ADMINISTRATION FLOW ANALYSIS IN A GOVERNMENT INSTITUTE: A STRATEGIC FLOW MANAGEMENT SYSTEM

Huei-Jung Liau[1*] and Adam J. L. Hou[2]
[1]*Institute of Nuclear Energy Research*
[2]*Department of Industrial Engineering and Engineering Management*
[2]*National Tsing Hua University*
Hsinchu (300), Taiwan

ABSTRACT

Over the past decades, the growth and development of information technology (IT) has brought a wider variety of innovative applications and services. IT as the basis of competition is the most important factor, since not only have IT changed the life style of the human beings, but it also promoted the competence of an enterprise. Those large enterprises which need to reduce cost and labors, and make the largest profit will think of what IT can do for them. Business process management (BPM) comes with the tide of fashion, and attracted many businesses' attention. Workflow is another synonym for 'business process' and it plays an important role in management information system (MIS). In this project, we take a medium scale of government institute as an example, through the support of IT, we develop a flow management system (FMS), which is a basic framework for all kinds of forms, and integrate the related systems. This paper also proposes a solution of architecture combining service-oriented architecture (SOA) and BPM.

Keywords: Business Process Management, Workflow, Integration System, Information Technology, Service-Oriented Architecture, Management Information System

1. INTRODUCTION

Over the past decades, businesses and governments have been giving increasing attention to business processes—to their description, automation, and management. This interest grows out of the need to streamline business operations, consolidate organizations, and save costs, reflecting the fact that the process is the basic unit of business value within an organization. In the administration environment of any government institute, there are many kinds of administrative processes, and thus, more and more application forms are needed to assist these tasks. In the administrative flow, a large number of papers are used in the administrative operations. Since the price of fossil fuel was dramatically increasing a few years ago, the government began to pay much attention to the issues of energy, consequently, and it urged the subordinate institutes to reduce papers. In fact, the most effective method of carrying out this tasks is to apply IT and develop a flow management system(FMS). There are many kinds of flow engine products offered by different companies in the market to help develop FMS. Should we use it or develop our own flow framework is a critical decision. We also give an objective evaluation and hope to find a good solution for our problems. This project presents a holistic review of BPM and how the system works related to the concept. It also discusses modeling model, system flows, databases, developing tools, and integration issues. Finally, it gives us a whole picture of the demonstration of FMS.

2. LITERATURE REVIEW

IT has played an important role with a history of about the several decades. Many techniques and concepts emerged to meet the requirements of human. This section introduces existing IT concepts and gives a clear demonstration.

2.1 Business Process Management (BPM)

BPM is an old discipline that allows you to model the organizational structure, define the business processes, and show the interactions between them [22]. BPM technology provides not only the tools and infrastructure to define, simulate, and analyze business process models, but also the tools to implement business processes [14]. BPM includes methods, techniques, and tools to support the

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* **Corresponding author: hjliau@iner.gov.tw**

design, enactment, management, and analysis of operational business processes. It can be considered as an extension of classical Workflow Management (WFM) systems and approaches [15]. BPM issues a revolution in management which concentrates on business process, demanding the enterprise to establish a clear process system and manage it effectively [17]. A business process is a complete, dynamically coordinated set of activities or logically related tasks that must be performed to deliver value to customers or to fulfill other strategic goals [2, 18].

2.2 Workflow

The term 'workflow' is used as a synonym for 'business process'. It is important to understand the role which workflow management system can play and how they should applied. Workflow management systems (WFMS) have been introduced to support the design, execution and monitoring of business process [20]. Workflow management promises a new solution to an age-old problem: controlling, monitoring, optimizing and supporting business processes [21]. Many organizations with complex business processes have identified the need for concepts, techniques, and tools to support the management of workflows. Based on this need the term workflow management was born. [3, 16]

2.3 Service-Oriented Architecture (SOA)

A service-oriented architecture is essentially a collection of services. These services communicate with each other. The communication can involve either simple data passing or it could involve two or more services coordinating some activity. Some means of connecting services to each other is needed [10]. SOA is a kind of structure model which is composed of standard components about service technology. Its purpose is to provide a flexible and reusable integrated interface for enterprises, schools or network offering organizations [9]. SOA is an important methodology of programming and it is a rule for administrative management. Through SOA, the integration of heterogeneous system integration become easy, and the reusability of codes become high. SOA answers for the technological problems such as integration and encapsulation. Architecture combining SOA and BPM improves the agility of business and the enterprise from both management and techniques, and makes the enterprise more competitive by adapting swiftly to the ever-changing market [17]. SOA architecture is viewed as five horizontal layers [12, 19].
(1) Consumer Interface Layer – These are GUI for end users or apps accessing apps/service interfaces.
(2) Business Process Layer – These are choreographed services representing business use-cases in terms of applications.

(3) Services – Services are consolidated together for whole-enterprise in-service inventory.
(4) Service Components – The components used to build the services, such as functional and technical libraries, technological interfaces etc.
(5) Operational Systems – This layer contains the data models, enterprise data repository, technological platforms etc.

2.4 Three-tier Architecture

Most web-based management systems adopt three-tier architecture, and this project is the same. Three-tier architecture is a client–server architecture in which the user interface (presentation), functional process logic ("business rules"), computer data storage and data access are developed and maintained as independent modules, most often on separate platforms[1]. It was developed by John J. Donovan in Open Environment Corporation (OEC), a tools company he founded in Cambridge, Massachusetts [5]. Figure 1 illustrates how each tier works in three-tier architecture:
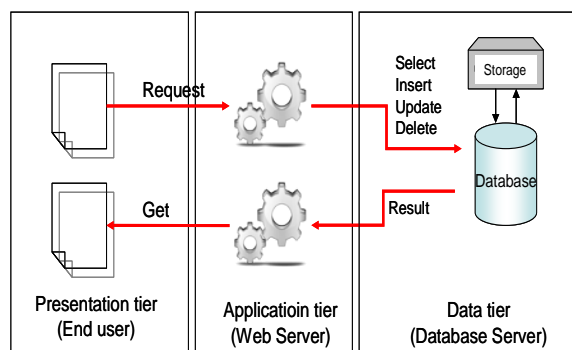

Figure 1: Three-tiers structure

(1) Presentation tier
The presentation tier displays information related to such services as browsing merchandise, purchasing and shopping cart contents. It communicates with other tiers by which it puts out the results to the browser/client tier and all other tiers in the network. (In simple terms it is a layer which users can access directly such as a web page, or an operating systems GUI)
(2) Application tier (business logic, logic tier, or middle tier)
The logical tier is pulled out from the presentation tier and, as its own layer, it controls an application's functionality by performing detailed processing.
(3) Data tier
The data tier includes the data persistence mechanisms (database servers, file shares, etc.) and the data access layer that encapsulates the persistence mechanisms and exposes the data. The data access layer should provide an Application Programming Interface (API) to the application tier that exposes

methods of managing the stored data without exposing or creating dependencies on the data storage mechanisms.

3. EVALUATIONS

3.1. Selection of Method

The purpose of this project is to collect many kinds of application forms in a government institute, analyze the administrative flow, find the rules, and finally build some modules to fit into all the flow. There are many products of flow engine in the market, but we decide to develop our own flow management system(FMS) instead of using the business software. There are some reasons about not using the flow engine in the market: (1) It requires extra labor to learn and maintain the flow engine. Besides, it also needs to share some data with existing system. (2) IT members are more aware of their information environment and any modification about system will be more flexible. (3) We need additional server to install a flow engine.

3.2. Selection of Development Tools

The WEB–based development tools are used to build web pages and web sites with HTML, CSS, JavaScript and server scripting and it can be divided into two mainstreams, which are java and ASP .NET. Each tool has its own specialties and it is hard to choose one of them. Finally, we chose ASP .Net as the development tool. The web server is IIS (Internet Information Technology). Generally speaking, IIS goes with ASP .Net.

4. METHODOLOGIES

This study uses IT technologies to design a web-based management system which deal with requesting, getting and transaction of data. Those transaction needs some tools and its methodologies, which are described as bellows:

4.1. AnyLogic

We adopt AnyLogic as an analyzing tool to simulate the business process. The simulation approach allows us to analyze and evaluate the effectiveness of the business processes already existing in the company, to work out an improvement plan addressing discovered problems, to improve existing business processes, and to develop entirely new business processes based on simulation experiments [8].

4.2. ASP .Net

A web development tool is necessary for build a management system. We use ASP .Net as the development tool not only it can support most the services in developing system, but also it is universal. Many treat ASP.NET as a language. In fact it is not a language, but a development platf also orm offered by .Net framework [11].

4.3. DBMS (DataBase Management System)

Most management system needs database which is a specially designed data structure to store data. Thus, database management systems (DBMSs) are also designed to allow the definition, creation, querying, update, and administration of databases. A general-purpose DBMS is designed to allow the definition, creation, querying, update, and administration of databases [4]. There are many well-known DBMS existing in the information environment, such as MySQL, PostgreSQL, Microsoft SQL Server, Oracle, SAP Sybase and IBM DB2.

4.4. SQL (Structured Query Language)

SQL is a special-purpose programming language designed for managing data held in a relational database management system (RDBMS), or for stream processing in a relational data stream management system (RDSMS). SQL became a standard of the American National Standards Institute (ANSI) in 1986, and of the International Organization for Standardization (ISO) in 1987 [7]. Since then, the standard has been revised to include a larger set of features. Despite the existence of such standards, though, most SQL code is not completely portable among different database systems without adjustments [6].

5. ANALYSIS

There are three major essentials in FMS. The first is 'flow'. Each application procedure has different flow, and how to design it and make it fit into all kinds of application procedure is an important task. The second is 'application forms'. There are different kinds of forms, and we have to design each form. The third is 'roles'. The roles are mainly divided into five kinds and they are applier, promoter, budget controller, accountant and auditors which includes leaders, associate directors, directors, chief, promoter, etc. In the flow process, there are a series of auditing jobs. Some promoters play the role of auditor as well. The roles are summarized in Figure 2.
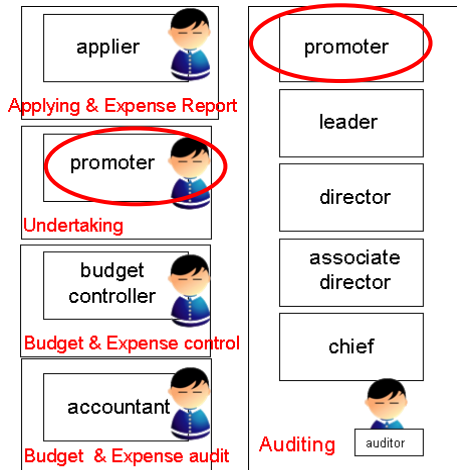
Figure 2: Five roles in FMS

5.1 System Design and ER model

In Figure 4, flow table is related to the other tables, and it is designed to record and control the flow of the administrative procedures. FormX represents any kind of form. Some are simple and others are complex. Therefore, some need only one table, but others need more. Once there is any requirement to add forms, we just design such a form to extend the system.
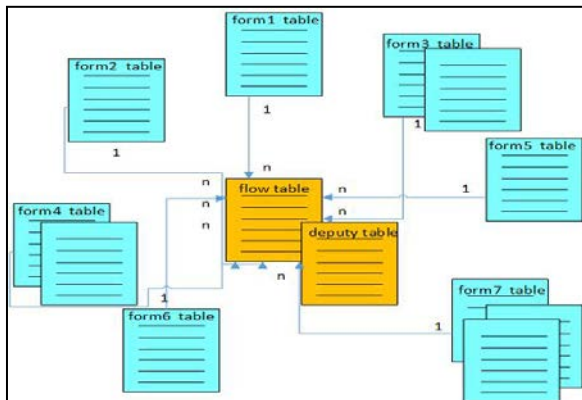

Figure: 4: ER model

5.2. Flow and Simulation

Figure 5 illustrates the flow in FMS. In the auditing process, there are four conditions. Since each department has different hierarchical structure, some may have only one auditing layer, others may have up to 3 auditing layers. Condition 1 and condition2 can demonstrate such a situation. Condition 3 shows that whether the application needs expense report or not. If it is true, then there is a series of budget and expense audit procedures. A few applications need promoters to deal with some work at the end. Condition 4 shows such a situation as well.

In Figure 5, the number represents the quantity in the flow. We simulate the flow process in a week, and the quantity in a week is about 2,100. Thus, it will be near 100,000 (2100 X 52 = 109,200) in a

year. Therefore, it can reduce papers up to 100,000. If more application forms applied in this system, the number will increase as well.
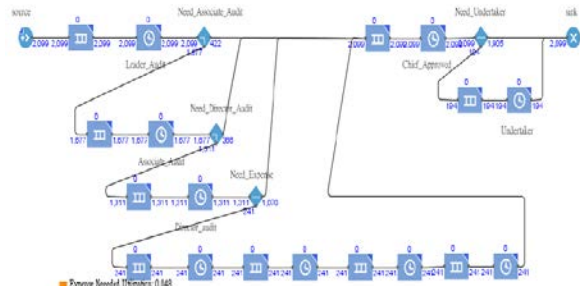

Figure 5: Flow in FMS

5.3. Functions and Integration

The functions mainly consist of applying, undertaking, auditing, expense report, statistics & Query and system administration. Appliers have the privilege to use 'applying' and 'expense report' functions. If this application needs expense, then expense function is required in the beginning and expense report function is also needed at the end. Just few promoters need to do undertaking job at the end, and they also play the role of auditor to check the application. Auditors just do the auditing job, and most of them are the promoters, leaders, directors, and chief in each department. After checking the application, they can decide if let it keep going, or return it to appliers. Those applications which need expense have to go through budget controller, accountant, and the leader, director in accounting department. There is a budget system to manage the budget and expense and it is used by budget controller and accountant. Thus, there is some integration in the project. Figure 6 illustrates the functions of the system.
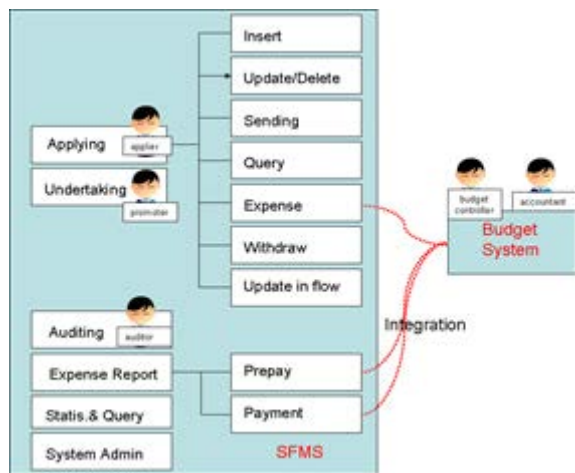

Figure 6: Functions in FMS and integration

6. SYSTEM IMPLEMENTATION AND DEMONSTRATION

This section demonstrates the system online. Figure 7 shows the entrance of all kinds of applying forms. Clicking one of the applying forms, and we get into one of the applying interface. We take visiting application as an example, in addition to its main input interface, there are other input interfaces, as the circled region in Figure 8 Each application form is different since each has its characters. Some may be complex and need more interfaces to input data, others may be simple and just needs a minimal interface.

Figure 9 illustrates one example of query. Statistics and query give important information to the decision maker. Owing to the diversity of each application, this leads a varied data and diagram. In this example, it needs 3 different kinds of statistics, as circled in Figure 9.

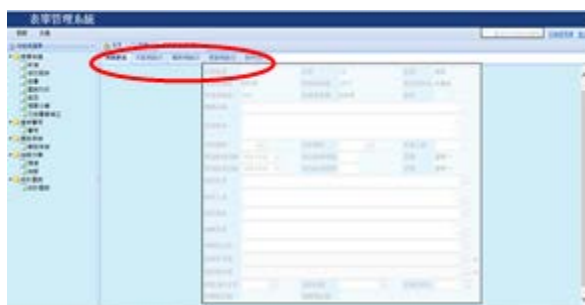Figure 7: Entrance of all kinds of applying forms

Figure 8: Applying interface in FMS

Figure 9: Statistics and query interface in FMS

7. CONCLUSION

This research provides techniques of capturing, organizing, and analyzing existing administrative application forms in a government institute. The FMS presents a flexible and extensible framework and it can also be integrated with other systems. The implementation of this project research has the following contributions. First, The application will be more efficiently because the system put the application forms together and it is easy to find. Finally, it indeed reduces the papers and thus achieves the goal the government's expectation. Since there are many application forms are needed to run in a government institute, and some forms are used in a great number every day. Thus, we believe FMS can satisfy our needs, and attain the slogan of "Energy conserved and papers reduced ".

In fact, in MIS environment, some systems have to share data with the other systems, and some control points are involved with each other. Therefore, integration is very important in MIS. Some applications need to pay money through this system to manage data; thus, integration with the existing budget system is necessary. Because it needs the organization hierarchical structure, human sources and projects information, for example. Hence, more systems is involved and more integration is needed. It has been verified that this integrated model is feasible and effective.

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ABOUT THE AUTHORS

Huei-Jung Liau has worked in Institute of Nuclear Energy Research for many years and she is good at Information System Development. She is a part-time Ph.D student of Industrial Engineering and Engineering Management at National Tsing-Hua University (NTHU). Her research interests are Management Information System and Electronic Enterprise Integration.

Adam J. L. Hou is a Professor in the Department of Industrial Engineering and Engineering Management at National Tsing-Hua University (NTHU), Taiwan R.O.C. Dr. Hou received his B.S., M.S. and Ph.D. degrees in Industrial Engineering from NTHU, R.O.C. His research interests are knowledge management and logistics management. He has participated in several e-business projects with high-tech companies, logistics service providers and R&D institutes in Taiwan.

政府行政流程分析：策略性流程管理系統

廖慧容[*]、侯建良
國立清華大學工業工程與工程管理學系
新竹市光復路二段 101 號

摘要

近幾十年來，資訊科技的高度發展帶來多樣性的創新應用與服務。資訊科技是競爭基礎的一項重要因素。因為資訊科技不僅改變人類的生活型態，它也促進了企業的競爭力。那些想要降低成本及人力，並創造利潤的的大型企業一定會先想到資訊科技能夠為他們做什麼。於是，企業流程管理(BPM)形成一股潮流，也吸引了企業的注意。流程管理(workflow)是企業流程的另一個同義詞，它在管理資訊系統中也扮演了一個重要的角色。在這個研究中，我們以中型的政府機構作為一個例子，透過資訊科技的支援，我們發展了一個流程管理系統(FMS)，這是一個所有表單共有的基礎架構，並且可與其他系統互相整合，本研究報告同時也為服務導向架構與企業流程管理提供了整合性的解決方案。

關鍵詞：企業流程管理(BPM)、工作流程(workflow)、整合系統(IS)、資訊科技(IT)、服務導向架構(SOA)、管理資訊系統(MIS)
（*聯絡人：hjliau@iner.gov.tw）

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