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Knowledge Management and Organizational Learning in Workflow Systems

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Introduction

Organizations must learn continuously to keep up with the changing environment, and individuals in an organization must synchronize with changes in internal and external procedures and regulations. Knowledge management is an important aspect of organizational learning and has become a growing area of research during the last few years.

According to Swanson (1996), "the New Organizational Knowledge should be understood to be a form of collective competence, the know-how of an organization's people and systems taken together. In the future, moreover, this competence can be expected to be increasingly system-based, compared to people-based, continuing the trend of recent years.... The organization's systems will in the future house much of its on-going business logic, much as today."

This view of system-based organizational knowledge is shared among many IS researchers, as reflected in their works over the last ten years (Tuomi, 1996). Research in knowledge management, organizational memory, and organizational learning has focused on the development of models and mechanisms for the capturing, storage, and delivery of knowledge in information systems in an organizational setting, such as in (Aksycyn et al., 1988; Paradice and Courtney, 1989; Carlson and Ram, 1992; Lee et al., 1992; Morrison and Weiser, 1994; Stein and Zwass, 1995;).

In the last few years, a new type of information system called a *workflow management system* is being deployed in many organizations (Georgakopoulos, et al., 1995). This new system is especially suited for actualizing organizational memory because workflow systems enable the automation of business processes across teams, functional departments, and suppliers in order to reduce product or service cycle times, to decrease costs, and to minimize duplication of effort. Workflow systems integrate the people, the organizational structure, and the information sources such as databases, file systems, emails, image repositories, computer-aided design tools, and desktop applications (Stohr and Zhao, 1997). That is, workflow systems are the ideal systems to house the business logic and bring the business logic into better view.

The commercial activities in this area have increased dramatically in the last few years since the start of the Workflow Management Coalition in 1993 (WfMC, 1993). Currently, there are 150 corporate members in the coalition. Workflow management has evolved from various platforms and applications such as groupware, group decision support systems, database management systems, document management systems, image processing systems, telephony systems, and smart email systems. However, the functions of organizational memory and organizational learning are now generally missing in commercial workflow management systems. In this paper, we study the issues of knowledge management, organizational memory, and organizational learning in workflow management systems. We first examine the types of knowledge that can be managed in workflow systems and propose mechanisms that can help enhance the efficiency of individual and group learning. The impact of the organizational memory component in workflow systems on organizational learning is also analyzed.

A Framework of Workflow Management Systems

In order to develop the organizational memory component, we must first understand the generic framework of workflow management systems. Most workflow management systems are based on the four perspectives of business process representation, i.e., functional, behavioral, organizational, and informational (Curtis et al., 1992; Bussler and Jablonski, 1994; Gruhn, 1995; Kwan and Balasubramanian, 1997).

The *functional perspective* indicates that workflow management systems need to specify the tasks and the underlying rationale of a workflow by decomposing high level functions into tasks that can be allocated to human or software agents. The *behavioral perspective* refers to the need for specifying when and how the tasks are performed; these can be specified using process logic in petri nets, or other process models (Kumar and Zhao, 1996).

The *organizational perspective* seeks to answer the question of who performs what tasks and with what tools. In workflow management systems, the organizational perspective involves actors, roles, resources, and resource management rules that can be modeled with organization charts and object hierarchies.

The *informational perspective* relates to the business data and documents that are the subjects of workflow activities. In workflow management systems, information is usually organized in object hierarchies or networks and stored in databases or file systems.

The diagram in Figure 1 illustrates the relationship between the four perspectives. This diagram is essentially a meta model for workflow management systems.

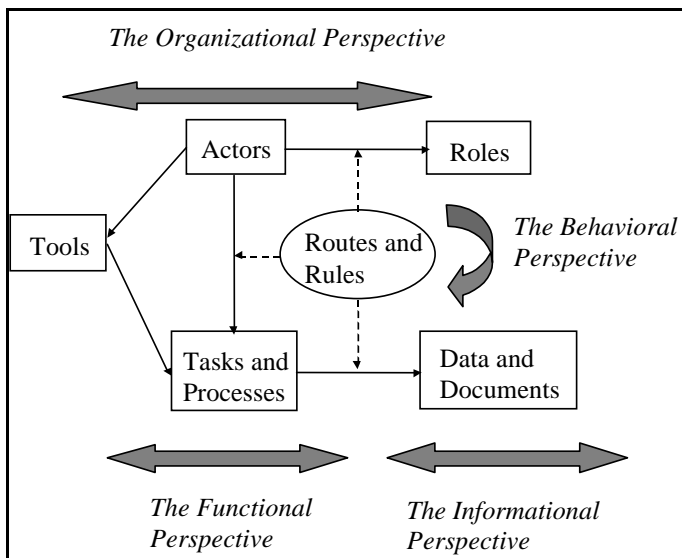


Figure 1. The Four Workflow Perspectives

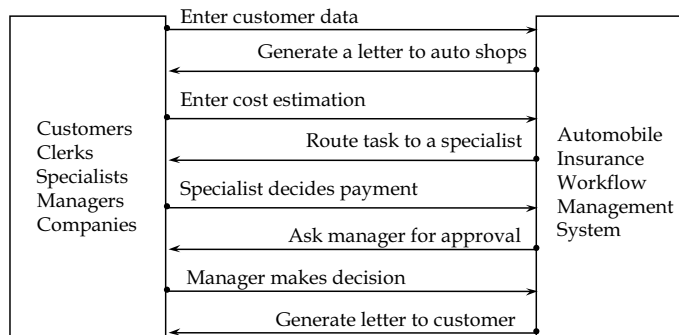


Figure 2. A Workflow System for Auto Insurance

A Workflow System Example

Figure 2 depicts an automobile insurance workflow system, which includes the actors and the workflow management system. The general process is as follows:

- A customer submits an insurance claim.
- The data about the insurance claim is entered into the WFMS.
- The WFMS generates a letter to several automobile shops for estimation of repair costs.
- Upon receiving the replies, a clerk enters the cost data.
- The WFMS routes the task to an insurance specialist according to the requirement of the task and the expertise of the specialists.
- The specialist decides on the form and the amount of the payment and returns the results back to the WFMS.
- The WFMS sends the claim and the payment proposal to a manager.
- The manager makes the final decision.
- The WFMS generates a letter to the customer.
- Eventually, the case will be closed after the customer agrees with the insurance company, perhaps with some iterations of the process.

The workflow technologies focus on automating the coordination of business activities and on automating the data flow within and between companies. Workflow extends the functionality of databases, emails, and EDI by adding more automation mechanisms by:

- Integrating the internal and external information and knowledge resources (as discussed in the last section) so that knowledge retrieval becomes more efficient;
- Providing document generation mechanisms (see the workflow example) so that many repetitive and tedious clerical and managerial tasks are automated;
- Operationalizing the workflow model so that handoffs between workers are automated;
- Maintaining the workflow history so that workers can search previous cases for guidance;

- Delivering the necessary knowledge to workers automatically and at the time of need, which can be referred to as just-in-time knowledge delivery;
- Customizing the knowledge management strategy so that workers are not burdened with irrelevant knowledge.

A Knowledge Management Model in Workflow Systems

A WFMS contains several different types of knowledge, including:

- *Process knowledge* that contains the descriptions of tasks, roles, rules, and routes;
- *Institutional knowledge* that describes the roles the actors, and business procedures and regulations;
- *Environmental knowledge* that describes the business environmental factors such as governmental regulations, industrial associations, competitors, and customers.

These types of knowledge may exist in various different forms such as:

- Workflow models inside the WFMS
- Workflow history (workflow instances) inside the WFMS
- Transaction data in company databases or data warehouses
- Decision support documents in company file systems
- Hypertext documents in external sources such as libraries or Web pages.

Figure 3 illustrates that the five forms of workflow knowledge that can be managed by the WFMS. Note that the five forms of knowledge should be treated separately because each requires different functions. The workflow model is a type of metadata that embodies the process knowledge and part of the institutional knowledge. The workflow history contains knowledge about typical business cases and exceptions. The database transactions and company documents are usually stored separately due to their differences in format and in purpose. Database transactions are mainly used for monitoring and controlling the business

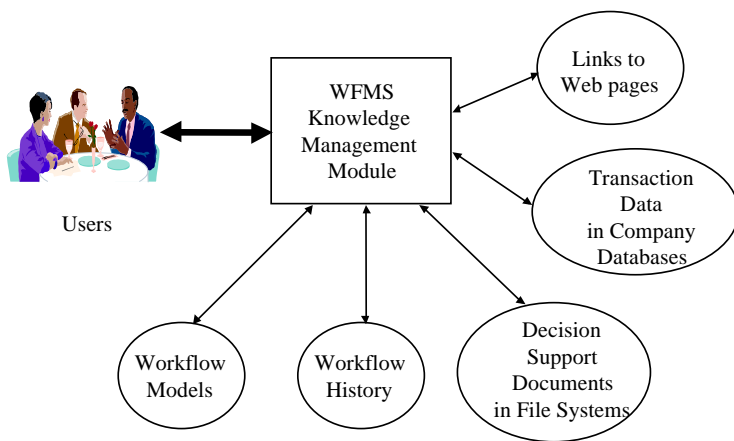


Figure 3. Knowledge Management in WFMSs

processes while documents are typically used for planning and for instructing purposes. The links to Web pages are increasingly important to corporate intelligence and should be managed as part of workflow knowledge.

Concluding Remarks

Workflow management systems provide a unique facility for managing organizational knowledge because of their novel features. The second order effects of workflow-centered knowledge management are numerous:

- The automatic distribution of business logic in workflow systems can be accomplished with better precision because the workflow model tells the workflow management systems who needs to know what and when. This minimizes the learning costs of the organization in terms of the distribution and filtering of knowledge.

- The cases in a workflow history can be used to train new employees by adding a simulation module in the WFMS so that training can be conducted using the workflow system rather than training seminars in conventional meeting rooms. This can potentially improve the quality of training and reduce its cost.
- The just-in-time and customized delivery of information also makes the management of organizational memory more effective. As a result, the workflow management systems will reduce the need for individual workers to maintain personal collections of files.

This paper proposes a conceptual framework for knowledge management and organizational learning in workflow systems. We are currently working toward substantiating the ideas suggested here by implementing them in a prototype system.

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