Web Content Management System for Schools

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Abstract. The Content Management System (CMS) changes the perspective towards the web design process through allowing easily nontechnical users to manage contents of their web sites. It has a wide range of features that will satisfy the school communication needs that are well served by dynamic web sites. Consequently, the main goal of this work is designing an appropriate framework for the School Content Management System (SCMS). This system adopts CMS features for creating, editing, organizing, and publishing content relating to different schools' activities. These activities include school administrative works, course management, and classroom management.

Keywords: CMS, WEM, UWE, UP.

1 Introduction

A few years ago, the administration of website such as updating, or adding new contents needs assistance from IT companies or web designer. Today with a few skills in computer, it is easy for nontechnical users to create and manage a comprehensive websites through using the CMS applications. They used for creating, editing, organizing, and publishing content of the website. The use of CMS for managing educational portal makes school's activities become more reliable and easy to perform. It should support schools from the following perspectives: Communication, CMS will enhance the communication between students and school faculty. The dynamic website keeps up the communication with coursework while away from the school and the forum modules provide an online interaction where students and teachers can discuss course materials, as well as events at the school. Usability, CMS for schools should be facilitating the tasks to optimize user's time spent in managing their website. Determining the appropriate utilization of modules, menus, managers, the visual design and physical place of the interface elements can improve the user's capability to navigate successfully through the tasks. Content Publishing, the CMS should be made easy to publish and manage all school website contents. Furthermore, schools need specific modules that serve the educational activities for the school's community. For example, Course Management which provides a full range of features to help teachers planning and managing the course contents. As well as, it assists students to conduct online learning. In addition to, Classroom Management which encourages the alternative collaborative learning. It provides features including modules for assignments, chat, forums, and quizzes.

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There are a lot of CMSs in the market, some of them released as an open-source software. Unfortunately, many systems have more functionality and most of them useless function for the school community. The huge number of functionalities complexes the use of these systems and they become not user-friendly for nontechnical persons. In addition, other systems miss the essential functions that needed to handle school activities such as course and classroom modules. Of course, some of them provide an opportunity to add customized features or integrate with other systems, which offer some features needed for educational systems. However, the school faculty in most cases misses the technical skills that required to understand these features. These reasons orient the CMS users to establish a customized CMS which satisfy their needs through easy and direct interface. The contribution of this paper is the design of CMS Framework for schools. It determines the fundamental requirements that should be offered by CMS that serve the school community and should be fulfilled the above perspectives. The rest of this paper is organized as follows: Section 2 presents the literature review. Section 3 defines the problem statement of this research. Section 4 presents the framework development and describes the key functions of SCMS. Section 5 discusses some issues related to the proposed framework. Finally, a conclusion of this paper in Section 6.

2 Literature Review

This research has been studying the existing CMSs and investigated some experiences of schools which already migrated for using CMSs to manage their websites. As well as, it reviewed the literatures that related to managing the school website's contents. At the beginning of this section, we will provide an overview of the two popular open-source CMSs that can be used to manage the school's website:

1. Joomla, which is considered the most powerful CMS. It is very widely used by users and includes many features, which allow users to create a website and manage their content. Joomla established JoomSchools which is a reasonable CMS that provides both primary and secondary schools with the ability to modify their websites. There are thousands of functions that can be used for school. The standard package includes modules such as email, calendar, document manager, file Repository, menu. Besides, optional modules such as room and resource online booking, e-Learning (LMS), and discussion Forum [27].
2. Drupal, which is used to create the personal blogs, as well as, enterprise applications. It includes thousands of add-on modules that assist to build any website. It recently incorporates the school administration module that responsible for storing information of students, faculty and non-academic staf\f. This module enables parents to view information of their kids. It contains some other modules for managing classes, lessons, class lists, and rooms booking [25].

Nowadays, many schools around the world already started the migration to CMS to gain advantages of Information Technology (IT). The Queensland (a state of Australia) education ministry used Joomla [23] to move their schools from fixed

websites to a CMS and help schools to publish and managed their content by offering many pre-installed templates [7]. Additionally, the program for the technology modernization of Portuguese schools that aim to improve the educational environment by developing school portals, that offering content publishing, course management, and virtual learning environments [20]. Moreover, the Malaysian Smart School is one of leading schools in using IT in education and management, these schools provided an educational portal to enable the knowledge sharing and improving the learning process [6, 8]. We have not found related works regarding the CMS for schools, but there are many literatures present some issues related to the school CMS. The web service oriented resource-based system named E-School which is a platform independent. The E-School simplifies the interaction between the students, teachers, administrators and the policy makers. Furthermore, the system provides management for reading materials, references, student reports, multimedia tools, central databases, and helps to standardize the education in both urban and rural institutes [3]. A school resource management system is a platform designed to help primary schools in developing and sharing the school's resources. These resources refer to digital teaching materials include documents, video, pictures, and other coursework materials [4]. In addition, a Web-based course plays a vital role in the educational system; the web-course platforms presented in [5,11] organize all course resources and realize the overall process of building a web-based course. The web-based learning system of computer course [9] that supports teachers in lesson preparation, teaching process, and implementation of online assessment as well as, a discussion, and providing student self-learning. Additionally, the platform that uses learning object to organize all the resources and content related to the web-course. It performs the whole process of building a web-based course, from creating a new course, editing the course content to publishing the course content [1].

Moreover, a classroom management is the powerful ability for any teacher, and can only be accomplished by establishing an effective interaction among teachers and students. Reference [10], constructed a web-based classroom management system using the concept of E-commerce technologies as well as, using the tools for building a dynamic website. Furthermore, the author [12] designed a Web-based teaching system for information retrieval. This system characterized by the active teaching which improves the student's ability in searching the Internet information resources. At the same time, it is helping teachers to monitor the overall affairs of students' learning process, and is providing content flexibility to optimize the effectiveness of teaching.

3 Problem Statement

All schools in Saudi Arabia's educational system already used computerized management system to achieve school administrative functions, and most of school have its own website to publish school information. The website has extremely limited or out-of-date information. Typically, school website contains only general information that is updated each semester. If data from the management system wants to be published on the web, it should be manually transmitted to the website by

website designer such as grading result at the end of semester. Additionally, teachers and students are missing the effective interaction; Teachers cannot upload their course materials on the website while the students cannot use it for supporting their learning. Furthermore, parents lack the ability to follow up their child's learning progress or check their attendance. Consequently, these systems loosely comply the current school needs. In order to address the above problems, this paper proposes the use of CMS solutions, which have a wide range of features that will satisfy the school community needs. Using CMS in schools ranges from managing school activities and creating teacher blogs, to extended community discussion forums, to online course offerings. We aim to design framework of SCMS that satisfy school needs and present required functions through user-friendly interface.

4 System Development

The next step is the selection of the methodology - which will apply of the framework design. There are several approaches have been proposed in the field of web engineering. Though, the CMS is an application which merges the Web technology and manages the unstructured data. The existing approaches for the requirements engineering of Web applications fail to implement the CMS system [19]. We apply the engineering method developed specifically for CMS-based web applications which built by merging components of two methods: UML-based Web Engineering (UWE) and the Unified Software Development Process (UP). This Engineering Method (WEM) proposed by Souer in [16,19] and it was applied successfully in several cases for WCM systems [16].

4.1 System Analysis

The definition phase of WEM defines the actual requirements analysis and specification [19]. A school's environment composed of psychological, social, and academic dimensions. The interaction among students, teachers, administrators, parents, and the community help to shape a school's environment [18]. This definition gives an overview of all school components. The school system requirements acquired by collecting information for existing system specifications, documents evaluation, and literatures investigation. These requirements covered all schools activities which relating to students, teachers, and administrators. Thus, the derivation of the accurate requirements will assist in developing a framework for school CMS. Several problems found and converted into the overall needs.

4.2 System Design

System design is the core of this paper and it is usually considered a crucial for the success of any system. The SCMS is a framework for a tool that will help in building dynamic websites for schools. It will be used, to create, edit, manage, and publish content at runtime in an organized fashion. Content managed may include blogs, documents, images, audio, and video files. Figure 1. depicts the system architecture of SCMS. The CMS gets and puts all its contents and the corresponding metadata into its

database. Different users connect to the CMS by standard browser clients. If users have access rights, then they can create and manage web contents. Otherwise, they can only browse web pages depending on their privileges.

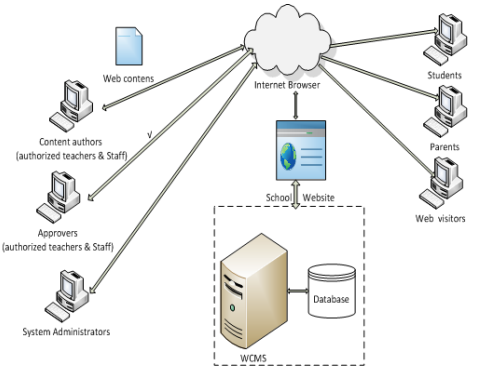

Fig. 1. System Architecture for SCMS

According to the objective and the design principle, the SCMS framework should include the following main functions: system and members manager, web pages manager, file manager, page editor, template editor, and module manager. The description of SCMS components is presented below.

1. **System and Members Manager.** This manager organizes and maintains the system information. It is handling the database backup and the system configuration functions such as themes, website title, language, date format, and user privilege. There are four types of WCMS members: system administrator, faculty and staff members, students, and parents. Each type of users has different access rights. The system administrators have the highest privileges. They can add or approve different users, and give other users the creating and managing privileges. Faculty and staff members can create, edit, manage and publish contents in a different format such as text, graphics, video, documents, etc. Students can browse the web contents and have additional functionality, such as submitting assignment or quizzes. Parents can view their child's record to follow up their learning progress or check their attendance.
2. **Web pages Manager.** This manager handles sections, categories, and web pages of the web sites. Section refers to a collection of web pages that can display in a menu. Category allows to create an extra hierarchal in the website menu and categorize pages within a section. Through this manger, the authorized users can create, edit and delete sections, categories, and web pages.
3. **Files Manager.** Files uploaded from the user's computer on to the server where the SCMS manager is running. Files can be organized by different categories, such as text, picture, flash, video and audio. It allows to create directories for different categories. From there, teachers can upload their lecture notes and laboratory experiments in audio and video format. Authorized users can be added these files to web pages and to course contents or to classroom activities.

4. **Page Editor.** The SCMS should be offered a fully featured editor to edit pages. The resultant files should be compatible with any web browser.
5. **Template Editor.** This editor helps nontechnical persons to create sophisticated templates for the website. It should provide easy tools and menus to handle the layout of different parts of the webpage. Additionally, any SWCM system should be offered preinstalled Templates.
6. **Module Manager.** Module is a program that can perform a determined function in the webpage. These functions include school administration, course, classroom, test, send email and messages, search, calendar, forum, links, news, and etc. The authorized users can use these functions in their web pages by selecting the module name from modules list. The following paragraphs present the key modules in SCMS:

    1. **School Administration Module.** School resources and records management are daily functions for school administration staff. Records for students, faculty and non-academic staff intended to store in the central database server. Student records keep general information, attendance, and medical records, as well as, grading information. The authorized users are responsible for adding a new record and updating existing record information. These records used to generate reports and perform statistical analysis. Parent can monitor their child's learning progress. Additionally, faculty and non-academic staff records include general information, contact numbers, and qualification. Through this module, faculty members can create personal web pages or blogs to publish their news and external information related to teaching courses. The business process model for student record management presented in Figure 2. Furthermore, this module handles room reservation which responsible for assigning rooms to subjects in school's schedule and determining teacher who will conduct this lecture

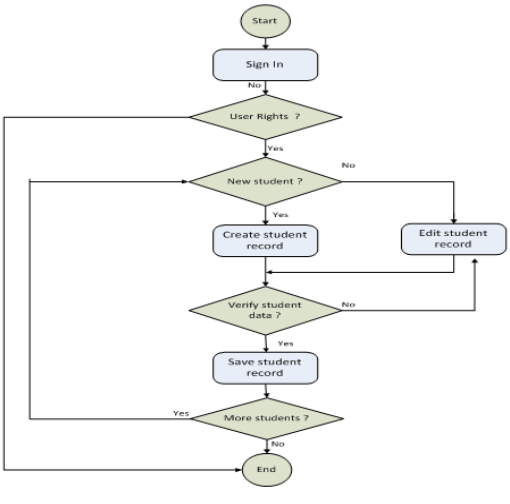

Fig. 2. Business Process Model for student record management

2. **Course Module.** Authorized teachers can create a new course or modify existing one. This process includes adding the basic information about the course, course index, course contents, polices, grading system, and calendar events. The course contents can be added from the files repository which are uploaded to the system from file manager. The following process is the course content approval and publishing which accomplished by authorized staff. The business process model for course module presented in Figure 3.

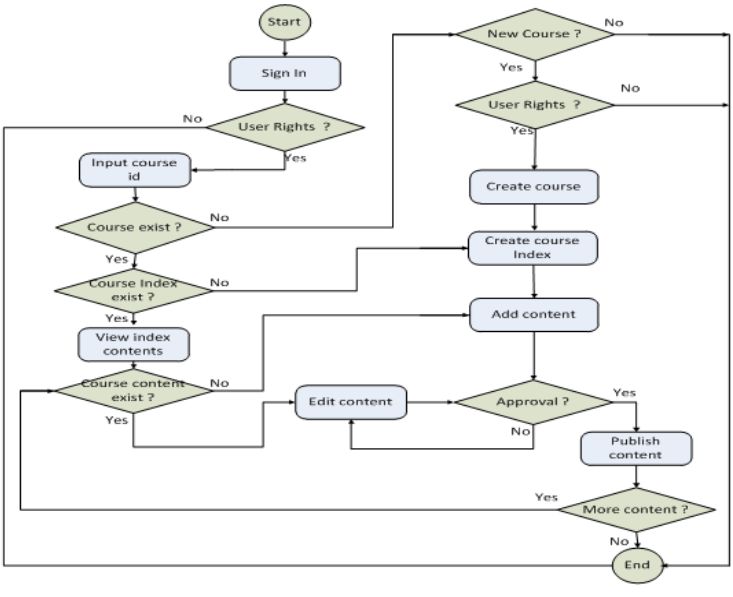

Fig. 3. Business Process Model for course Module

3. **Classroom Module.** New classroom object can be created and managed through this module. Students who belong to one classroom should be added to a classroom object. Classroom module intended to support different class activities. It manages the learning resources and teaching activities. The learning resources include learning materials in any format and teaching activities, which include a bulletin board, learning record, quizzes, assignments, homework and announcement [14]. Additionally, Chat for each classroom should be configured to support teachers and students interaction. In addition to, messages broadcasted to classroom members. Each classroom administrated by class manger (specific teacher) who is responsible for managing classroom activities. The business process model for classroom is shown below in Figure 4.

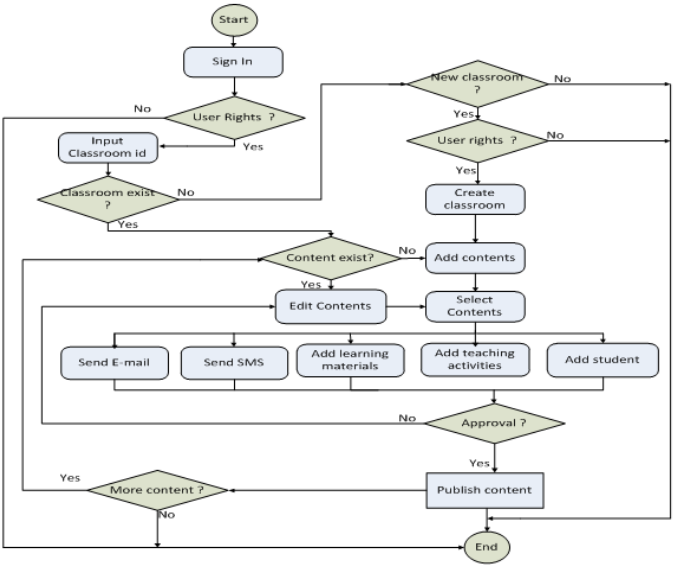

Fig. 4. Business Process Model for Classroom Module

4.3 Presentation Design

This phase is part of WCM implementation. It is related to the construction of the visual presentation of the website. The presentation usually developed by an external graphical designer such as XHTML prototype [16]. Additionally, the implementation consists of using other technologies to support CMS-based Web applications. We intended to use eXtensible Markup Language (XML) [24] to support CMS framework. There are many areas in CMS where XML plays an important role such as communication, authoring, interoperability, storage, query processing, and publishing [21]. In communication, a number of XML based interaction formats designed to maintain the flow of information between different groups. There is a need to pass messages among different system modules and different groups of user. These messages can be carried out using XML Remote Procedure Call (XMLRPC), the Rich Site Summary (RSS) and NewsML [3,21]. Additionally, the use of XML-aware editor as part of a CMS will simplify the authoring of school information. The Interoperability, where most of the schools already have school management system. There is a need to connect the CMS with other information systems. The solution is the use of web service platforms, such as Sun's J2EE or Microsoft's NET [21]. Furthermore, The XML schema and the XML DTDs can be used to determine the set of rules for the data storage [3]. Finally, we can use the XQuery [27], the XML-based query language to create the query response. Then, the result can be published by Extensible Stylesheet Language Transformation (XSLT) [28] which offers a separating of the presentation from the contents to support multiple published formats depends on user preferences.

5 Discussion

This research studied the essential requirements for WCM system that suitable for managing school web sites. The school's activities decomposed into a set of coherent functions. The principal functions should be implemented in separated modules, which help nontechnical persons such as teachers to use it in a few easy steps. For example, the course module which provides a full range of features that help teachers to build and organize course's contents. Classroom module, which provides a collaborative learning. It offers features including modules for assignments, chat, forums, and quizzes. In addition to, the test module which allows test creation in different formats and provides automatic grading scheme which helps teacher easily to assess the student's learning. These modules integrate the learning management system features into the web content management to produce SCMS framework that fulfills the school requirements. Furthermore, the school administration module which is handling the daily works in the school. It is responsible for handling records of student and staff, as well as, organizing different school resources. The school environment is different from any other organization from educational and pedagogical aspects. These aspects should be taken into consideration when designing WCM framework for schools. The rest of functions contained in this framework is shared with other WCM systems. These functions provide website creation and content development as well as to offer communications tools.

6 Conclusion

In conclusion, this paper presented a flexible and scalable framework for school content management system. Based on the study of school requirements, we proposed a design of the framework that supports the content management and activities accomplishment. The proposed framework provides an effective management process that needed to create and manage website contents. The SCMS is employed an easy and flexible tools that suitable for nontechnical users such as school staff. It used the customized modules to incorporate educational and pedagogical features to our framework. For example, the course module helps teachers to build and to organize course's contents. Classroom module offers features including modules for assignments, chat, forums, and quizzes. Additionally, the test module allows test building and provides automatic grading system which helps teacher easily to evaluate the student's learning. Furthermore, the school administration module assist school administration staff to accomplish school's daily work. For example, school resources and records management are daily functions in the school environment. These features represent the main difference between WCM system that suitable for the school environment and other general WCM systems. We perceive that the essential functions of any WCM system included in this framework. Finally, we plan as a continuation of this research to present an implementation for the proposed framework.

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