# Design and Implementation of Examination Affairs Management Automation

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**Abstract.** Examination affairs management has become a bottleneck of the development of examination management information system because of its complex process. A kind of automated management of the examination affairs is present in this paper. In the system the examination affairs is controlled by the workflow driven by forms, at the meantime, the security is ensured through the dynamic database authentication. The control method of the workflow is discussed and some realization screenshots are displayed. The automated examination affairs management is conducive to standardize examination management and improve work efficiency.

## 1. Introduction

Examination Management is one of the important daily works of university teaching management. Its quality and the level has been an important indicator to measure the level of school education because the exam is an effective means to measure and assess students' ability and levels [1].

Examination Management includes assign examination paper writer; review, and offset print examination paper before exam; arrange and carry out the examination when exam; save, inspect and assess examination paper after exam. So it is a complex work involving many persons, many departments, lot of links and has long time periods. Management Informationization is an effective means to improve its management level. At present, work in this aspect mainly focuses on examination informationization, and a little done on Examination Affairs Management Informationization (EAMI) because of its complex process and difficult control, then EAMI has become the bottleneck of the development of Examination Management Informationization. In this paper, automated Examination Affairs Management (EAM) based on workflow driven by form is discussed.

## 2. Flow of Examination Affair and its Control

### 2.1 Flow of EAM

EAM relates to teaching office, school/department leaders, teachers, students, printing room, etc. The teaching office release examination arrangement according to the predetermined teaching plan; school or department schedule examination paper writer; the finished paper should be reviewed by school or department leaders, and be saved after passed the review; school teaching officer contact printing room for paper production; those production are saved in the school; exam invigilator get the paper to the examination room before exam and supervise the examination process; the examination paper are sent to the teacher who will go over them; at last examination papers are sent back to the school again after being marked for saving and inspection. A general examination affairs process is shown in Fig. 1.
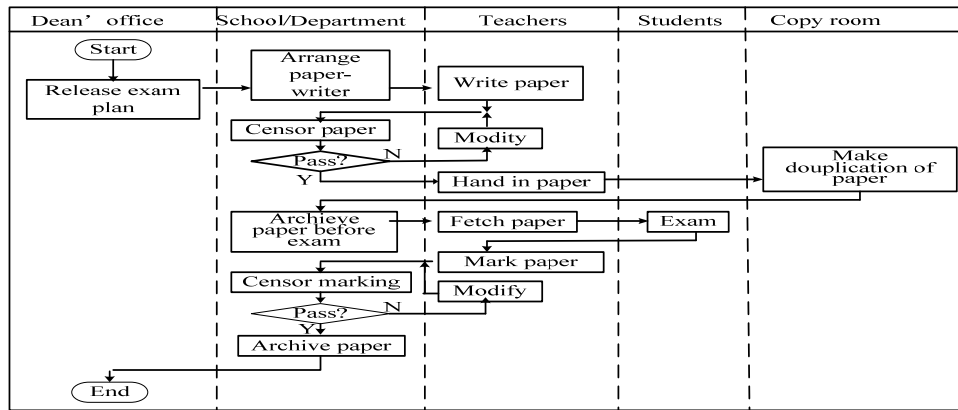
Figure 1   A general flow of examination affair

## 2.2 Technologies of Workflow

EAM begin with planning exams, ends at archiving paper after the exam, round documents such as examination papers, audit tables, etc. , with relatively fixed processes. To automate such a work is so-called workflows. Workflow Management Coalition (WfMC) definite the workflow as[2]: Workflow is concerned with the automation of procedures where documents, information or tasks are passed between participants according to a defined set of rules to achieve, or contribute to, an overall business goal.

The design of information system based on workflow different from that of the traditional information is that the management process is separated from the program. For the operation of UI and data storage, there is not any modification when nodes in the process and forms changes, only work need to do is to modify the parameters of the original information nodes and form design.

Workflow implementation techniques have: CORBA-based distributed workflow management system [3], distributed workflow system based on permanent message [4], agent-based workflow management system [5], and so on, all of these are mainly concern on solving the distributed workflow. EAM is a sequent with tasks one by one although it contains many steps. Taking this characterristics into account, a method of the workflow driven by filling in form information to automate EAM is proposed in this paper.

## 2.3 Control of the Workflow of Examination Affair Management

The method of the workflow driven by form correspond the data sheet in database with flow of the examination affair management through the relationship between the tables. The principle is shown in Fig. 2.
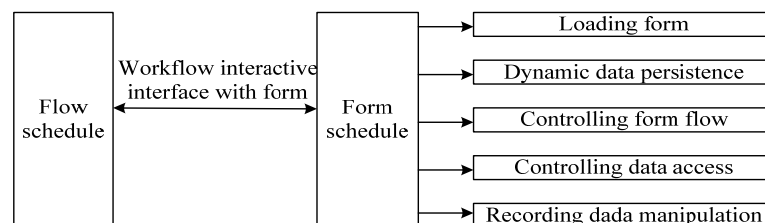


Figure 2   WfEAM driven by form

The engine of the affair is as following: form engine receives a client request, parse and persistence the request based on the model in the form; the data is passed to the workflow engine through the control of form flow; workflow engine start affair schedule after it acquired the form data corresponding the form operation results and presupposed rules.

## 3. Design and Implement of the System

### 3.1 Data Abstraction
**(1) Relationship between entities**

Data abstraction and database design is a focus in the system design, which is the base of foundation of workflow. The entities are educational administration, schools/departments, courses, students, teaching and administrative staff, students, classes, etc. The relationship between entities is complex, the main body is shown in Fig. 3.
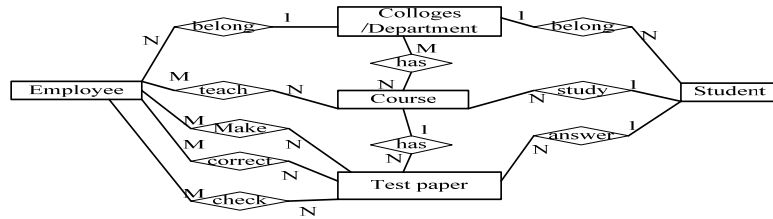


Figure 3   E-R diagram

**(2) Data structure of workflow**

Various entities in the system take part in the intended transaction in the workflow of examination affair management (WfEAM) collaboratively, and then EAM was done. The data structure of WfEA is defined as in the Table 1.

Table 1  Data structure of WfEAM

| Field Name | Field Type | Constraint condition |
|------------|------------|----------------------|
| workflowid | int | Primary key |
| PaperWriter | char[] | Non-empty |
| DepartmentCensor | char[] | Non-empty |
| SchoolCensor | char[] | Non-empty |
| DeanCensor | char[] | Non-empty |
| Printer-name | char[] | Non-empty |
| PaperId | char[] | Non-empty |
| WorkflowName | char[] | Non-empty |
| IsOn | char[] | Non-empty |

Table 2  Data structure of affair

| Field Name | Field Type | Constraint condition |
|------------|------------|----------------------|
| AffairId | int | Primary key |
| WorkflowId | int | Foreign key |
| NowPosition | Int | Foreign key |
| IsOk | bool | Non-empty, 0 as default |
| Opinion | char[] | NULL |

**(3) Data structure of affairs**

The WfEAM can be seen as a set of a series of ordered affairs, its data structure is defined as in Table 2.

### 3.2 Function Modules

The system function is divided into public module, workflow management module, affair management module, bulletin management module, administrator management module, and etc., the logical structure of function is shown in Fig.4.
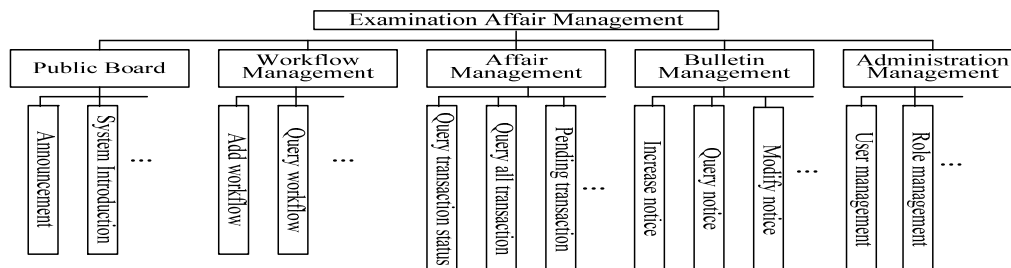


Figure  4   Function of the system

(1) Public Board:  it is mainly used to display the notice and news, and provides query for those, etc. It is visible for all the users.

(2) Workflow Management provides the operation of workflow, such as: adding workflow, query workflow, edit workflow, etc. This function is visual for teaching administrator, partially visible for other users.

(3) Affair Management deals with the operation related to the affair, such as: query transaction status, query all transaction, query pending transaction, etc. It will show the related content accordance with the user's role.

(4) Bulletin Management gives the operation of notice, such as: add notice, modify notice, query notice, etc. The function is only visible for all academic deans.

(5) Administration Management includes all the data manipulation background, such as: user data, role data, course data, class data, etc. The function is partially visible for all academic deans and whole visible for the Super Admin.

## 3.3 System Implementation
### (1) Main interface
Usable operation menu is displayed accordance with the different role of different user. If the user was a school administrator, then the operation interface is as Fig. 5, which contains all function set mentioned above.
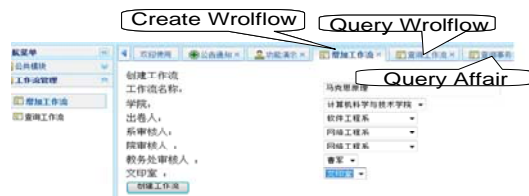


Figure 5  Interface of teaching administrator      Figure 6  Interface of creating workflow

### (2) Interface of workflow management
Examination workflow is created by school administrator after the examination plan is released, and the operation interface is shown in Fig. 6.
### (3) Visible interface of examination affair management
Visual interface shown in Fig. 7 will be automatically generated once the workflow is successfully created. The figure includes the various departments or personnel in the flow of the paper, such as course teacher, leader of the school, department, teaching administration, printing room, etc.
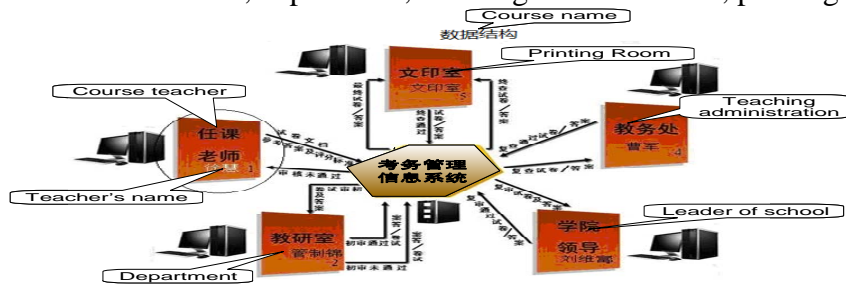


Figure 7  Visual interface of EAM

User can browse the process of the paper through the visual interface and do operations in connecting with his role. For example, a course teacher can enter the paper submission interface by clicking on the appropriate tab.

### (4) Interface of paper submission
Paper submission interface shown in Fig. 8. Before a paper is submitted by upload paper file to the system, it must be prepared in advance, some basic information such as examination form (open or closed), examination object, paper writer, etc., need to be filled in screen form by the teacher.
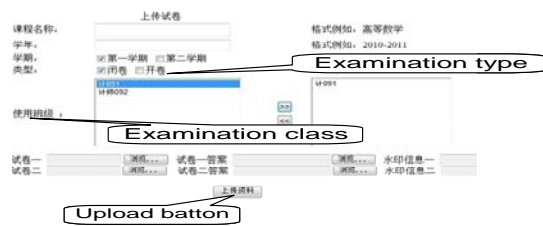
Figure 8 Interface of paper submission



Figure 9  interface of paper reviewer

### (5) Paper reviewer interface

A series of censor work around the examination paper starts after the paper submission is successful. The work goes forward in accordance with preset order, not free. The dean's reviewer interface is shown in Fig. 9.

## 4. Summary

Examination affair automated management is built based on WfEAM driven by form in this paper. This method can be better to configure user process and form advantageously. The EMA on the web is strictly controlled by the workflow, from making paper, reviewing paper, download paper for printing, etc. Meanwhile, the dynamic verification of the database ensures the security of the paper in the flow.

Examination management automation is not only a good response to the "paperless office", but also help to improve the management efficiency, it makes many relevant teachers and management personnel break the constraints of time and space for coordination work, and liberate them from everyday tedious work.

## 5. Acknowledgement

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