UNIVERSITI PUTRA MALAYSIA

**MODELING WORKFLOW PROCESSES
BASED ON TASKS AND TRANSACTIONS:
A CASE STUDY OF THE UPM GRADUATE SCHOOL OFFICE**

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By

CHEANG MEI CHUIN

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Workflow binds, integrates the people, the processes, and the organisation into a value chain. Workflow modeling is used to redesign work processes to increase the efficiency and productivity of work. Workflow is said to be the technological cousin to Business Process Reengineering. Workflow carries the promise of integrating office work, resulting in short delay times, improved customer services and better knowledge of logistics parameters of office work.

Workflow systems support business systems by maintaining the logical sequence of transitions between tasks in a work process, making sure that all related tasks or a process are

completed. Tasks and transactions form an integral part of a workflow management system.

However, workflow modeling is a relatively new field. Many organisations intending to conduct business process reengineering are finding it difficult to obtain frameworks to model their workflows. This study presents the development of a framework for these organisations to model workflow processes. Old workflow processes are studied from a selected organisation and a new workflow model is designed. The performance improvements of the new workflow model over the old workflow model are then quantified. From here, a framework for workflow modeling is produced for future reference.

Important concepts and issues that need attention when modeling workflows, are discussed. These issues can be used to overcome setbacks faced by many organisations while modeling their workflows, such as identifying problems in the workflow and redesigning a workflow model that will increase productivity.

From this study, it is revealed that redesigning workflows require that each process be looked into carefully for its flaws and problems, to look for measures to improve the processes, and to redesign these workflow processes with attention given to issues,

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such as allowing the workflow model to be open, reusable, portable and scalable. With these issues in reference, workflow modeling can then be successfully implemented, for the reengineering of any organisation.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia bagi memenuhi syarat untuk Ijazah Master Sains.

PEMODELAN PROSES-PROSES ALIR KERJA BERDASARKAN TUGAS DAN TRANSAKSI: KAJIAN KES PUSAT PENGAJIAN SISWAZAH DI UPM

Oleh

CHEANG MEI CHUIN

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Alir kerja mengikat, mengintegrasi ahli-ahli, proses-proses dan juga organisasi kepada sebuah rantai kerja yang produktif. Pemodelan alir kerja digunakan untuk merekabentuk semula proses kerja untuk meningkatkan produktiviti dan kecekapan membuat kerja. Rekabentuk alir kerja dikaitkan rapat dengan perekasayaaan semula kerja. Alir kerja membawa kepada integrasi kerja pejabat, yang memberi kemajuan-kemajuan seperti jangka masa proses yang lebih pendek, perkhidmatan pelanggan yang lebih baik, dan pengetahuan yang lebih mendalam mengenai parameter-parameter kerja.

Sistem alir kerja menyokong sistem perniagaan dengan menetapkan suatu transisi turutan tugas yang logikal, dan

memastikan bahawa semua tugas atau proses yang terlibat lengkap dilaksanakan. Tugas dan transaksi merupakan unsur yang penting dalam suatu sistem pengurusan alir kerja.

Walau bagaimanapun, pemodelan alir kerja merupakan suatu bidang yang terkini. Kebanyakan organisasi yang bertujuan merekayasakan proses perniagaan mereka dapati bahawa amat susah untuk memperolehi rangka kerja untuk pemodelan kerja mereka. Kajian ini membina suatu rangka kerja untuk pemodelan proses kerja dalam sebuah organisasi. Proses alir kerja lama dikaji dan sebuah model alir kerja yang lebih baik direkabentuk. Kemajuan dalam pelaksanaan alir kerja baru dibanding dengan alir kerja yang lama. Dari sini, sebuah rangka kerja untuk merekabentuk model kerja disediakan.

Beberapa isu dan konsep yang penting dalam merekebentuk alir kerja juga dibincang. Isu-isu ini boleh digunakan oleh organisasi yang menghadapi masalah merekebentuk semula alir kerja mereka. Masalah yang sering dihadapi adalah seperti mengenalpasti masalah dalam alir kerja dan merekebentuk sebuah model alir kerja yang mampu meningkatkan produktiviti.

Bukti yang diberi oleh kajian ini menunjukkan bahawa merekabentuk semula alir kerja memerlukan penelitian terperinci

kepada masalah dan keburukan setiap proses, mencari peluang membaiki proses ini, dan merekabentuk semula proses alir kerja dengan penumpuan kepada isu-isu seperti sifat terbuka model alir kerja, penggunaan semula, adaptasi semula, dan penskelan semula. Dengan merujuk kepada isu-isu ini, pemodelan alir kerja boleh dilaksanakan dengan berjaya dalam aktiviti perekasayaan sebarang organisasi.

CHAPTER I

INTRODUCTION

Workflow has been regarded as the element that binds, integrates critical factors such as people, organisations, and processes into a value chain. In this chapter, the purpose and an overview of workflow is presented. The origin of workflow is explained. A framework will be developed for intended audiences such as managers who conduct reengineering activities, workflow modelers, and system developers who wish to conduct workflow design activities. Here, various definitions of workflow are discussed. The role of workflow as a technological enabler in Business Process Reengineering (BPR) is also explained.

Purpose

Many workflow processes have been developed through an effort to increase the efficiency and productivity of work. The

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discussions presented here will serve as a framework to help workflow modelers and managers alike to design a practical workflow model for the workflows existing in their organisations. Tasks and transactions are an integral part of the workflow. According to Anne et al. (1995), tasks are concerned with policies such as scheduling the execution of transactions, how to react to failures and how to optimise business goals. Whereas transactions are concerned more with the operational details. Thus, the use of tasks and transactions in workflow will form the main feature in the discussion of this thesis.

Organisations have long realised the need for reengineering businesses to remain competitive and ahead of their industry. Workflow is said to be the technological cousin to BPR. Stark (1997) says that most organisations that reengineer are compelled to use workflow because of factors such as:

1. Improved efficiency, leading to lower costs or higher workload capacity.

2. Improved control, resulting from standardisation of procedures.

3. Improved ability to manage processes. Performance problems are made explicit and understood.

Workflow carries the promise of integrating office work, resulting in short delay times, improved customer services and better knowledge of logistics parameters of office work. However, designing workflow systems is a difficult task. This study develops design heuristics allowing the organisation intending to model workflow processes to support the phase preceding workflow implementation.

Who Will Benefit From This Study?

This discussion intends to cover the design of workflow models in organisations traditionally operating in manual or legacy systems. Looking from different perspectives, different intended audiences can be identified. It can be viewed by the steering committee of reengineering efforts as a viewpoint worth considering while redesigning their workflows.

Whether the person has a business or an Information Technology focus, this discussion provides a suitable introduction. It includes an overview, the technology aspects, the business benefits and the direction of workflow in the future. The reader is able to specify problems that can be addressed by workflow. He can also identify the benefits that will likely be gained once workflow is implemented.

This discussion is also useful for designers who wish to implement a workflow system. It provides a good foundation to planning and implementing workflows and is demonstrated with a case study. It also includes examples of past workflow projects and what other users have done and implemented.

An Introduction to Workflow

This section introduces some aspects of workflow as the background of the study. The introduction starts with the origins of workflow, continues with the definition of workflow, tasks and transactions in workflow, and describes the processes in an organisation.

Origins of Workflow

Key developments in software technologies have played a big role in workflow management and design. According to Jablonski and Bussler (1996), these technologies are often considered as the origin of workflow, they are:

- Office automation
- Database management

- E-mail

- Document management

- Software process management

- Business process modeling

- Enterprise modeling and architecture

According to Ellis and Nutt (1980), workflow originated mainly from office automation. Office automation was aimed at computerising individual office tasks. Office information systems requirements were later applied to workflow design and management. They are scheduling activities, function integration, personal assistance and task management (Bracchi and Pernichi, 1984).

Database management systems have stemmed the transactional aspect of workflows, called transactional workflow (Rusinkiewicz and Sheth, 1995). The approach specifies tasks, which define work to be done. Another important characteristic of workflow is e-mail. Many messaging methods have been implemented in organisations. E-mail plays an important role when applied in workflow management, where users of workflow processes are connected via electronic messaging.

Document management allows for the replacement of paper documents with electronic documents. Active document management systems incorporated service functions based on time management, for example, by triggering a document to be presented again after a certain period for review. Software processing guides and assists people involved in software development. Their characteristics that leads to development of software process models form the essentials of workflow.

Business process modeling leads us back to BPR (Hammer, 1990). BPR deals with the radical redesign of business processes to improve operations and be more productive. It deals with the redesign of different aspects of business elements, i.e. financial, flow of information, data across business processes. Workflow modeling now assumes the role of a technological enabler of BPR.

Enterprise modeling and architecture must be named as another trigger for workflow management. They define a concrete path from modeling to execution. This can usually be applied to the issue of mapping business process to workflows.

The Definition of Workflow

When the term 'workflow' is mentioned, it often refers to a business process, specification of a process, software that supports co-ordination and collaboration of people that implements a process, or a software that implements or automates a process.

Workflow, according to Georgakopoulos and Hornick (1995), is defined as a collection of tasks organised to accomplish some business processes. A task can be performed by one or more software systems, on or a team of humans, or a combination of these two. Below are a number of definitions of workflow from workflow vendors that produce workflow products:

- A representative of Peoplesoft Inc., states that, "Workflow is the mechanism by which you can implement business reengineering practices" (Frye, 1994).

- Produce literature from Action Technologies Inc., defines workflow as, "Work (that) is recast as a series of people-based transactions", and states that, "A series of workflows form a business process" (Frye, 1994).

- Product literature from Recognition Internal Inc., states that, "Simply defined, (workflow is the process by which individual

tasks come together to complete a transaction - a clearly defined business process - within an enterprise" (Action Workflow System product literature, 1993).

- A Wang Laboratories representative, states that, "Workflow goes beyond routing (i.e. moving information among users or systems) by integrating information from a variety of sources" (Frye, 1994).

According to Jablonski and Bussler (1996), workflow solves two issues. First, workflow defines the function perspective, i.e. what has to be done. Secondly, workflow constitutes a frame where the other perspectives like the behavioural or the organisation perspective are embedded.

Workflow systems support business systems by maintaining the logical sequence of transitions between tasks in a work process, making sure that all related tasks or instances of a process are completed. Workflow systems also support individual tasks in a process, bringing together human and information resources needed to complete a task (Stark, 1997). Workflow systems form a backbone for business processes by managing the flow of responsibility from one party to another and from one task to another.

Large workflow systems are used in organisations where the number of users may be in thousands or tens of thousands. The number of process instances may be in hundreds of thousands. Finally, the number of sites in thousands, and all distributed over wide geographic areas.

Tasks and Transactions

Tasks are jobs, responsibilities to be completed to fulfil a work process. Workflow systems ensure that tasks that need to be completed are matched with resources needed to perform them.

Tasks require both human and information resources. Tasks application resources are used in workflow tasks to create, display and make changes to content resources. Currently, tasks are defined as something done by one person, using one task application at a time.

Transaction management was invented to optimise usage of information systems by allowing asynchronous execution of multiple transactions. Transaction emphasises data dependencies. transaction's basic unit is a message (Anne et al., 1995). The semantics of messages and its communication protocol is specified formally. Tasks specify the scheduling and execution

of transactions and provide recovery activity in view of application breakdowns. Tasks deal with policies, i.e. scheduling and execution of transactions, reacting to failures and optimising a business objective.

Transactions deal with functional and operational details. Transaction management preserves data consistency by preventing execution of conflicting operations from multiple concurrently executing tasks (Jablonski and Bussler, 1996).

Processes in an Organisation

Process definition includes modeling of activities. It also includes controlling connectors between these processes. Process activities help to organise work. They also allow team members to work independently on different activities. Process activities can be associated with time limits, with default actions taken if conditions are not met within these time limits.

Processes are usually divided into three (Georgakopoulos et al., 1995), material processes, information processes and business processes. Each of these processes are described as follows:

1) Material processes assemble physical components and deliver physical products. These tasks include producing, assembling, storing, transforming and measuring physical objects.

2) Information processes relate to automated or semi-automated tasks that create, process, manage and provide information.

3) Business processes are the business market oriented descriptions of an organisation's activity. For example, a business process engineered to fulfil and order or to satisfy a customer's needs.

Workflow and BPR

BPR has recently gained wide popularity as a management practice. Workflow is usually related to BPR as a technological enabler. Workflow systems provide support for alternative process paths and automating the routes among these paths. Workflow systems also support parallel flows. Workflow systems are effective in providing end-to-end responsibility, especially in processes that have cross-functional boundaries. Workflow systems are also capable of processes which are triggered by events (Stark, 1997).