Towards Adaptive Workflow Systems

CSCW-98 Workshop Report

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Introduction

The workshop *Towards Adaptive Workflow System* was organized by the authors of this report as part of the 1998 Conference on Computer Supported Collaborative Work (CSCW-98), and was held at the Westin Seattle on Saturday, November 14, 1998. The workshop had about 30 attendees and included invited presentations, paper presentations/discussions and a panel. This report summarizes on the Goals and topics of the workshop, presents the major activities and summarizes some of the issues discussed during the workshop.

Goals and Topic

Today's business environments are characterized by dynamic, uncertain and error-prone environments. In order to effectively support business processes in such contexts, workflow systems must be able to adapt themselves effectively when deviations from the "ideal" process occur during process execution. Such "exceptions" can include process enactment errors, violations of the assumptions (e.g. concerning resource availability) underlying the current workflow model, or even changes in the business environment not yet reflected in the current process model. If not detected promptly and handled effectively, such exceptions can result in severe impacts on the effectiveness of collaborative work.

Workflow systems currently provide little support for such challenges. Most do not allow one to modify a process model once it has started executing. Exceptions are handled by attempting to include conditional branches for all possible contingencies. It is difficult, however, to anticipate all possible failures. Adding such branches also greatly complicates the process models and thereby obscures the "preferred" process. Even such systems that do support exception modeling and dynamic workflow model modification do not help determine the best response to a given exception, which can include changing the current process instance or making lasting changes to the process model template followed by future instances.

The goal of the workshop was to provide researchers with a rare opportunity to discuss how workflow systems can better deal with such challenges. Our hope was to draw together help identify the breadth of current work, commonalties, gaps, potential collaborations and future research directions. Relevant topics included:

- Methodologies and tools for detecting, understanding and resolving exceptions
- Infrastructures for dynamically modifiable process models
- Semi-prescriptive process models for dynamic environments
- Empirical studies of exception handling in collaborative work settings

Relevant work is taking place is many fields including artificial intelligence and other parts of computer science, industrial engineering, social science, management science and so on. We attempted to represent as broad as possible a cross-section of this work within the workshop.

Submissions

The workshop's CFP was well received. Of the 36 papers submitted, 25 were accepted for attendance, and 11 for presentation. It was interesting to see that most of the accepted papers (17) focused on the technological aspect of adaptive workflow management and mostly presented new approaches using either some type of exception handling or partial specification (e.g. late binding techniques). The other papers included taxonomies/frameworks for understanding adaptive behavior and surveys of existing techniques. Only one empirical study was submitted.

Activities

The workshop's activities included an introduction, paper presentations/discussions and a concluding presentation.

Introduction

The introduction set the stage for the papers and the discussion of the topics. It was meant to present the problems in workflow management implementations from three different perspectives: the implementing organization, the users and the vendors. Furthermore a panel discussed the requirements for adaptive workflow management.

In the first invited talk of the day Dr. Christoph Bussler of Boeing presented the complexities of implementing workflow management solutions in large corporations. Experiences have shown that today's workflow solutions aren't flexible enough to cope with exceptions in the process and organizational/policy changes. He concluded that workflow systems have to be more adaptive and able to cope with exceptional situations.

Next the empirical paper was presented describing the users' coping mechanisms with restrictive systems. Furthermore the classical problems of a CSCW-system implementation (see Grudin (1994)) were observed. The final presentation of this section was by Dr. Sunil Sarin of InConcert. He introduced the concept of a data-driven workflow, in which the structure of the workflow is driven by the structural data about the artifacts handled. He also mentioned that the actual possibility to change the workflow model might not be sufficient, since it does not help the users in deciding what changes are necessary.

The panel focused on alleviating the prescriptiveness of workflow descriptions. A lively discussion emerged around this topic which covered different approaches like tying the process to the artifact or allowing users to not follow the workflow prescription without remodeling the process model.

Paper presentations and discussion

The paper presentations and discussions took up most of the rest of the day. It was interesting to observe that most approaches involved adding some type of exception handling to traditional modeling techniques. Only a few alternative, partial-specification approaches were presented.

Most of the discussions were centered on the subject of closing the gap between organizational reality and the capabilities of workflow management systems. Among the discussed approaches were systems using reflection, knowledge-based systems, agent-based approaches and partial specification of workflows. Furthermore it seemed as if agreement existed among the participants that there was a need for better understanding the organizational and social issues of workflow management.

Concluding Presentation, Open Issues and Outlook

A concluding presentation tied together the subjects discussed in the papers and during the workshop. It led to a discussion about the research in the field and how it might be promoted. The presentation was in agreement with the participants of the workshop that the topic of adaptive workflow management still needs a lot of research. The following topics were identified as meriting particular attention:

- Explicit process modeling vs. emergent workflow. When are the approaches appropriate? Are those two approaches a dichotomy or rather a continuum?
- What models are needed to support process? Candidate models include business processes, dependencies among processes, artifacts, organizational models, etc.
- Do we need a taxonomy of business processes? What are interesting dimensions for characterizing business processes? What is the interplay between those dimensions and the suitability of workflow management approaches?
- Organizational issues: How can workflow solutions be evaluated? What determines workflow management systems acceptance?
- What can be learned from previous research in CSCW, AI etc.?
- Are there different categories of adaptiveness in workflow management? (e.g. data-driven, goal-driven)
- How can the gap between the organizational reality and the workflow management tools in the social perspective be narrowed?
- How can the gap between social science and technological research be bridged?

Conclusions

The workshop organizers would like to thank the CSCW-98 organizers, workshop reviewers and participants for their efforts in making the workshop a reality. It is our hope that it helped promote further progress on research in this area. Interested parties may also wish to see the upcoming January 2000 special issue of the Journal of Computer Supported Cooperative Work (CSCW) on this topic. Further information on the workshop itself is available at http://ccs.mit.edu/klein/cscw98/.

Appendix

References

Grudin, Jonathan. 1994. "Groupware and social dynamics: eight challenges for developers." *Communications of the ACM* 37 (1):92-105.

Papers

Yanbo Han et al.
A Taxonomy of Adaptive Workflow Management

Stephan Poelmans
Coping Strategies and Distributed Viscosity in a Workflow Management System: a Case Study

Rachel Jones
Are embedded process models what are needed?

Steinar Carlsen et al.
Emergent Workflow

Zongwei Luo et al.
Defeasible Workflow, its Computation and Exception Handling

George White
Towards the Analysis and Synthesis of Adaptive Workflow Systems

Stephen E. Dossick et al.
Worklets for Adaptive Workflow

Edward C. Cheng
OMM: An Organization Modeling and Management System to Support Adaptive and Dynamic Workflow

Aris M. Ouksel et al.
The Need for Adaptive Workflow and What is Currently Available on the Market

Dickson K.W. CHIU et al.
Exception Handling with Workflow Evolution in ADOME-WFMS: A Taxonomy and Resolution Techniques

Hoffman et al.
Augmenting Self-Controlled Work Allocation

Wolfgang Deiters et al.
Support for exception handling through workflow management systems

Theo Dirk Meijler et al.
Realising Run-time Adaptable Workflow by means of Reflection in the Baan Workflow Engine

Stefan Horn et al.
An Approach to Dynamic Instance Adaption in Workflow Management Applications

Alessandra Agostini et al.
Simple Models for Articulating Complex Work Processes

Gert Faustmann
Enforcement vs. Freedom of Action - An Integrated Approach to Flexible Workflow Enactment

Joachim Herbst
An Inductive Approach to Adaptive Workflow Systems

Fabio Casati
A Discussion on Approaches to Handling Exceptions in Workflows

Alex Borgida et al.
Workflows as Persistent Objects with Persistent Exceptions

Pauline Berry et al.
Adaptive Process Management: An AI Perspective

David Edmond et al.
Achieving Workflow Adaptability by means of Reflection

Peter Kammer et al.
Requirements for Supporting Dynamic and Adaptive Workflow on the WWW

Keith Whittingham et al.
An alternative approach to business process support

Perakath Benjamin et al.
Toolkit for Enabling Analysis and Modeling of Adaptive Workflow (TEAMWORK)

Mark Klein et al.
A Knowledge-Based Approach to Handling Exceptions in Workflow Systems