Chapter XII
Temporalities for Workflow Management Systems

Carlo Combi
Università degli Studi di Verona, Italy

Giuseppe Pozzi
Politecnico di Milano, Italy

ABSTRACT

Time is a very important dimension of any aspect in human life, affecting also information and information management. As such, time must be dealt with in a suitable way, considering all its facets. The related literature already considered temporal information management from a pure database point of view: temporal aspects (also known as temporalities) of stored information cannot be neglected and the adoption of a suitable database management system (Temporal Database Management System - TDBMS) could be helpful. Recently, research of the temporal data management area started to consider business processes, extending and enriching models, techniques, and architectures to suitably manage temporal aspects. According to this scenario, the authors discuss here some of the main advantages achievable in managing temporal aspects and consider temporalities in process models, in exception definition, in the architecture of a Workflow Management System (WfMS), and in the scheduling of tasks and their assignment to agents.

INTRODUCTION

Time features any aspect of human life, being associated or associable with any fact or information or event. The need for supporting temporal information, as well as storing, reasoning about, and representing data and facts, has been recognized for a long time (Snodgrass & Ahn, 1985), showing that a proper management of temporal information is required. The literature presents an analysis of the current status and sketches about future trends on storing (Jensen & Snodgrass, 1999, Khatri et

al., 2004), representing and reasoning (Chittaro & Montanari, 2000) on temporal information: other papers consider these trends in several application domains, e.g. in medicine (Adlassnig et al., 2006, Combi & Pozzi, 2006b).

Time is thus relevant for any human activity, either if managed in a "traditional" way or with the support of ICT (Information and Communication Technology) tools. Workflow Management Systems - WfMS – (Aalst & van Hee, 2004, Grefen et al., 1999, Weske, 2007) can help in managing activities and/or business processes, and can be even more helpful if such systems can properly manage time and related temporal dimensions (i.e., temporalities). As an example, changes in the managed information, in the organization, in the process model, as well as deadlines, constraints on the activation or completion of a task or of the entire process, temporal synchronization of tasks can be easily defined, monitored, and detected by a suitable WfMS (Marjanovic & Orlowska, 1999a, Marjanovic & Orlowska, 1999b).

Since most of the information managed by a WfMS is stored by a database management system (DBMS), it can be easily observed that a suitable management of temporalities by the DBMS itself, which could result in a temporal DBMS (TDBMS), could be helpful. Unfortunately, and to the best of our knowledge, very few TDBMSs are available: despite this, we shall consider throughout the paper that some temporalities can be managed at the DBMS level: as an example, we shall assume that the valid time dimension, which is one of the relevant elements in managing temporalities, is available and manageable by the DBMS.

The chapter is organized as follows. The first section is entitled *Temporalities in Workflow Models* and it considers the main models and the related temporalities used in a workflow system: the process model, describing the single atomic work units and their coordination; the information model, describing all the information of the process instances (i.e., cases) by the workflow system; the organizational model, describing the

agents (i.e., participants, which can be human or not, of an organization), and the structure of the organization where process instances will be executed.

The second section is entitled *Temporalities in Expected Exceptions* and it considers the abnormal events, also known as exceptions, which may occur during the execution of process instances. The section focuses on expected exceptions, i.e. those exceptions which must be considered at process design time, may occur at any time during the execution of the process, may deviate the "normal" flow of execution, and include a not negligible semantics.

The third section is entitled *Temporal Scheduling* and it considers the scheduler of a workflow management system, its policies for assigning tasks to agents and for fulfilling the defined temporal constraints. The section also includes the description of one possible algorithm for a temporal scheduler of a WfMS.

The fourth section is entitled *Temporal Architectures for WfMSs* and it considers both the general architecture of a WfMS and the changes that can be applied to such architecture, enriching it to suitably managing temporalities. The section discusses the pros and cons of three different architectures, depending on the availability of a full-fledged temporal database management system or not.

Finally, the last section entitled *Conclusions* provides an overview of the chapter and sketches out some possible research topics in the area.

TEMPORALITIES IN WORKFLOW MODELS

When considering a business process and its enactment via a Workflow Management System (WfMS), the main models to be considered relate to the process model (i.e., the schema of the considered process), to the information model (i.e., the information managed by the process

17 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/temporalities-workflow-management-systems/19696

Related Content

The Impact of the Knowledge Economy on Leadership in Organisations
Manon Van Leeuwen (2003). *Knowledge and Business Process Management (pp. 238-258).*
www.irma-international.org/chapter/impact-knowledge-economy-leadership-organisations/24846

Sustainable Competitive Advantage in Turbulent Business Environments Using Critical Organizational Capabilities and Resources to Manage Complexity
Yannis A. Pollalis (2018). *Global Business Expansion: Concepts, Methodologies, Tools, and Applications (pp. 1374-1393).*
www.irma-international.org/chapter/sustainable-competitive-advantage-in-turbulent-business-environments-using-critical-organizational-capabilities-and-resources-to-manage-complexity/202276

Information Governance Maturity Model: Should Retention Be Rethought?
Salvador P. Barragan (2019). *Diverse Applications and Transferability of Maturity Models (pp. 92-119).*
www.irma-international.org/chapter/information-governance-maturity-model/214782

E-Banking in India: Risk Management in Payments and Settlement System
Rituparna Das (2018). *Global Business Expansion: Concepts, Methodologies, Tools, and Applications (pp. 1176-1190).*
www.irma-international.org/chapter/e-banking-in-india/202265

Fuzzy Clustering With Derivative–Free Search Algorithm for Location of Biogas Energy Systems
Gökçe Kiliçkaya, Tarik Küçükdenizand akir Esnaf (2021). *International Journal of Operations Research and Information Systems (pp. 1-19).*
www.irma-international.org/article/fuzzy-clustering-with-derivativefree-search-algorithm-for-location-of-biogas-energy-systems/294118