분석한다. 마지막으로 의사결정을 지원하기 위한 SAP 비즈니스 인텔리전스를 이용하여 BPM에서 생성된 데이터를 분석한다. 비즈니스 인텔리전스는 의사결정에 유용한 정보를 제공할 뿐만 아니라 비즈니스 프로세스 최적화 기회를 제공한다.

Abstract

Recently, a combination of Business Process Management (BPM) and Service Oriented Architecture (SOA) is being recommended as the best approach for automating large business systems. And the need to create meaningful information from daily operational data is increased today. In this paper, we propose a methodology for automating business processes based on the BPM-SOA convergence trend and verify the methodology by implementing the project management business process. BPM-SOA convergence provides higher extensibility and productivity due to the loosely coupled system construction and maintenance. The system has good properties for frequent process changes and reuse of duplicate processes. We then analyze extensibility of the system as new business processes are added to the existing system. We finally analyze the data generated by BPM by using SAP business intelligence to support management's decision making and strategy.

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• 투고일 : 2009. 04. 17, 심사일 : 2009. 04. 18, 게재확정일 : 2009. 04. 27.

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* This work was supported by the research grant of the Chungbuk National University in 2007.

Business intelligence provides not only useful data for business decisions but also chance to optimize the business processes.

- ▶ Keyword : Business Process Management (BPM), Service Oriented Architecture (SOA), BPM-SOA Combination, Business Intelligence (BI)

1. Introduction

Recently, the combination of Business Process Management (BPM) and Service Oriented Architecture (SOA) is being recommended as the best approach for automating large business systems. A business process is a collection of related, structured activities that produce a service or a product that meets the needs of a client [1]. These processes are critical to any organization as they generate revenue and often represent a significant proportion of cost. SOA is a computer system's architectural style for creating and using business processes, packaged as services, throughout their lifecycle. Enterprise architects believe that SOA can help businesses respond more quickly and cost-effectively to changing market conditions [2]. The activities of the business process management can be grouped into five categories: design, modeling, execution, monitoring, and optimization. Business Process Management System (BPMS) is a system that provides automation of these activities in a package.

Most organizations have common difficulty to manage the R&D projects efficiently: repeated tasks, no standard, and frequent change of task assistants etc. Although government encourages a centralized system such as ERP(Enterprise Resource Planning) for managing these projects, efficient management is still difficult because of the differences among various projects and newly generated projects. BPM-SOA is a very useful tool to solve these difficulties because of its agility and extensibility.

In this paper, we propose a methodology for automating business processes based on the BPM-SOA convergence trend. We then apply the methodology to the automation of business processes for the project

management in the universities. We then analyze extensibility of the system as new business processes are added to the existing system. Another objective of this paper is to propose analysis method for the huge data generated by the BPM by using Business Intelligence (BI) technology. BI technologies are defined as specialized tools for data analysis, query, and reporting (such as OLAP and dashboards) that support organizational decision-making that potentially enhances the performance of a range of business processes [3]. And it's not only method to make useful data for business decisions but also gets feedback to improve existing business processes.

The organization of the paper is as follows. In Section 2, we look at related work. In Section 3, we present the framework for automating business processes based on BPM-SOA. In Section 4, We implement a real business (project management) by using u-Engine BPMS[4]. In Section 5, we analyze the data generated by BPM by using SAP business intelligence to support management's decision making. Finally, we make conclusion and provide future work at Section 6.

2. Related Work

Three main technologies, SOA, BPM, and BI(Business Intelligence), are widely used to solve the business processes automation problems. In this section, we introduce these technologies in detail.

Today, according to many specialists of different international companies, combining SOA and BPM makes the work more easy and simple [5]. Using these tools we can escape a lot of difficulties like, financial expenses, reducing time, exchange data simply. SOA and BPM are necessary tools for big companies. Here, we give a detailed description of

SOA & BPM and their advantages.

Service-oriented architecture (SOA) is a method for systems development and integration where functionality is grouped around business processes and packaged as interoperable services [1]. SOA also describes IT infrastructure which allows different applications to exchange data with one another as they participate in business processes [1].

Business Process Management (BPM) is a management practice that provides for governance of a business's process environment toward the goal of improving agility and operational performance [5]. BPM is a structured approach employing methods, policies, metrics, management practices and software tools to manage and continuously optimize an organization's activities and processes [5]. Business Process Management is the best tool for automating the dynamic processes. Absolute advantage of this process is user satisfactory and possibility to change to the requirements of your business.

Business Process (BI) is a set of concepts, methods, and processes [6] to improve business decisions, which use information from multiple sources and apply experience and assumptions to develop an accurate understanding of business dynamics [7]. With appropriate BI, a company will be able to develop intelligent decision support systems to gain the competitive advantage of the industry [8]. Gartner's 2006 CIO survey showed BI as their highest rating technology issue: as they focus on projects that enable users to positively affect financial and business performance [9]. BI technology refers to an important class of systems for data analysis and reporting that provide managers at various levels of the organization with timely, relevant, and easy to use information, which enable them to make better decisions [10]. BI technologies are rapidly being adopted to provide enhanced analytical capabilities to previously installed ERP systems, which manage and integrate a very large array of business information [3]. Many companies such as Oracle, IBM and SAP provide business

intelligence packages. In this paper, we use SAP BI 3.5 to analyze operation data in BPM.

3. Framework for the Automation of Business Processes

In this section, we propose a framework for automating business processes by using BPM and SOA convergence. The framework consists of six steps from system discovery to system evaluation. We explain each step in the next.

(1) System Discovery

This step is showing us a clear picture about the business processes. Discovery means becoming explicitly aware of how things are actually done, as opposed to what is said to be done [11]. Various user's requirements are derived at this step.

(2) System Design

System design means modelling, designing, simulating and redesigning the process as the organization learns what is possible[12]. Various tools such as BizAgi[12] can be used for the system design and documentation. BizAgi includes Business Process Management Notation(BPMN), a graphical notation that describes the logic of steps in the business processes [12].

(3) System Deployment

It is rolling out new processes to all participants, including people, applications and other processes. Various tools, such as u-Engine 3.0[4], can be used in this step.

(4) System Execution

This step means that the new business process is carried out by all participants - users, organizations, systems and other processes. Data delivery and message notification should be checked at this step.

(5) Operation & Optimization

The next important step is management (operation) and optimization work. It is possible to

appear some unforeseen circumstance, and we must check frequently and not forget to update our functional and technical specifications that are upgrading the process on the fly, adding, removing and changing participants in the process.

(6) System Evaluation

One of the main targets is comfortability to use, simple design, and simple process and of course we saved our time, using visual designing without programming code.

4. BPMN Modeling for Business Processes

In this section, we model business trip processes by using BPMN diagram and we present the implementation of the business trip processes via u-Engine BPMS.

4.1 BPMN Notation [12]

Figure 1 shows the components of the BPMN diagram, which are to be used in the modeling of business processes. The rectangle node represents a unit task, and the link shows the flow of business processes. The diamond node represents conditional branches. In the diagram, we have one starting nodes and four end nodes.

Mark	Type	Description
	Start	Starts a process flow
	End	Ends a process flow
	Conditions	Give condition for the current process
	Message Event	Notification by message
	User Task	Human – performer, perform the task.
	Send Task	Task that is designed to send a message
	Receive Task	Task that is designed to wait a message
	Normal Sequence	Normal Sequence Flow.
	Message Flow	Show the flow of message

Figure 1. The BPMN diagram for business trips

4.2 Automation and Evaluation of the Business Processes

To demonstrate the effectiveness of the

implementation, we constructed a prototype system. We utilize u-Engine [4] as the BPMS to make the automation more easy, simple, effective, efficient, and more convenient.

u-Engine [4] is a powerful open source tool for the automation of the business processes. By using this tool, we automated the business trip processes just by using GUI tools instead of coding. Flow of the work can be seen by a graphical monitor with a flash support. u-Engine also supports SOA, UDDI, and SOAP, which provide various advantages in the SW development and maintenance.

Figure 2 shows the workflow of the business trip processes generated by the u-Engine. By using BPMN, we can draw business trip processes as shown in Figure 3.

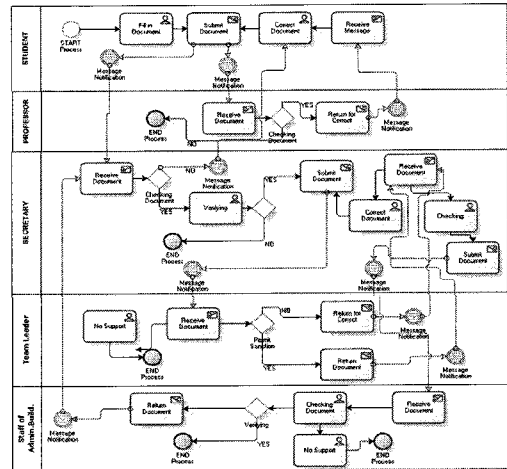


Figure 2. BPMN for the Business Trips

There are five lanes in the BPMN diagram: student, professor, secretary, team manager, staff. At first, after filling in the document for business trip, student submits it to the professor. Then professor confirms and sends it to the secretary. The secretary receives it to check and verify, and sends it to the team leader. After checking the document and the reason for the business trip, team leader decides to accept it or not and result document is returned to the secretary. When the team leader

accepts it, the secretary can submit the document to the staff of administration. The process will be finished in this step, if the staff can't find any problems on the document. If some problems occurred, the process can be cancelled.

Note that each node in Figure 2 corresponds to the service component in SOA that can be reused by another business processes. Figure 3 shows the constructed system for business trips. The window corresponds to the work list assigned to the member. Each user can find his job list after logon the system.

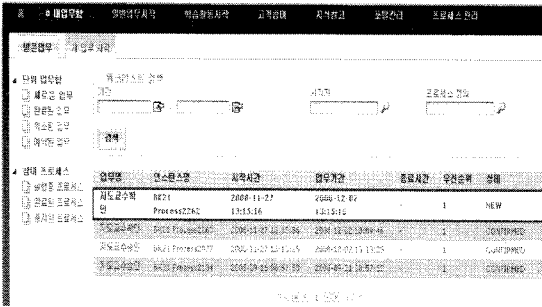


Figure 3. Implemented System : Work list for the member.

4.3 Analysis of the System

Until now, the business process for trips has been automated by using u-Engine BPMS. Here, we discuss the extensibility of the system by adding new business processes and counting reused nodes.

Other business processes such as oversee conference participation, oversee training, and purchases, can be added with minimum extra overhead. An important issue in the addition is reuse of existing business

(sub) processes. Figure 4 shows this concept graphically. The sub-process (nodes 3, 4, and 5) can be reused by the business processes 1 and 2. In this research, we have implemented additional business processes(oversee conference participation, oversee training, and purchases) to the existing business trip to check its reusability.

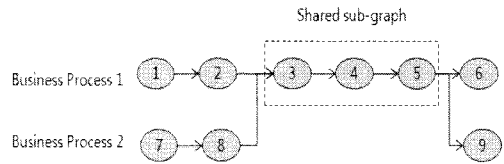


Figure 4. Reuse of Existing Business Processes

Identification of reused parts from existing business processes is not a trivial task. This can be done by comparing BPMN diagrams for various business activities. Automation of this comparison may be very useful if the diagrams are complex. Another issue is making each node in a standard service components under SOA.

Extensibility of the system can be measured by counting the number of reused nodes as new business activities are added. Three additional business activities (oversee trip, training, and purchases) are added to the existing business trip and the reused components are calculated as shown in Table 1.

Nodes in the BPMN are developed once and used many times in the next business activities. Therefore, finding reusable nodes is the main issue in the construction of new business processes. In

Table 1 : Number of reused nodes in the BPMN as new business processes are added.

Business activities	Number of nodes	Number of reused nodes	Number of Newly created nodes
<i>Business Trip</i>	21	0	21
<i>Purchases</i>	21	19	3
<i>Oversee Conference</i>	25	23	6
<i>Oversee Training</i>	24	22	2
<i>Sum</i>	91	64	32

Table 1, about 70% (64 from 91 nodes) of the nodes have been reused in the 4 business processes. In the Business Trip, since it is the first business process, all nodes have to be created via u-Engine BPMS. However, in the next business processes, only 2~6 from 21-25 nodes have to be created and the remaining nodes can be reused from the previously constructed nodes. The reusability depends on the similarity of the business processes. Note that it is difficult for conventional approaches to exploit this reuse even though there is a great similarity among the business processes. In SOA, standard service components are the solution for the increased reusability.

5. Multidimensional Analysis for BPM Data

In this section, we analyze the data in BPM by using one of major BI tool, SAP BI 3.5. Figure 4 shows the whole system diagram we have done.

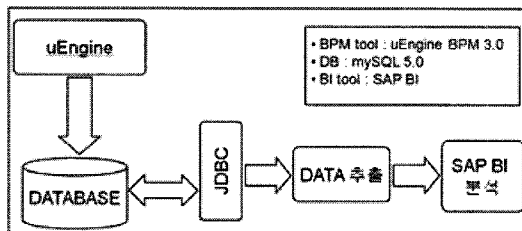


Figure 5. Multidimensional Analysis for the BPM Data

When we run business processes, operational data are saved in a database. Accumulated operational data may contain critical information for organization if they are analyzed. In this section, we extract the useful data from underline databases and analyze them by using SAP BI technology. Figure 6 shows the accumulated database of business trip processes in the BPM system. This database has information of each business trip: person, aim, day, destination, price, and distance etc.

id	instanceid	name	aim	startdate	enddate	destination	amount
1	2233	Lee	Conference	2008.01.23	2008.01.24	Seoul	13
2	2239	Kim	Conference	2008.02.03	2008.02.03	Daejeon	25
3	2412	Cho	Semina	2008.03.13	2008.03.12	Daegu	34
4	2469	Kang	Congerence	2008.04.21	2008.04.22	Pusan	21
5	3511	Jung	Conference	2008.05.09	2008.05.11	Incheon	40
6	2469	Paik	Conference	2008.05.11	2008.05.12	Pusan	14
7	2233	Lee	Semina	2008.06.01	2008.06.01	Seoul	69
8	2233	Kim	Semina	2008.06.30	2008.07.01	Seoul	30
9	3051	Cho	Education	2008.07.02	2008.07.02	Pohang	510
10	2233	Kang	Education	2008.07.13	2008.07.13	Seoul	34
11	2239	Jung	Semina	2008.08.04	2008.08.05	Daejeon	75
12	2511	Paik	Semina	2008.08.04	2008.08.06	Incheon	38
13	2469	Kim	Education	2008.09.13	2008.09.14	Pusan	140
14	2233	Paik	Education	2008.09.21	2008.09.24	Seoul	210

Figure 6. Database in the Business Trip Process

We make a cube for data analysis using SAP BI 3.5. Figure 7 shows the cube structure (SAP InfoCube) for the business trips data. This cube has a fact table with five dimensions: Business trip, Destination, Employee, Time and automatically generated Unit dimension. Each dimension has one characteristic: Aim (a goal of business trip) for Business trip, City (a destination of business trip) for Destination, and, Employee (a person who took on business trip) for Employee, Calendar day (a day of business trip) for Time. The fact table has two key figures: amount (cost of business trip) and distance (distance of business trip). This cube can be used to measure the amount and distance of business trip depending on these four characteristics.

SAP BI 3.5 provides an easy and simple reporting tool and a query designer. We don't need to know detail of SQL queries to create result tables what we want. Result screen can be made by easy GUI tool. Users just select rows and columns of the tables in the star schema, then the result is displayed through the web browser or excel to CEO.

Figure 8 shows the result of a query for analyzing the amount of business trip categorized by the person and the aim for the business. Of course, if CEO wants other analysis, we can make them easily by drag and drop style, without writing any SQL queries.

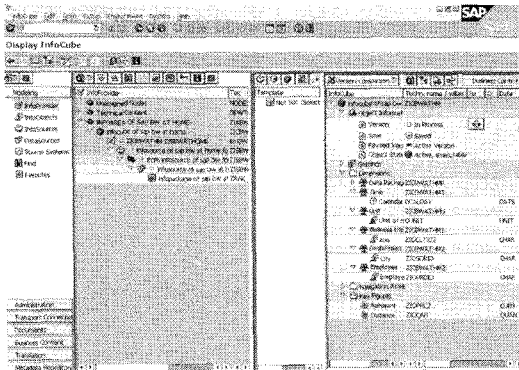


Figure 7. Cube of Business Trip Data

Name	Act	Account
Overall Result		\$ 2548.00
Lee	Conference	\$ 30.00
	Semina	\$ 129.00
Kim	Conference	\$ 45.00
	Semina	\$ 60.00
	Education	\$ 210.00
Cho	Semina	\$ 70.00
	Education	\$ 1210.00
Kang	Conference	\$ 51.00
	Education	\$ 54.00
Jung	Conference	\$ 80.00
	Semina	\$ 145.00
Park	Conference	\$ 84.00
	Semina	\$ 90.00
	Education	\$ 310.00

Figure 8. Multidimensional Analysis for the BPM Data

6. Conclusion

We addressed key issues in the automation of business processes by using BPMS. We proposed a framework for the business processes automation, and then applied it to a real application: business trip processes in the project management. Well known BPMN is used for the modeling of the business processes, and u-Engine BPMS is used for the implementation of the system. In addition, we proposed a simple method for analyzing BPM data by using powerful BI technology.

The most profit of our work in using u-Engine is agility because u-Engine BPMS supports visual tools and we don't need to use any programming code. And with BI technology, we can make full use of

operational data to support management's decisions making.

Future work includes adoption of new version of u-Engine, and analysis of huge underline databases where daily business information is accumulated. And, to improve existing business processes, we'll apply feedback of the result of data analysis to the business process.

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