

December 1998

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Recommended Citation

Bagla, Kunal and Konana, Prabhudev, "Workflow Management in Educational Environment" (1998). *AMCIS 1998 Proceedings*. 349.
<http://aisel.aisnet.org/amcis1998/349>

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Workflow Management in Educational Environment

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Abstract

This paper discusses a Web-based system for managing educational processes as a set of workflows. The premise of the model is that instructional activities are conceptually similar to business processes for which numerous workflow management systems are available. Using Oracle DBMS back-end and the features of triggers and stored procedures we created an environment for monitoring performance and progress, disseminating information, managing routine administrative tasks, and providing better collaboration and coordination mechanisms. Database triggers are used to enforce educational rules (e.g., not more than three students can work on the same project topic). We used a restricted version of the Web-based system in an introductory information management class for MBA students with much success. Over 80% of the students found the Web-based topic selection (auction), monitoring and final submission was educational, fair and exciting.

Introduction

Workflow management systems (WFMS) have been extensively used in businesses to design, execute, and monitor processes (Georgakopoulos et al., 1995). They provide an efficient environment for collaboration, coordination and communication among *agents* - people and software programs - to complete activities in a particular order and with certain rules, procedures and constraints. However, WFMS have not been discussed in the context of educational environment for instructional purposes. Or, for that matter educational activities have not been thought of as a set of workflows. On closer analyses, we find that a majority of the educational processes are nothing but *information processes*, (Medina-Mora et al., 1993), that is, the process by which information is created, stored, retrieved, distributed, compared, and transmitted. Some of these tasks can be automated using programs (triggers or stored procedures) or performed by humans (e.g., students, faculty or teaching assistants) interacting with the computers. The Web technology has been used to manage some information processes (e.g., retrieval or information dissemination) in education and training very effectively. However, the Web has not been extensively used for managing educational processes such as to orchestrate work in progress by initiating activities, signaling deadlines, and monitoring progress. In this paper, we explore how workflow systems (or concepts) can be implemented using the Web technology for educational processes and test its effectiveness. We provide a workflow implementation methodology for using a database management system with triggers and stored procedures.

Rest of the paper is organized as follows: We first provide an overview of analyzing educational processes as workflows and provide an example of workflow for managing projects from start to completion. We then describe the development methodology with some implementation details.

Educational Processes

Many of the tasks performed in education and training are part of larger processes involving instructors, individual students and groups of students in both traditional and virtual classroom settings. These tasks are accomplished in some sequence with a set of rules, constraints and procedures similar to tasks performed in businesses. It is common that instructors spend enormous amount of time managing certain routine activities, often not contributing to the actual learning process. This is particularly true in very large classes or in distance learning where the overhead cost of maintaining an effective information flow is significant. This lack of coordination and information flow lead to dissatisfied students and instructors, and unmet expectations. Figure 1 illustrates a core set of common activities in an educational environment. We classify activities performed by a faculty member into three main categories: administration, monitoring, and information dissemination (See Figure 1). For the sake of brevity we do not discuss activities of the students.

Is it possible to translate routine non-instructional activities as a learning process? In this research we attempt to do that by viewing educational process as a workflow. Below we discuss class project as a workflow and how projects can be assigned, monitored and completed. The process has objectives of being fair and exciting. The process should by itself a learning experience. We assume project topics are auctioned over the web with certain rules, constraints and procedures. For example, rules include that there can be no more than five members in a team or no more than two groups can work on a given project topic. There are constraints that the topics must be chosen within certain time window and that only the group leader is authorized to make the selection. The instructor can impose certain intermediate deadlines during the project completion. The project materials are posted on a web site where the instructor can view the material on-line. The compliance of the deadline can be monitored by the timestamp of when the web site was last modified. If the group fails to confirm completion of intermediate deadlines then the system will automatically trigger an electronic mail to the group about the project deadline (one could enforce a rule that a group will not be able to confirm once the deadline has expired). This process will continue until the project is completed and graded. Much of the routine monitoring and administrative tasks are automated within the system. Traditionally an instructor would spend valuable class time to perform many of these activities. This results in waste of valuable class time, confusion among students, and a negative feeling among groups that do not get the project of their choice.

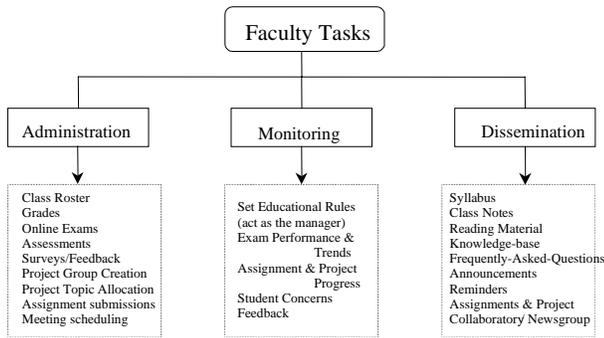


Figure 1. Faculty Task Categories

triggers and stored procedures (e.g., Oracle's PL/SQL Web Agent) that generate HTML documents dynamically. Although one could argue that stored procedures are also triggers, they are fundamentally different. Triggers are invoked before or after a table is modified. However, stored procedures are not associated with any given table but are invoked by external actions (e.g., when users request some action). Stored procedures invoke other stored procedures (e.g., reply to a request from a user). A prototype implementation using Oracle Server 8.0 can be found at <http://pundit.bus.utexas.edu/~baglak>. Oracle InterOffice suite is being integrated with our model.

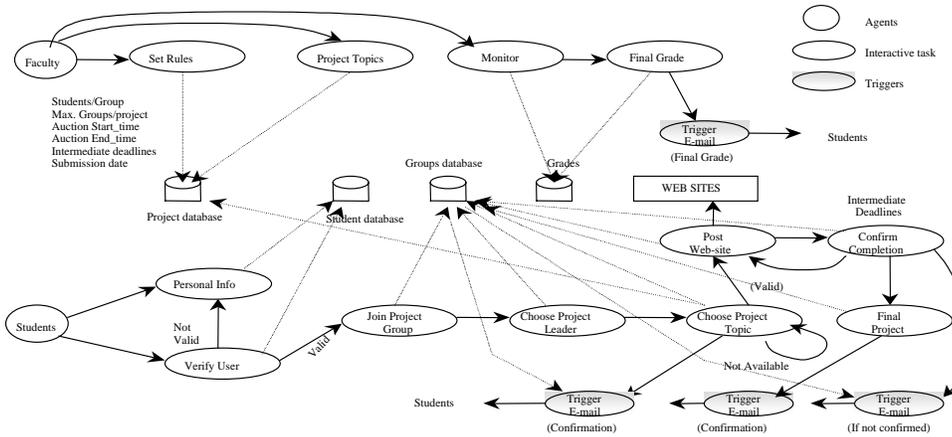


Figure 2. Project Workflow

the students found that this workflow implementation was a valuable learning experience on how technology can be used in businesses to improve productivity and quality of work, to provide feedback, and to monitor activities.

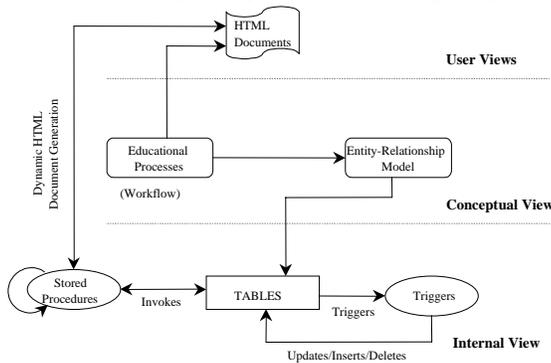


Figure 3. Development Architecture

Design Methodology and Implementation

Our design methodology is a modification of the three level database architecture. The user views are HTML documents. These documents are dynamically generated from the database using stored procedures. At the user level, the implementation details are transparent. The conceptual view consists of the educational processes (workflow) and Entity-Relationship (E-R) model. One could relate the navigational aspects of user views to the actual workflows. The workflow is actually a collection of educational processes (e.g., projects, assignments). Although not shown in the figure below, the traditional E-R model could be substituted with extended E-R models such as RMM methodology (Isakowitz, Stohr and Balasubramanian 1995) suggested for Web-based systems. The Internal view consists of tables associated with

Conclusion

We can view educational activities as part of a workflow. Therefore, by using a workflow system we can improve overall communication, collaboration, and coordination between students and instructors. A Web-based project workflow was used in a required introductory information management class of 85 students at the MBA. A survey of the MBA students found that over 80% the students felt that the system contributed significantly in completing projects and assignments on time. They found that the project auction was fair and exciting. In fact, over 90% of

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