



ELSEVIER

Available online at www.sciencedirect.com

SCIENCE @ DIRECT®

Data & Knowledge Engineering 50 (2004) 87–115

DATA &
KNOWLEDGE
ENGINEERING

www.elsevier.com/locate/datak

A case-based reasoning framework for workflow model management

Therani Madhusudan^{*}, J. Leon Zhao, Byron Marshall

MIS Department, University of Arizona, Tucson, AZ 85721, USA

Available online 25 January 2004

Abstract

In order to support efficient workflow design, recent commercial workflow systems are providing templates of common business processes. These templates, called cases, can be modified individually or collectively into a new workflow to meet the business specification. However, little research has been done on how to manage workflow models, including issues such as model storage, model retrieval, model reuse and assembly. In this paper, we propose a novel framework to support workflow modeling and design by adapting workflow cases from a repository of process models. Our approach to workflow model management is based on a structured workflow lifecycle and leverages recent advances in model management and case-based reasoning techniques. Our contributions include a conceptual model of workflow cases, a similarity flooding algorithm for workflow case retrieval, and a domain-independent AI planning approach to workflow case composition. We illustrate the workflow model management framework with a prototype system called Case-Oriented Design Assistant for Workflow Modeling (CODAW).

© 2004 Elsevier B.V. All rights reserved.

Keywords: Case-oriented workflow modeling; Case-based reasoning; Ad hoc workflows; Model reuse

1. Introduction

Business process modeling is a critical activity in modern organizations to enable enterprise application integration, standardization of business processes, and online B2B and B2C E-commerce. The importance of business process modeling in IT-enabled business process management

^{*} Corresponding author.

E-mail addresses: madhu@email.arizona.edu (T. Madhusudan), lzhao@bpa.arizona.edu (J.L. Zhao), byronm@eller.arizona.edu (B. Marshall).

strategies is indicated by the recent calls for improving process modeling and process management in organizations [14].

Workflow modeling involves the translation of high-level business requirements into workflow schemas that can be executed by appropriate workflow engines. Specifying a workflow model is a knowledge intensive endeavor because development of a typical workflow model requires detailed understanding of the business process logic, the organizational chart, and the information systems accessed by the workflow. Further, a given informal business process description may be modeled in multiple ways, depending on the underlying IT infrastructure and business context.

Recent research has suggested the reuse of field tested process knowledge and associated process models to guide workflow modeling and design efforts [18,20,24]. Towards this end, recent commercial systems (such as Oracle Workflow-11i, INCOME [35], and ARIS [39]) provide basic templates for business processes, such as order processing and procurement. These templates may be instantiated and appropriately modified to an organization's needs by a knowledgeable workflow designer. However, standards for template representation and associated ontologies, formal guidelines for reuse of these templates, rules for their instantiation or modification, and procedures for their composition into complex workflows are currently non-existent. Furthermore, there is a lack of design guidelines and workflow modeling tools at present to support tasks such as generation of alternative workflow process models for a given set of business requirements [40].

Workflow modeling and design is the task of defining structured workflow schemas from informal business requirements that satisfy a variety of business logic, organizational and resource constraints. We note that the terms workflow schema, process model, and workflow model are used synonymously in this paper. Workflow modeling involves definition and selection of appropriate tasks (possibly from a task library), sequencing of the tasks to satisfy data and logical dependencies, allocation of resources consumed by the tasks, allocation of agents to execute tasks, scheduling of tasks considering concurrency, and finally, validating and verifying the model [1]. Manual workflow modeling is supported by graphical interfaces, where the workflow model is defined as a graph. Workflow modeling involves searching (albeit implicitly) through a design space defined by a large number of process model alternatives and selection of an optimal process model to fulfill the given problem. With the increasing adoption of workflow management systems and the advent of flexible process integration technologies such as web services, there is an acute need for developing tools and approaches to support workflow design and modeling.

In this paper, we propose a workflow model management framework based on a structured workflow design process, which enables reuse of process knowledge (both structured and unstructured) from organizational process repositories. The workflow design process consists of two phases. In the first phase, relevant business tasks are ordered into a seamless whole, satisfying pre-conditions and post-conditions. The result of this phase is a workflow model, a project network defined by a partial ordering amongst all the relevant tasks. Multiple workflow models may be designed to fulfill a given set of business goals. In the second phase, a process model is selected from the available alternatives and is further annotated with appropriate agents, resources and timing information, followed by incorporation of routing details, such as appropriate forks and joins to facilitate concurrent execution. Both phases of design may reuse process knowledge from available repositories.

We use a case-based reasoning (CBR) approach [22], which consists of case retrieval, case reuse, case adaptation and case verification tasks, to support workflow model reuse during workflow

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات