Document-based workflow modeling: a case-based reasoning approach

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Abstract

A workflow model is useful for business process analysis. A well-built workflow can help a company streamline its internal processes by reducing overhead. The results of workflow modeling need to be managed as information assets in a systematic fashion. Reusing these results is likely to enhance the quality of the modeling. Therefore, this paper proposes a document-based workflow modeling mechanism, which employs a case-based reasoning (CBR) technique for the effective reuse of design outputs. A repository is proposed to support this CBR process. A real-life case is illustrated to demonstrate the usefulness of our approach. © 2002 Elsevier Science Ltd. All rights reserved.

1. Introduction

Reengineering has enabled companies to operate faster and more effectively and to use information technology more productively (Hammer & Stanton, 1999). Workflow models have become popular because of such increased interests in business process reengineering and improvement of related technologies such as inter-networking and object-oriented techniques (Jablonski & Bussler, 1996). They help managers fight their ways through the productivity wars of the past 10 years. Companies have revamped their processes and cut out redundant activities. Workflow technologies can facilitate enterprises' requests for improved competitiveness by increasing productivity and enhancing services for customers (Lawrence, 1997).

Workflow models are useful for business process analysis (Bracchi & Pernici, 1984; Ellis & Nutt, 1980). When workflow technology is adopted in real business, it is important to model workflow in a systematic fashion. Very few modeling experts encounter the same case more than once in their entire career; modeling experience is valuable and hard to acquire (Brown & Gupta, 1994). The results of modeling activities are valuable information assets. It is important to manage these modeling results systematically.

Case-based reasoning (CBR) technique is useful for the reuse of knowledge. CBR is a problem solving technique that reuses past cases, experiences, or tacit knowledge (Kim & Han, 2001b; Kolodner, 1991; Kolodner, 1993; Korczak,

Maciaszek, & Stafford, 1989; Noh, Lee, Kim, Lee, & Kim, 2000; Riesbeck & Schank, 1989; Slade, 1991). CBR retrieves similar cases from a case base, selects the most similar case among them, adapts this case according to the user's requirements, and then stores this new case into the case base for future reuse.

Although CBR is useful for the reuse, it has not been applied for workflow modeling. However, CBR has been employed successfully for other modeling activities such as data modeling (Lee & Han, 1997; Paek, Seo, & Kim, 1996). Therefore, this paper proposes a document-based workflow modeling support system (DWMSS) using the CBR technique. DWMSS is better able to utilize the business know-how embedded in the previous workflow cases.

In Section 2, we introduce and sharpen a document-based workflow model (Lee & Suh, 2001). Section 3 presents a real-life case that is modeled by the use of DWMSS. Section 4 explores the system architecture and modeling process of DWMSS. Section 5 describes a repository included in DWMSS. Sections 6 and 7 illustrates the details of the modeling process of DWMSS by the use of a real-life case. Section 8 compares DWMSS with other modeling support systems using the CBR technique. Section 9 concludes this paper and points out some important avenues for future research.

2. A document-based workflow model

Workflow is the automation of a business process;

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Table 1
Elements of the document-based workflow model

Model elements	Description
Task	A unit consisting of a workflow
Agent	An individual responsible for a task (identified as an organizational position)
Document	A view for an information set required to support a task

documents and tasks are passed from one participant to another for action, according to a set of procedural rules (Lawrence, 1997). The *Workflow model* represents a business process and supports its automated manipulation. It consists of: (i) a network of activities and their relationships, (ii) criteria to indicate the start and termination of the process, and (iii) information about individual activities, such as participants, associated IT applications, and data (WfMC, 1996).

Although a variety of workflow models have been developed, a formal modeling method is rare (Baus & Blanning, 1997). The major reason is that workflow technologies have been developed by the solution vendors in the industry domain rather than by academic research (Swenson & Irwin, 1995). Therefore, each workflow model seems especially well suited to specific objectives and purposes (Jablonski & Bussler, 1996). Most of these models have three key components in common: the unit of work, actor, and tool for work (Lee & Suh, 2001).

We employ and enhance a document-based workflow model (Lee & Suh, 2001) for developing DWMSS. Corporate documents are produced according to certain organizational processes (Uijlenbroek & Sol, 1997); most formal business tasks are based on, or driven by, document flows (Sprague, 1995). Therefore, corporate documents and the corresponding business processes play key roles in modeling a corporate information system (Frank, 1997; Morshheuser, Raufer, & Wargitsch, 1996; Sprague, 1995; Uijlenbroek & Sol, 1997).

As shown in Table 1, the document-based workflow model includes three key elements of the workflow model. Here, a task corresponds to the unit of work; an agent corresponds to an actor; a document corresponds to the tool for work.

In workflow modeling, it is important to show the flows of tasks precisely for more effective analysis. However, the document-based workflow model does not include the detailed notations for depicting the relationships among tasks, such as intertask dependencies.

As shown in Fig. 1, six types of intertask dependencies are possible (WfMC, 1996). *Sequence* means that several tasks are executed in sequence under a single thread of execution ('No Split' or 'No Join' conditions hold during sequential routing). *Iteration* means a task cycle for the
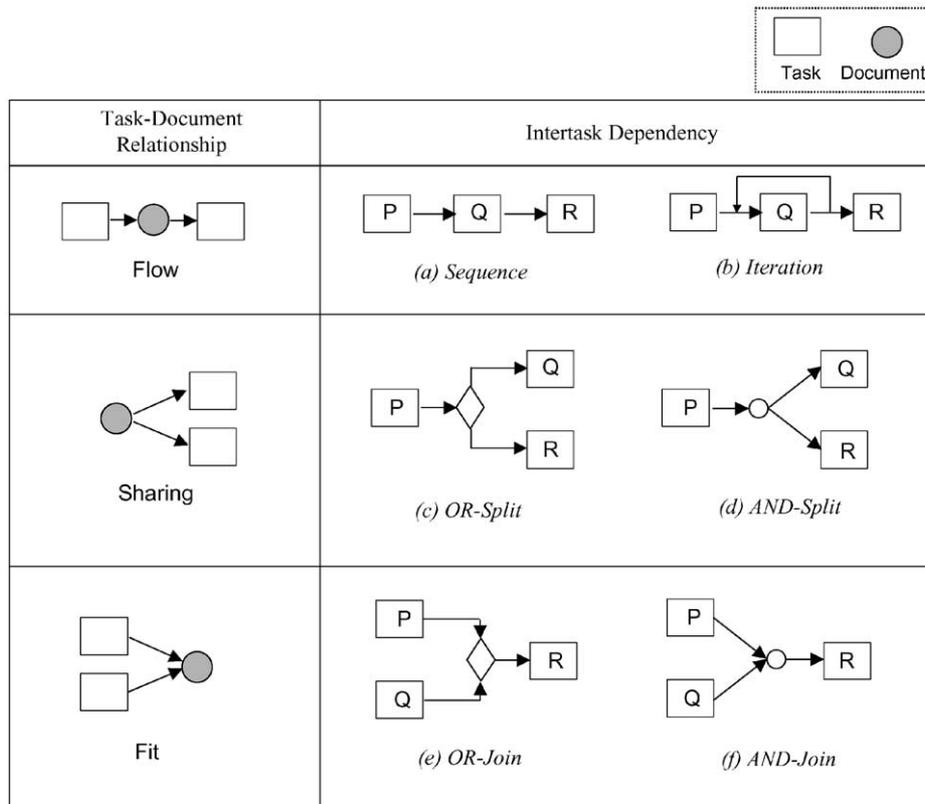

Fig. 1. Intertask dependency types and their grouping in terms of task-document relationship.