Workflow-based Document Management System for Higher Education Programmatic Accreditation Agency

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***Abstract*— This research is about designing a workflow-based-document management system for higher education programmatic accreditation agency. Principles of document management systems and workflow-based management system were combined to design an effective and efficient accreditation system for higher education accreditation agency. A document management system is a method for storing, organizing, and providing remote electronic access to documents. A workflow-based management system, on the other hand, arranges work activities sequentially and brings out the appropriate human and information resources in relation with the said activities. The study aimed to monitor the progress of approved documents under each key area, allow higher education agency accreditors to conduct evaluation and assessment during accreditation process, and to generate reports and/or result of the said accreditation. With these management principles in mind, the researcher started developing the system by providing a system architecture model, use case diagram, context flow diagram and entity relationship diagram to be presented to the stakeholders to identify the initial requirements for the system in order to understand the problem and derive a solution. After the system has been developed, a system evaluation was conducted through a survey. Several criteria were used in the system evaluation. The results show that the system designed is generally deemed to improve the current accreditation process. It has an overall mean of 4.47, which is interpreted as acceptable. With this result, it is therefore concluded that this system can help higher education agency improve their current process. However this research also recommends to enhance the findings of the study including; (a) rule- based processing on incoming document, (b)include complex structure, or complex data types such as full-motion video and voice annotations, (c)implement compound document architecture, (d)implement concept retrieval, (e) collaboration in the implementation of workflow-based document management system for higher education agency programmatic accreditation.**

***Keywords*— accreditation, document management system, workflow-based.**

I. INTRODUCTION

Document management system is a method for storing, organizing and providing remote electronic access to documents [1]. [2] suggested that document management is one aspect of projects heavy with information. He adds that document management can help in monitoring the project. He discussed that the project outcomes are based on how the documents are managed to present how a certain project progressed.

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As a result, an effective system should bring together all of an organization's information and become part of the workflow so that the information becomes an organizational task based asset rather than just a stand-alone document. In short, all documents should be available to all parties who require it, have appropriate permissions to view it, inaccessible to those without appropriate authorization, and should be presented at the correct time or point in the workflow.

Developing a document management system for higher education accreditation agency can help the organization improve their work and save a lot of time in completing the documents needed for programmatic accreditation. An electronic document management system can serve as their storage facility, while also allowing them to create, capture, organize, retrieve, manipulate and control circulation of documents.

The system is focused primarily on the storage and retrieval of self-contained electronic data resources in the document form. Generally, The DMS is designed to help the organizations to manage the creation and flow of documents through the provision of a centralized repository. The workflow of the DMS encapsulates business rules and metadata.

II. RELATED WORKS

Document Management System

Document management (DM) has generated great interest in the business world recently. It allows organizations to exert greater control over the production, storage and distribution of documents, yielding greater efficiencies in the ability to reuse information [3] however [4] expresses that a document referencing computer applying relationships or links between documents, wherein the documents are managed by a document managing computer, and the relationships or links are managed by a knowledge managing computer. The display of the links is controlled according to a variety of conditions. The display of a respective link between documents can be controlled by either a user who sets the respective link (the link setting user) or by a user using the document referencing computer to reference documents(a referencing user), thereby enabling related documents to be referenced easily. By using this system, a lot of time and effort are saved and retrieval process is efficient[5]. As stated by [6] a document management system is used to run with a process management system that can be used to record and view metadata of a document. The metadata serves as storage for the record resource references while a document is still being developed; the resources identifies the relationship

of the resources and the content of the document, which includes links that lead to document metadata stored in a remote server. The metadata of a document remains consistent when metadata and content are stored separately.

Electronic documents may be stored in an internet accessible server given that the system used is an internet based document management system. The documents stored in this server can be accessed through a previously known web browser. The server is meant to give a variety of services supported by a common database and document store, like storage and retrieval services, delivery services, document distribution services, collaborative file-sharing and workflow service. All these are included in the system in order to be able to do everything that is needed in a certain business[7].

In line with the advancement of technology in the modern days, paper documents are being replaced with electronic documents. Retrieving documents electronically causes less hassle in modern offices, and also helps save time. Office workers' productivity is increasing with the help of electronic documents, which are managed in what is called the document management system [8].

Many businesses consider workflow management technology important; however, some research communities doubt its efficiency. Though there are possibilities of abusing the system, it is proven to be helpful for individuals in performing their work and provide a real context for doing such work. The biggest challenge in implementing the usage of the said system is the oneness of the process models and software that has varying activities and behaviors that performs the "real" work [9] .

[10] stated that a document management system organizes the documents according to its categories based on its associated attributes. It provides access privileges to the categorized documents depending on its attributes also.

[11] stated that computer based records management systems are capable of filtering information to assure that record data units do not store the same documents. Record data units may be electronic in nature and may store data scanned from paper and digitally formed from audio, video and the likes. The goal of having this system is to store and access information easily without needing its hard copies. Incomplete and redundant documents in the record data units are filed separately, returned or disposed. For each system the record data units are recognized and enabled for tracking, verification and certification of documents.

For storing files, a document management system contains a content repository, a management system for monitoring and managing files in the repository, and an authoring portal. The authoring portal is responsible for controlling and converting documents, it also generates JavaScript codes to enable the content repository to respond from the input of a user providing also a feedback without accessing the databases associated with the document [12].

The document management system does not only allow easy access to documents, it also secures the documents so that not everyone will be able to get these. Data will be easily accessible as long as the individuals who try to access these are allowed by the system to do so; data can be accessible but there is a certain limit. The security functions depend on the people who are using the system, for example, a document was output, the receiver of the document may view its content, however, and it may only be limited to viewing. The document may not be downloaded or edited by the receiver depending on how the system is set to run [13]. Obtaining original electronic data of a printed material became possible because of the document management system. For DMS to work, a host computer, image information processing apparatus and a document management server that manages electronic data, are required. The three are connected to each other via network. A reader section is contained in the image information processing apparatus, which reads the image information, the printer section, on the other hand outputs the read image information and print data output from the host computer [14].

Workflow-based Management System

According to [15], business goals are efficiently achieved with the help of workflow management systems by arranging work activities sequentially and bringing out the appropriate human and information resources in relation with the said activities. Nowadays, as technology arises, computer usage seems to be a lot of help, and with this, using the workflow management gains more attention both in the industry and research community. [16] stated that companies are starting to reconstruct their businesses in a way that applications which already exist are modified so that it would increase the company's efficiency and productivity, and new applications are written because it is run and circulated in a diverse environment while doing its corresponding individual tasks. These functions can be done by a workflow-based application.

Specifically, a workflow sequence is ran by a workflow management system which passes through different levels or segments accordingly, that is specified by a process definition. It is important to define and identify the membership of individuals in a group; this is done by using a role based access control. It gives each individual their roles accordingly, which is equivalent to a task. Individuals who are part of the active roles are allowed to perform the other steps in the process. Duties and responsibilities of each individual could be interchanged; as it changes role memberships are reassigned, thus allowing the workflow process to function without interruptions [17].

Accreditation

Accreditation is a voluntary process in which recognition is granted to educational programs which meet or exceed established standards of educational quality. To initiate the process, an institution or program which wishes to be considered for accreditation requests an application from the appropriate accrediting body, along with standards and guidelines. Once the institution or program submits the application it is generally reviewed by the accrediting body to determine if the educational unit is ready to be considered for accreditation. If the accrediting body feels the institution or program is ready for consideration, self-study evaluation materials or questionnaires are sent[18]. The purposes of a programmatic accreditation evaluation are to provide public assurance of an institution's effectiveness in delivering an educational program that meets the established criteria of a

profession and a stimulus to improve the quality of instruction [19].

Accreditation, on the other hand, is not intended to measure the learning of individual students [20]. Rather, accreditation is intended to determine that (a) the validity of Higher Education Accountability and CSHSE Accreditation 4 programs in the context of similar higher education programs, (b) national standards are met in the curriculum, and (c) policies and procedures exist to assure continuity of curriculum delivery, consistency with other institutions of higher education, and continuous improvement. In other words, the program, not the individual student, is the unit of analysis [20].

III. Methodology

The study developed the workflow-based DMS using PHP, MySql, for the back-end processes. While for the user interface, HTML,CSS and Javascript applying bootstrap framework were used. This project also involved Agile software development approach where each iteration is passed through a full software development cycle, including planning, requirements analysis, design, coding, unit testing, and acceptance testing when a working product is demonstrated to stakeholders. This helps to minimize the overall risk, and allows the project to adapt to changes more quickly.

Using Agile method, the study was developed in a period of 5 months. During user acceptance test, it went through used the software evaluation using ISO 9126 criteria and distributed it to the users during the testing stage. The following are the identified users: members of the programmatic accreditation team, executive committee heads, program in-charge, and other stakeholders involved in the programmatic accreditation agency.

The Likert's scale with the interpretation of Highly Acceptable, Moderately Acceptable, Acceptable, Slightly Acceptable, and Not Acceptable was used to specify the users' level of agreement or disagreement on the software evaluation items. The results of software evaluation are presented in the succeeding sections of this paper.

IV. Results And Discussions

Figure 1 presents the system architecture of the workflow-based document management system covering the administrator module, document management module, workflow module and report generation module. The administrator module are intended for account users settings, document settings, program for accreditation settings and accreditation criteria settings. While document management module are intended for submission of document, approval/disapproval of document, versioning of document, sharing of approved document. These modules are intended for members, executive committee head and accreditors. Workflow module is intended to modify the status of every document being sent to the intended recipient. The report module is intended for the accreditors, executive committee head and other stakeholders. Figure 1 presents the system architecture of the workflow-based document management system covering the administrator module, document management module, workflow module and report generation module. The administrator module are intended for account users settings, document settings, program for accreditation settings and accreditation criteria settings. While document management module are intended for submission of document, approval/disapproval of document, versioning of document, sharing of approved document. These modules are intended for members, executive committee head and accreditors. Workflow module is intended to modify the status of every document being sent to the intended recipient. The report module is intended for the accreditors, executive committee head and other stakeholders.

Fig. 1. System Architecture of Workflow-based for Higher Education Agency Programmatic Accreditation

Figure 2 shows the interface the status of document sent by the member to the approver with a For Review status. While if the document had been approved by the Approver, the status changed to Approved.

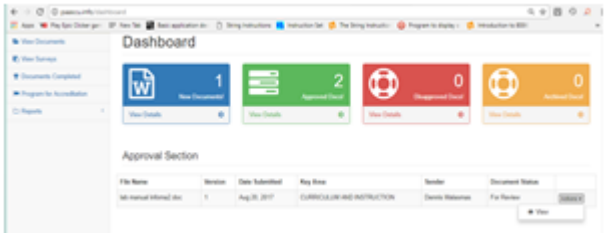

Fig. 2. Submission of Documents

Fig.3: shows the document for review of the approver. The said document is viewable in PDF format. There are three options the Approver may choose, (1) to give feedback, this option allows the Approver to make comments or suggestions for the improvement of the submitted documents (2) disapproved, meaning the submitted documented is not appropriate or the document that was sent is invalid. Lastly, the approved option, which means that the submitted document is appropriate.

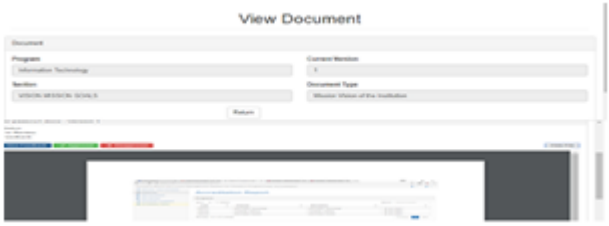

Fig. 3. Viewing of Submitted Document

Figure 4 shows the list of documents, along with its status, for review, disapproved and approved. This figure also shows the key area where the document belongs as well as the origin of the. In this module, the recent document submitted is placed on top of the list for the Approver to have it checked immediately.

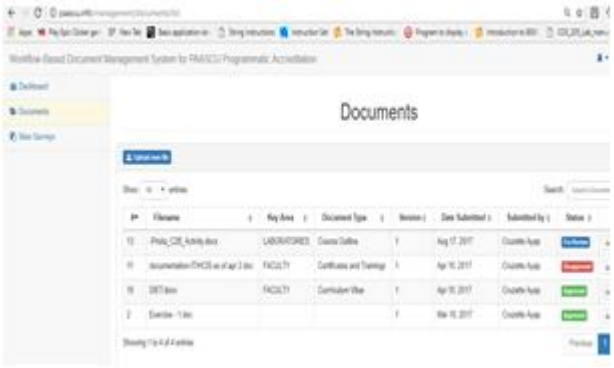

Fig. 4. Submitted Documents

Figure 5 shows the lists of versions of submitted document. This module is provided in order for both the member and executive committee head to monitor the required or recommended changes in the submitted document. This module is intended for the member to review the submitted document and sending it again to the executive committee head or approver.

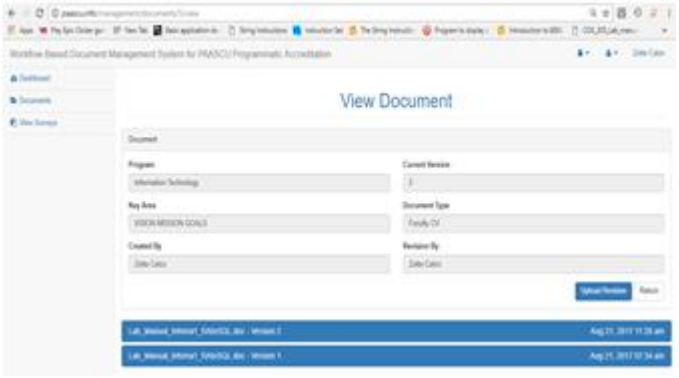

Fig. 5. Viewing of Revised Document for Approval

Figure 6 shows the accreditor's module, given the list of criteria. The accreditor can rate each of the criteria form 1-5, having 5 as the highest and 1 as the lowest. This module helps the accreditor doing the accreditation process easier. However, this is just one of the considerations of the accreditation result.

This module answers the second objective to enable the higher education agency accreditors to conduct evaluation and assessment during higher education agency accreditation process by providing an interface for rating the different key areas of accreditation.

Fig.6. Evaluation and Assessment

Figure 7 shows the accreditation report of a particular accreditor. The said report is only available in the accreditor's module. This document is intended to show the accreditation result conducted by each accreditor.

This module answers the third objective, generate reports and/or result of the said accreditation. Each of the accreditor can generate results of accreditation.

Fig. 7. Accreditation Report

TABLE 1 SUMMARY OF SOFTWARE EVALUATION

Criterion	Mean	Interpretation
A. Functionality	4.52	Highly Acceptable
B. Reliability	4.39	Acceptable
C. Usability	4.61	Highly Acceptable
D. Efficiency	4.54	Highly Acceptable
E. Maintainability	4.25	Acceptable
F. Portability	4.51	Highly Acceptable
Overall Weighted Mean	4.47	Acceptable

In general, the software evaluation indicates a strong perception among the respondents that the workflow-based document management system is functional (4.52), reliable (4.39), usable (4.61), efficient (4.54), maintainable (4.25), and portable (4.51). Hence, the software evaluation receives an overall rating of 4.47 with an interpretation of acceptable. The results indicate that the system's purpose has certainly achieved the goal of the study of developing workflow-based document management system for higher education agency programmatic accreditation to enhance and improve the manual process of preparing documents and conducting assessment and evaluation.

V. CONCLUSIONS AND RECOMMENDATIONS

This research aims to provide a document management system for higher education programmatic accreditation

agency, a software tool to monitor the accomplishment of documents needed in programmatic accreditation.

Based on the objectives and results of the evaluation, the study concludes the following: (1) preparation of higher education agency papers saves more time and effective since the system can help monitor the status and progress of each document; (2) for the accreditors, conducting assessment is easier during a programmatic accreditation; (3) faster generation of reports can help the accreditors handle the results of the evaluation immediately. The conducted software evaluation takes a great part in the achievement of the objectives of the study.

However this research has also recommendations to enhance the findings of the study including; (a) rule- based processing on incoming document, (b) include complex structure, or complex data types such as full-motion video and voice annotations, (c) implement compound document architecture, (d) implement concept retrieval, and (e) collaboration in the implementation of workflow-based document management system for higher education agency programmatic accreditation.

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