

지식관리 시스템에서의 프로세스 지식화 **Process Packaging in Knowledge Management System**

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Abstract

Although managing knowledge about business processes has been recognized as an important aspect of Knowledge Management System (KMS), it has not been satisfactorily addressed academically or commercially. This paper proposes a KMS architecture to effectively manage business process as knowledge. It expands commonly recognized KMS functions with the process packaging module that defines business processes, monitors and evaluates process instances, keeps process instance history, and provides link between processes and other knowledge items such as documents and experts. The users can not only find the best practice of a business process but also learn from mistakes. A prototype system is implemented to show the feasibility of the proposed architecture. The results of this paper can contribute to expand current KMSs to help use knowledge to enhance the users' performance in their business processes.

1. Introduction

Various efforts have been carried out and numerous papers have been published for the managing of knowledge and the definition of knowledge. The term, 'knowledge' is often used to refer to a body of facts and principles accumulated by mankind in the course of time [1]. However, in this paper, another tactical definition is proposed. :

Knowledge is the intangible processed information with the ability to turn information and data into effective action.

How can turn information and data into effective action is the aim of knowledge management. Bair, J. of Gartner Group said that knowledge management is an integrated, systematic approach to identifying, managing (capturing, archiving and retrieving) and sharing all the information assets of an enterprise, including databases, documents, policies and procedures, as well as previously unarticulated expertise and experience resident in individual workers.

On the basis of the above definition of knowledge and knowledge management, this paper proposes a new knowledge management system (KMS) architecture that deals the process generated from the Workflow Management System (WFMS) as knowledge.

Knowledge transfer processes often occur on an ad hoc basis when the need for specific knowledge arises somewhere in the organization, but organizations also have a large number of formalized processes that regulate the flow of information. These days, the researches on knowledge management bring business processes into focus. A process as knowledge could entail procedures of

The goal of this paper is to propose an approach that extends the KMS architecture with process packaging using WFMS. K2 System (Knowledge Management System developed by the Cyberdigm) is selected as a prototype KMS on which proposed process packaging module is implemented.

A proposed process-packaging module acts as a powerful tool for capturing and archiving knowledge in business. In this paper, we also provide a simplified evaluation schema designed on the basis of a process packaging module. A prototype KMS is developed.

2. Related Work

2.1 Knowledge Management

In an economy where the only certainty is uncertainty, the one dependable source of a lasting competitive advantage is knowledge. Yet, few managers understand the true nature of a knowledge-creating company, let alone know how to manage it [5].

The increasing use of electronic group collaboration tools to support teamwork has fueled interest in the methods by which people use those tools, which can be captured, stored, and reused by others. Called 'knowledge management', it is important for enterprises whose principal currency is knowledge, rather than physical or financial resources. These are enterprises which have always been wholly devoted to knowledge work, such as consultancies; a growing number of enterprises who discover that knowledge dealing with how to produce products is as salable as the products themselves; and any enterprise which realizes that its knowledge is an asset to be managed [3].

Knowledge has its roots in three primary areas. People gain knowledge from their experiences and their peers' expertise, as well as from the analysis of business data such as sales and financial reports. Through the synthesis of these three elements, new knowledge is created and opportunities are shaped. Effective Knowledge-management strategies manage and foster all of these sources of new knowledge.

According to Microsoft Corporation, Knowledge is composed of the tacit (implicit) experiences, ideas, insights, values, and judgments of individuals. It is dynamic and can only be accessed through direct collaboration and communication with experts who have knowledge[4].

2.2 Workflow

The concept of workflow is the core component of the architecture of the system that implements the main idea of this paper. Workflow Management System is used to catch, store and manage the business process as knowledge.

A comprehensive WFMS can be used as application-independent, infrastructure-independent glue to stitch together the heterogeneous applications into a mesh of cooperating units to achieve a unified solution [7].

Among many approaches on workflow management, Gruhn et al. deals the repository (used to store information such as documents, images and sounds that processes in workflow create and manipulate) as the storage which store the business process models themselves[8]. But, It was not considered the process as knowledge but information. So it can catch only model (template), although in the knowledge-oriented view the instance level of process is more useful.

3. Knowledge Management System Architecture

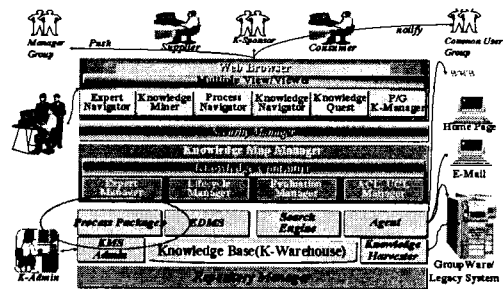
Among KMS products, K2 System¹ is used to implement the architecture that is proposed in this paper. K2, is a full-fledged Knowledge Management System written in 100% pure Java. In addition to providing all the commonly recognized KMS functions, K2 provides an integrated workflow management functionality. Therefore, it can help the users manipulate many different kinds of knowledge according to their business flows. It allows the users to access knowledge from "any Web browser on any platform anywhere, anytime". Easy installation and maintenance and the possibility of using cheaper NC (Network Computer) or thin-client PCs are also some of the obvious advantages of K2. Far beyond the static and non-interactive HTML-based user interface, it features the speed, control, and interface of Microsoft Windows applications. This demonstrates that Windows users can migrate into the Java environment without sacrificing performance and convenience.

¹ Cyberdigm Co. developed on the base of enterprise documents management system.

Because of the reason that K2 provides the workflow management functionality, the architecture proposed in this paper was implemented easily.

The architecture of KMS with process packaging is described in this chapter. It is depicted in Figure 1. It consists of five layers and six core functional components with workflow, which is the base component of process packaging. Each layer is consists of a user interface layer, a security management layer, a knowledge map management layer, a function layer, and a repository management layer. Six core functional components satisfy KMS's key features, such as internet/internet based, document management system, search engine, process packager, knowledge harvester which for retrieving data from GroupWare/legacy system, database repository, and administration tools.

The item, 'knowledge', called in this KMS, consists of four sub items (Documents, URL's, Experts, Books). To these sub items this paper proposed to add one item, process. The process is packaged to the form of knowledge item automatically by workflow system. The architecture of workflow system for the process packaging is described in section 3.1 in detail.



[Figure 1. The architecture of KMS with process packaging]

3.1 Process Packaging

Knowledge transfer processes often occur on an *ad hoc* basis when the need for specific knowledge arises somewhere in the organization, but organizations also have a large number of formalized processes that regulate the flow of information. Workflow systems enable users to codify knowledge transfer processes when they require a more rigid method of dissemination. For example, proposal generation processes often require the proposal writer to collect prior knowledge assets, create new information and gain approval on the entire proposal. This process necessitates structured and ordered information preparation and review, which is what a workflow system facilitates.

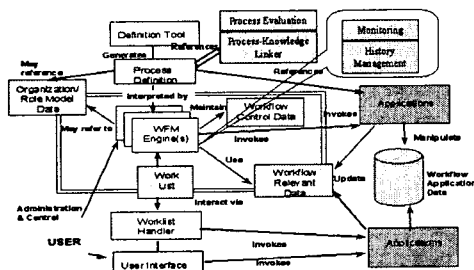
A few systems attempt to store process itself as knowledge in restricted form, but most system use it as a knowledge delivery tool. Ones such system is Process Knowledge Management System (PKMS) of Deva Industries, Inc.[2].

The PKMS consists of 55 generic process flow diagrams with overviews. Over 300 resources and additional information related to each process are provided, to include: forms, regulations, overviews, sample policies, sample letters, posters, record keeping requirements, contacts, URLs for the governing authorities, and various

other resources. Hyperlinks are provided from the resource listing directly to the source documents either on the Web and/or on your local area network/server. However, PKMS is not a workflow system but a system which stores and manages well-defined templates of generic process flow.

In this paper, not only the template but also real process instances are stored and managed for staff education and training, improvement of operation, just-in-time delivery information to the people who need it, process performance, and evaluation of process's value. The workflow module and schema are modified to store the history of each activity which comprises the process, to be contained in and to contain the knowledge item. In addition to that, process evaluation modules and simulation modules are added.

The standard WFMS architecture suggested by Workflow Management Coalition (WFMC) is modified as Figure 2.



[Figure 2. The architecture of workflow for process packaging]

The four modules are for process packaging. The Process Evaluation module helps users evaluate the process with the concept of knowledge. To link the packaged process to knowledge, the Process-Knowledge Linker module is implemented. For monitoring working process and finished process, Monitoring module with History Management module is contained WFM Engine. In section 4.2, the simple schema of workflow for process packaging will be explained.

4. Implementation

As the architecture in chapter 3 shows, the process packaging module is included in the KMS along with process packager. This implies that the process packaging module should be developed on its base. To achieve this purpose, The KMS should be developed first. Fortunately it is developed by Cyberdigm Co.. The System, named *K2™*, is used as a base system for implementing the process packaging module proposed in this paper.

Because, this KMS forms the basis for the process packaging module, other KMS functions will naturally flow from its operation.

4.1 System Overview

All components of the KMS architecture except for the Search Engine have been developed with Java language. The process packaging module has been developed with Java language also. Each component of the process packaging module was implemented as an independent

application, but the monitoring and history management are tightly combined into one application.

Among many Java development environments, JDK 1.2 was selected because it has many UI and other control classes. The components of the prototype process packaging have been implemented as an applet which runs on any platform which has browser with appropriate Java virtual machine. Oracle 8i was used for the process packaging module to store all process packaging information. The detailed development environment is as follows.

- **DB construction, web service:**

OS: windows NT Server 4.0

Database: Oracle 8i

DB interface: JDBC for Oracle 8i

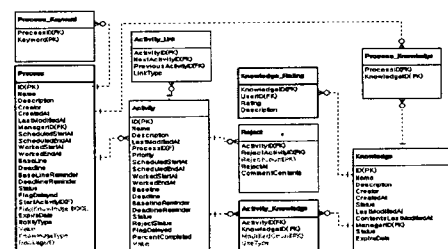
- **Process Browser, Editor:**

Execution Environment: IE 4.0 or higher, Netscape 4.06 or higher

Development Language: JDK 1.2

4.2 Process Packaging Technique

Storing and monitoring the whole events occurred in the workflow system is a burden for the KMS. The Step one activity is finished and proceeds to the next activity, the data is stored with processed time and related knowledge's change. If one activity is rejected and returns to a previous activity, the rejected date and comments should be stored. When a reject event is stored, the number of times the rejection occurred should be stored also. The relation of activity and knowledge contains the Use-Type. If Use-Type is 'R', it means that the activity will use the knowledge as reference knowledge: in other words, the knowledge will not be modified in the activity. On the other hands, if Use-Type is 'E', it means that the knowledge is modified in the activity and the modification history will be monitored and stored by the process packaging module. The simplified schema of this technique is described as Entity Relationship Diagram (ERD) shown below. Detail schema that contains the knowledge items such as expert, URL, book and document is not presented because of the security of the K2 project.



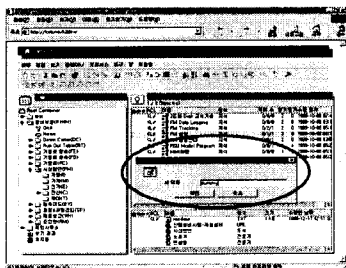
[Figure 3. The schema of workflow for process packaging]

To implement the above schema Oracle Database's stored procedure is used. Moreover, the Java DataBase Connectivity (JDBC) was used for applet to communicate with the database.

4.3 Process Browser and Editor

As described in section 4.1, the process browser and

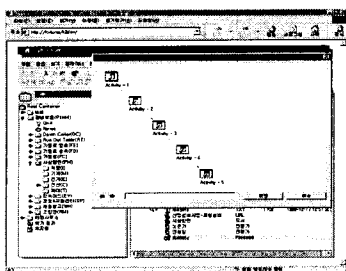
editor are integrated as a java applet. With this applet, users can interactively operate several functions such as creation, modification, deletion, monitoring and search on processes in the workflow system. Figure 4 shows the dialogue for linking process to knowledge in the KMS.



[Figure 4. The linking of process to knowledge]

In Figure 4, the process named "dummy" in the workflow is linked to knowledge "FM 설정". Other knowledge items, such as documents, URLs, books, and experts are linked before.

Figure 5 shows the process tracking dialog. This tracks the activities in the process step by step and stores the history of each activity. Each activity's property can be observed as dialog and the value of the activity can be modified or be referred. Using these features, the workers can learn the business process more easily.



[Figure 5. The tracking of process as knowledge]

5. Conclusions and Future Research

This paper proposes the architecture of KMS to manage knowledge more effectively. It is composed of WFMS with process packaging module and other KMS components. The business process managed by the WFMS can be packaged to knowledge item, and evaluated by the expert or evaluation rule component. Packaged process can be used for practice so, that a novice can learn the business process more easily.

Although many KMS have been used in the business field, it is insufficient for describing the business process that is the resource of tremendous intangible assets(knowledge). Therefore, KMS needs to be extended to an integrated KMS that contains WFMS for packaging business process.

In this paper, we implement a prototype system to show the feasibility of the proposed architecture. The results of this paper can be used to expand KMS to manage process as knowledge for more effective management of knowledge.

The benefits of the proposed KMS architecture and prototype for process packaging can be summarized as follows.

- **New Concept of Knowledge:** Defining the packaged process as knowledge item is a new attempt in the study of knowledge management. The importance of the business process as knowledge highlighted by this paper.

- **Facilitates Learning of the Business Process:** With the help of proposed KMS, a novice can learn business process more easily without the help of an expert. Because a business process can be easily tracked, user can recognize other works that his work relates to.

- **Business Process Evaluation with Concept of Knowledge:** this paper provides the tool for evaluating the business process with the concept of knowledge and issues it, though the detailed evaluation schema was not presented.

Future research issues are as follows. First, a detailed evaluation schema for evaluating the value of packaged business process must be developed. Second, for packaging nested process, studies must be undertaken to monitor nested process and store the history of nested processes. Third, for the complete implementation of the process packaging for the existing WFMS, splits and merges of flow should be considered in the process packaging module.

Acknowledgement

The authors would like to thank the Ministry of Education of Korea for its financial support toward the Electrical and Computer Engineering Division at POSTECH through its BK21 program.

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