

# A SYSTEM FOR MANAGING CHANGES IN COURSE MATERIAL

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**Abstract:** Existing course management systems do not consider the management of course material changes, particularly courses that require more than one instructor. It is also important to communicate these changes to students registered in the course. Moreover, having one single repository of course material at the department level is very useful and can help the course assessment committee in each department to easily access course grades to perform quantitative course assessment. Existing learning systems lack three important features: (1) tracking changes made to course material; (2) informing instructors and students when a new material is uploaded and when an existing material is changed; and (3) managing changes. To overcome the above drawbacks, a course material change-management system was developed using Visual Basic programming language and Access database and was tested using a hypothetical case study. The novel aspect of the developed system is the effective management of changes made to course material and communicating these changes to instructors and students in a timely manner.

## 1 INTRODUCTION

With the advent of the Internet, e-learning has evolved and the term is now most commonly used to refer to online courses or web-based learning (Monahan et al., 2008). Web-based learning uses network technologies to create, deliver, and facilitate learning, anytime and anywhere. Many understand it as the most recent evolution of distance learning (Liaw, 2008; Raab et al., 2002). In essence, it is most commonly used to refer to managing and delivering learning content online where instructors and learners are anywhere. This broader understanding is adapted for use in the present study.

The use of innovative learning would improve communication, collaboration and interaction between the learners and educators (Hinger, 2007; Kaminski, 2005; Martín-Blas and Serrano-Fernández, 2009; Saw et al., 2008). The importance of communication and collaboration has been highlighted previously by Stump et al. (2011), Smith et al. (2009), and Thurmond and Wambach, (2004), among others. As a result, online discussion boards have become an invaluable resource. However, there are still some issues to be resolved before a realistic learning experience can be provided. Various web-

based learning systems have been developed for higher education. For example, Web Course Tools (WebCT), the Web Course Homepage System (WebCH), Blackboard Learning System, and the System for Multimedia Integrated Learning (Smile) are the latest waves of technology-based pedagogical tools. They provide web-based learning platforms that use the Internet as a delivery mechanism to allow students from all over the world to access course material. Many institutions of higher education adopt such Web-based learning systems for their courses. For instance, WebCT has been used by 2100 institutions of higher education all over the world (Ngai et al., 2007). In the United Arab Emirates (UAE), Blackboard Learning System or WebCT are being used in almost all institutions of higher education as a means for posting and managing course material online.

The benefits of web-based learning, at the learners level, have been discussed in the literature (Adhikari, 2010; Bouhnik and Marcus, 2006; Kramer et al., 2010; Liaw et al., 2007). As reported by Bouhnik and Marcus (2006), web-based learning has four main advantages: 1) freedom to decide when each online lesson will be learned; 2) lack of dependence on the time constraints of the lecturer;

3) freedom to express thoughts, and ask questions, without limitations; and 4) the accessibility to course's online materials at students' own election. On the other hand, Capper (2001) listed other benefits of web-based learning online courses.

Despite the perceived benefits of web-based learning mentioned above, research indicates that students are often dissatisfied with the web-based learning experience. Bouhnik and Marcus (2006) stated that students' web-based learning dissatisfaction was based the following disadvantages: 1) lack of a firm framework to encourage students to learn; 2) a high level of self-discipline or self-direct is required; 3) absence of a learning atmosphere in web-based learning systems; and 4) the distance-learning format minimizes the level of contact, as well as the level of discussion, among students. In other words, e-learning lacks interpersonal and direct interaction among students and instructors.

This paper presents the development of a dynamic system for managing changes in engineering courses in a university in the UAE. The university is currently using "Blackboard" as the learning platform for course material delivery and management. The four disadvantages mentioned above for distance learning are not an issue since the university uses the "Blackboard" environment for face-to-face learning. The main problem with this environment is managing changes made to courses at the department, college, and university levels. Due to the high enrolment, these courses require many sections that are taught by different instructors. Each of these courses should have the same material for all sections (i.e., same assignments, midterm exams, final exams, etc.). This research utilizes the concept of web-based learning for use in face-to-face lectures and uses visual basic programming language to develop the course change-management system. Although the problem of having several sections for the same course are more severe at the college and university levels, the system is developed using civil engineering courses due to their accessibility and availability to the researcher. The developments made provide instructors and students in the civil engineering department with an easy access to course material in a collaborative environment. It also allows instructors to add and modify course material and provides a mechanism for managing changes made to any course material and informing all parties needed to be informed by such changes in a timely manner. Interviews with several students and instructors were first conducted to get their feedback

regarding the advantages and disadvantages of the current university's "Blackboard" system. The main components of the system were presented and the developments made to it were discussed in detail. Implementation issues are discussed and a case study is then presented to validate the developed system and demonstrate its capabilities and features.

## 2 INTERVIEWS

The university under investigation uses Blackboard as its main web-based learning system. Interviews were conducted among several students and instructors to get their feedback regarding the university's Blackboard system. The majority indicated that the main advantages of the Blackboard learning system are: 1) course material and announcements are available and accessible anytime and anywhere; 2) instructors can have online tests and quizzes which can be graded electronically; and 3) instructors can post grades online. On the other hand, almost all instructors and students agreed that the main disadvantages of the system are: 1) none of the above benefits is valid when the server is down or when the Internet connectivity is unavailable; 2) it takes time to upload and download large-size files; 3) students do not know when a course material is uploaded until they login to Blackboard; 4) students do not know when a change/update is made to a course material; and 5) instructors do not know if another instructor has made a change or updated a course material.

The proposed system was designed to overcome the following three important issues: 1) tracking changes made to course material; 2) informing instructors and students instantly when a new material is uploaded and when an existing material is changed; and 3) managing changes. The main components of the proposed system are summarized in the following section.

## 3 THE PROPOSED SYSTEM

As shown in Figure 1, the system is composed of two main modules: (1) course material module; (2) change management module. Upon integrating the two modules, using Visual Basic programming language, the developed system's main screen will appear as shown in Figure 2. The proposed system can be used by instructors to upload, retrieve, and update course material, make new announcements,

and receive notifications about changes made to course material by other instructors. Students can view course material and announcements for courses they are registered in and receive notifications about changes made to course material by instructors. They will also automatically receive electronic messages informing them when a new material is uploaded or an existing material is changed/updated.

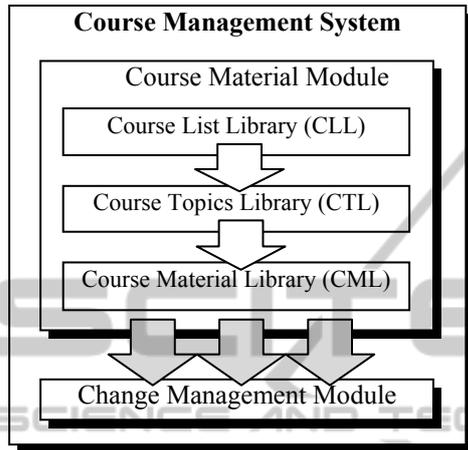


Figure 1: Components of the proposed system.

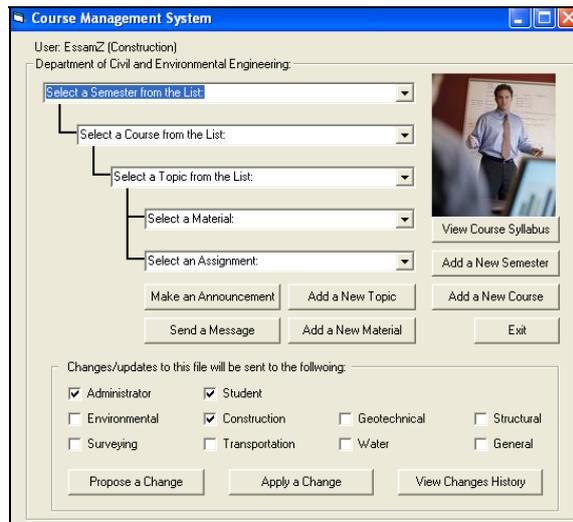


Figure 2: Main screen of the proposed system.

In the following sections the components of the proposed system are explained in detail and a case study is presented for validation. The proposed system is implemented on Microsoft Visual Basic 6.0 Enterprise Edition (Microsoft, 1998), which allows client/server developments. The choice of this programming language is due to its object-oriented programming features, relative ease of use, availability, and ability to integrate with other

Microsoft family of software (e.g., Microsoft Excel, Access, Word, PowerPoint, etc.).

### 3.1 System Databases

At the core of the system is a group of databases developed using Microsoft Office Access 2003 (Microsoft, 2003), which are directly readable by Visual Basic code. The system is developed using civil engineering courses due to their accessibility and availability. The courses are divided into eight main areas of specialty. One database is needed to store all semesters of the years. Another database is used at the course level to store all civil engineering courses and generate a library of available courses in each of the eight areas. Also, each course has a separate database which is designed to contain six course-dependant tables for course topics, course notes, course assignments, course exercises, proposed changes, and applied changes.

### 3.2 Course List Library (CLL)

The CLL is a central repository of all courses. The library can be updated periodically by instructors and monitored and maintained by the system administrator. All courses related to the eight civil engineering areas are stored in the “CLL” database. This database is accessible to all instructors and students.

Only the system administrator has “add” access to the CLL, while all instructors and students have “read only” access. The system administrator can add a new course to the CLL and then specify the instructor(s) that can modify the material of that course. The system administrator can also specify route of changes (communication paths), which will help in communicating course material changes/updates to concerned parties.

### 3.3 Course Topics Library (CTL)

The CTL is course specific. It allows for a unified storage and manipulation of course topics that promotes consistency and avoids redundancy. All course topics in the CTL contain all their related information. As such, each topic in the CTL contains information related to its material for the selected course topic. The instructor can add a new course topic by simply entering the name of the new topic. The system will then automatically generate a default assignment, a lecture material, and three exercises. To refine the initially generated components, the instructor can change the default

names of the components and add new ones to the newly generated topic. All course topics are stored in the “CTL” database.

### 3.4 Course Material Library (CML)

The CML is also course specific and allows for a unified storage and manipulation of course material. The CML includes information related to course lecture notes, assignments, and exercises. All course material in the CML contain all their related information including parties that need to be informed when a course material is changed, updated, or added. The instructor can add a new course material by providing the material type and file type and name. The system will then automatically generate the material needed and add it to the appropriate database.

### 3.5 Change Management Module

It is important for students to know, in a timely manner, when a new material is added to the course or when an already posted material is updated. This is also important for instructors teaching the course. One of the main features of the system is that each course material is an active object capable of automatically communicating changes made to them to interested parties. As shown in the bottom of Figure 2, any changes made to the “Construction” course material will be communicated to the administrator, instructors in the same area of specialty, and students registered in the course.

The system allows instructors to propose changes to course material or add a new material and obtain approval from other parties before doing the change/add, and track/find changes made to any course material. The change management module also includes other general procedures (activated by the buttons shown at the bottom of Figure 2) that provide effective tracking of all changes made, allow interested parties to propose and respond to proposed changes, apply approved change-proposals, and obtain various reports on the changes made. These procedures keep course information up to date and allow the system administrator, students registered in the course, and interested instructors to see any new material or changes made to course material by instantly informing them with this change. Each course has a “Changes” database that is composed of two tables used for storing changes made to the course (one for storing “proposed changes” and the other is for “applied changes”). Proposals for changes are temporarily stored in the

“proposed changes” table and then transferred to the “applied changes” table at the instructor’s request using the “Apply a Change” button shown in the bottom of Figure 2. If a proposed change is not approved and not applied, it will stay in the “proposed changes” table. The reporting system queries the “Changes” database to provide the user with information regarding pending changes for any course during a semester.

## 4 CASE STUDY

A simple hypothetical case study is presented in the following subsections to demonstrate the features of the proposed system. It is assumed that the “Construction Engineering and Management” area of specialty has three instructors (“EssamZ”, “PeterP”, and “SuleimanA”). It is also assumed that the instructor with a user name “EssamZ” is using the system and will add new topic/material and modify/update an existing one. The following subsections explain the detailed use of the system, how a change to a course material is proposed, how a change proposal is approved and then applied, and how students receive instant notifications of course material changes and new uploads.

### 4.1 Opening an Existing Course Material

The first step is to securely login to the system. Each user has his/her password that enables him/her to access the system. As such, each user can access the required data only. The second step is to open existing course material related to a selected topic. Each course material in the list is linked to a file. The file can be a PowerPoint, a Word Document, MS Excel, MS Project, or Acrobat file. When a user selects a topic, the system will access the selected course material database and list all files available for the selected course topic. As shown in Figure 3 for the “project scheduling with uncertain durations using PERT” topic, the system lists four default files for lecture notes (.ppt), exercise 1 (.doc or .docx), exercise 2 (.xls or .xlsx), and exercise 3 (.pdf) and make them ready for downloading.

### 4.2 Uploading New Course Material

Only the system administrator can add a new semester or a new course to the database. Instructors can only add a new topic or a new course material.

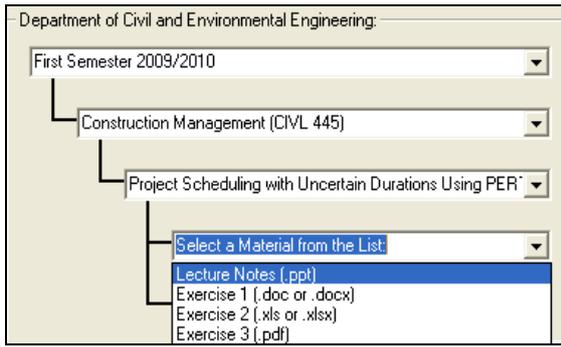


Figure 3: Example of opening PowerPoint notes.

To add a new topic, the instructor needs to click on the “Add a New Topic” button shown in the first screen capture of Figure 4. The new topic will be automatically added to its corresponding database and will also be listed in the topics combo box. To add a new course material, the instructor needs to click on the “Add a New Material” button shown in the bottom of the first screen capture of Figure 4. The instructor should select the new material type and the file type. The instructor will then be asked to select the topic name from the available list of topics to which the new material will be linked. As shown in Figure 4, the instructor added a new “Types of Contracts” PowerPoint lecture notes.

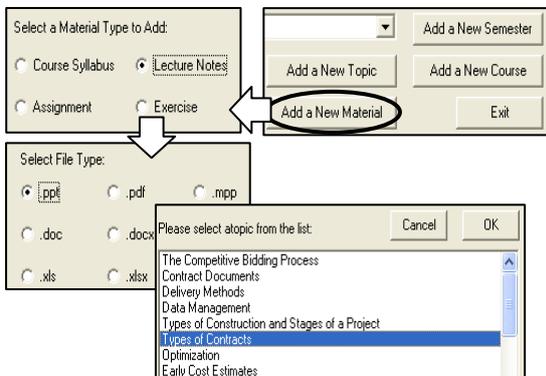


Figure 4: Adding a new topic or a new course material.

### 4.3 Proposing Changes and Applying Change Proposals

An instructor can use the system to add a new file or change/update an existing file. Before doing this, a “change proposal” should be sent to interested parties. In this case study, instructor “EssamZ” proposed to add a new section to the “Delivery Methods” lecture notes which explains a type of project delivery methods. The system administrator and other instructors in the same group/area of

specialty (“PeterP” and “SuleimanA”) received this change proposal. For example, Figure 5 shows that instructor “PeterP”, received this change proposal and approved it. The role of the system administrator is to follow up on this proposal and make sure that all other instructors respond to it in a timely manner; otherwise they will receive warning messages from the administrator. Instructor “EssamZ” can also view the status of other instructor’s approvals or disapprovals on his/her proposed change. Instructors can also provide explanations behind their approval or disapproval of proposed changes. Once all instructors approve the proposed change, “EssamZ” can go ahead and apply this proposed change. All types of changes are stored in different databases/tables for future view and follow up by the administrator.

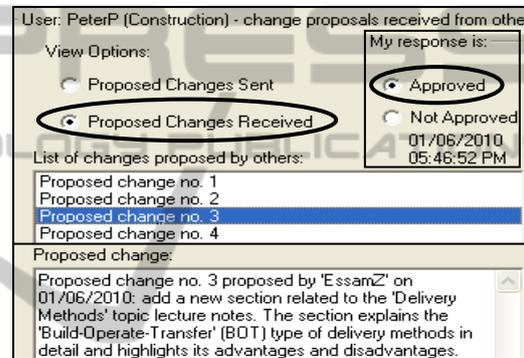


Figure 5: Example of changes received by an instructor.

### 4.4 Receiving Notifications of Changes

When a change is applied by an instructor, other parties will be instantly notified through automatically generated messages. For example, student “SalehM”, who is registered in the “Construction Management” course and instructors “PeterP” and “SuleimanA” in the construction engineering and management area were instantly notified with the change applied by instructor “EssamZ”. In addition to these change notifications, system administrator and course instructors can view reports of proposed changes and applied changes. To view reports on changes made by any instructor, users can click on the “View Changes History” button shown in the bottom right of Figure 2.

## 5 CONCLUDING REMARKS

This article presented a system for the management of changes made to some course material. The

components of the system were developed using visual basic programming language. The system provides instructors with a mechanism to upload and modify course material effectively and securely. Instructors can view, modify, and add course topics, lecture notes, exercises, and assignments in different formats. The novel aspect of the developed system is its mechanism for managing changes made to any course material and informing all parties affected by such changes in an effective and timely manner. The study introduces the system administrator as a main party. The main role of the administrator is to add new courses and semesters, determine and preset changes communication paths, follow up on change proposals, and track changes. The developed system was tested on a course in a university in the UAE. A case study was then presented to demonstrate the capabilities of the developed system.

The present study does not include methodologies for online tests, course grades, and course assessment. The author is currently working on developing modules for these requirements. The details of the developments and their integration with the system will be presented in a future paper.

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