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Data & Knowledge Engineering 47 (2003) 237–267

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Workflow mining: A survey of issues and approaches

W.M.P. van der Aalst ^{a,*}, B.F. van Dongen ^a, J. Herbst ^b, L. Maruster ^a,
G. Schimm ^c, A.J.M.M. Weijters ^a

^a *Department of Technology Management, Eindhoven University of Technology, P.O. Box 513, NL-5600 MB, Eindhoven, The Netherlands*

^b *DaimlerChrysler AG, Research and Technology, P.O. Box 2360, D-89013 Ulm, Germany*

^c *OFFIS, Escherweg 2, D-26121 Oldenburg, Germany*

Received 2 October 2002; received in revised form 29 January 2003; accepted 26 February 2003

Abstract

Many of today's information systems are driven by explicit process models. Workflow management systems, but also ERP, CRM, SCM, and B2B, are configured on the basis of a workflow model specifying the order in which tasks need to be executed. Creating a workflow design is a complicated time-consuming process and typically there are discrepancies between the actual workflow processes and the processes as perceived by the management. To support the design of workflows, we propose the use of workflow mining. Starting point for workflow mining is a so-called "workflow log" containing information about the workflow process as it is actually being executed. In this paper, we introduce the concept of workflow mining and present a common format for workflow logs. Then we discuss the most challenging problems and present some of the workflow mining approaches available today.

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Keywords: Workflow mining; Workflow management; Data mining; Petri nets

1. Introduction

During the last decade workflow management technology [2,4,21,35,41] has become readily available. Workflow management systems such as Staffware, IBM MQSeries, COSA, etc. offer

* Corresponding author. Tel.: +31-40-247-4295; fax: +31-40-243-2612.

E-mail addresses: w.m.p.v.d.aalst@tm.tue.nl (W.M.P. van der Aalst), joachim.j.herbst@daimlerchrysler.com (J. Herbst), schimm@offis.de (G. Schimm).

generic modeling and enactment capabilities for structured business processes. By making process definitions, i.e., models describing the life-cycle of a typical case (workflow instance) in isolation, one can configure these systems to support business processes. These process definitions need to be executable and are typically graphical. Besides pure workflow management systems many other software systems have adopted workflow technology. Consider for example Enterprise Resource Planning (ERP) systems such as SAP, PeopleSoft, Baan and Oracle, Customer Relationship Management (CRM) software, Supply Chain Management (SCM) systems, Business to Business (B2B) applications, etc. which embed workflow technology. Despite its promise, many problems are encountered when applying workflow technology. One of the problems is that these systems require a workflow design, i.e., a designer has to construct a detailed model accurately describing the routing of work. Modeling a workflow is far from trivial: It requires deep knowledge of the business process at hand (i.e., lengthy discussions with the workers and management are needed) and the workflow language being used.

To compare workflow mining with the traditional approach towards workflow design and enactment, consider the *workflow life cycle* shown in Fig. 1. The workflow life cycle consists of four phases: (A) *workflow design*, (B) *workflow configuration*, (C) *workflow enactment*, and (D) *workflow diagnosis*. In the *traditional approach* the design phase is used for constructing a workflow model. This is typically done by a business consultant and is driven by ideas of management on improving the business processes at hand. If the design is finished, the workflow system (or any other system that is “process aware”) is configured as specified in the design phase. In the configuration phases one has to deal with limitation and particularities of the workflow management system being used (cf. [5,65]). In the enactment phase, cases (i.e., workflow instances) are handled by the workflow system as specified in the design phase and realized in the configuration phase. Based on a running workflow, it is possible to collect diagnostic information which is analyzed in the diagnosis phase. The diagnosis phase can again provide input for the design phase thus completing the workflow life cycle. In the traditional approach the focus is on the design and configuration phases. Less attention is paid to the enactment phase and few organizations systematically collect runtime data which is analyzed as input for redesign (i.e., the diagnosis phase is typically missing).

The goal of *workflow mining* is to reverse the process and collect data at runtime to support workflow design and analysis. Note that in most cases, prior to the deployment of a workflow

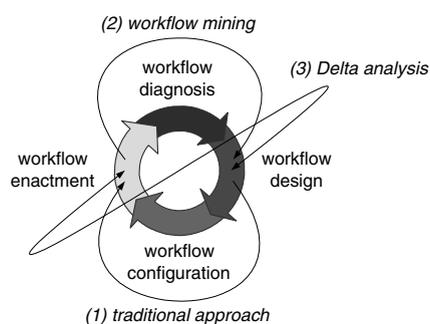


Fig. 1. The workflow life-cycle is used to illustrate workflow mining and Delta analysis in relation to traditional workflow design.

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