



Enhancing university accreditation readiness through a tag-based document management and analysis system: development and usability evaluation

Renz Mervin A. Salac, Djoanna Marie V. Salac*, Benjie R. Samonte, Albert S. Mercado

College of Engineering and Computing Sciences, Batangas State University, The National Engineering University, ARASOF-Nasugbu

ABSTRACT

Accreditation is a voluntary process aimed at ensuring that universities meet specific criteria and standards set by recognized accrediting organizations. However, preparing the necessary documents for accreditation can present complex challenges for universities. The process of gathering, consolidating, sorting, and organizing documents can be time-consuming and resource-intensive. To address the various accreditation-related issues, the researchers have developed a document management system that incorporates automatic tagging for efficient sorting and organization of documents. The system integrates different features such as dashboards, file upload functionality, document tags, and a calendar to cater to the needs of users. The developed system underwent evaluation using the ISO 25010 software quality standard to assess its functionality, efficiency, portability, and security. Additionally, it was evaluated by intended users, including Quality and Assurance Management (QAM) staff, faculty, deans, and local accrediting bodies, using the System Usability Scale (SUS) to measure its usability. The results of the evaluations indicated high scores, affirming that the developed system is a functional and reliable tool that facilitates accreditation processes while enhancing document management efficiency and security. By utilizing document tagging, the repetitive task of sorting and arranging documents based on benchmark statements listed in the survey instrument can be eliminated.

Keywords: university accreditation, tagging, document management, analysis, usability

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1. Introduction

Accreditation process is an essential instrument for institutional improvement and quality assurance in the complicated structure of higher education. In addition to demonstrating an institution's commitment to academic excellence, accreditation plays a crucial role in maintaining educational standards, ensuring accountability, and fostering continuous improvement. It covers different aspects of program development and operation, including vision and mission, faculty, curriculum and instruction, student services, research, extension and community involvement, library, physical plant and facilities, laboratories, and administration [1]. It is a unidirectional process carried out by Higher Education Institutions (HEIs) to ensure compliance with established standards. With the growing number of HEIs in the country and the demand for skilled workers in the global market, there is an urgent need to further enhance the quality of education. It is also believed that accreditation had a high impact on schools or institutions and that accreditation visits were managed well by responsible authorities [2].

In the Philippines, accreditation serves as one of the quality assurance mechanisms employed by the Commission on Higher Education (CHED). It is utilized to assess educational programs provided by both public and private HEIs [3]. As a result, this process ensures that educational

institutions provide high-quality education that meets certain standards.

The primary role of the Accrediting Agency of Chartered Colleges and Universities (AACCUP) involves accrediting curricular programs in the Philippines, with a particular focus on state universities and colleges. Additionally, a key objective of the AACCUP is to create a system for and execute evaluations of both programs and institutions [4]. They require the program to be accredited to submit accurate and detailed institutional data or documents from the current year to a couple of years ago.

With this, the organized compilation and submission of documents is an essential part of the accreditation process. Educational institutions must examine all aspects of a program, including its organization, curriculum, faculty credentials, student results, and support services, when they submit the program for accreditation. They must meet all predetermined standards and provide the necessary documents to accelerate the accreditation process [5]. Hence, one of the primary challenges in preparing for accreditation lies in the document collection and organization process [6]. Despite having a structured document compilation and management procedure, programs preparing for accreditation frequently encountered difficulties in keeping track of the ever-growing number of required documents. Traditional document management techniques can result in inefficiencies, a higher chance of mistakes, and make it harder for different stakeholders to work together during the accreditation

*Corresponding author

Email address: djoanna.salac@g.batstate-u.edu.ph

process. In addition, the faculty-in-charge face several challenges: (1) searching for the needed documents from different offices is time-consuming; (2) sorting and compiling these collected documents according to their respective benchmark statements takes substantial time and effort and may lead to incorrect classification; and (3) the repetitive administrative workload becomes highly demanding during the accreditation process.

Document management systems serve as storage facilities, while also allowing them to create, capture, organize, retrieve, manipulate, and control the circulation of documents. Consequently, organizations can decrease overall document-related expenses and enhance the effectiveness of work processes and procedures to meet specific business requirements. Numerous organizations claim time and effort savings, increased productivity and profitability, and improved coordination and collaboration among end-users [7]. A well-managed document management system is crucial to ensuring an efficient and quick working process for the entire organization [8].

Since 2020, document management systems for educational institutions have rapidly changed, with a strong trend toward digital, web-based, and AI-enhanced solutions that generally increase administrative efficiency and document handling.

Bobadilla pointed out that artificial intelligence greatly improves operational efficiency by speeding up response times and automating procedures [9]. A web-based DMS that makes it simple for teachers to maintain, upload, and retrieve instructional materials digitally was created for educational institutions [10]. At the University of Tetova, Imeri et al. presented a successful automated solution that addressed documentation issues by improving access and processing speed [11].

This research study addresses the challenges associated with conventional document management practices during the accreditation process and offers a solution that not only organizes files systematically but also leverages tagging mechanisms to facilitate quick retrieval and sorting of pertinent accreditation documents. Document tagging plays an essential role in the efficient retrieval and organization of accreditation materials. With tagging, additional information is added to documents for easier categorization [12]. Using the assigned tags, the system efficiently manages the entire document classification process. Each document is automatically sorted and matched with its corresponding benchmark statement based on the predefined tagging rules. This decreases the possibility of misclassification, reduces sorting time, and eliminates the need for manual checking. In addition to streamlining the workflow, the tagging mechanism guarantees that all documents are consistently arranged in accordance with accreditation standards. With this, users can access files quickly and maintain a reliable and organized repository of accreditation documents.

Another feature of the developed system is the readiness analysis feature, which evaluates whether a program is prepared for accreditation based on the uploaded documents. This feature serves as a decision support tool for the administrators, deans, and accreditation teams to understand their current level of compliance before the actual accreditation.

2. Materials and methods

The researchers adapted the agile approach to the development of the system to ensure its continuous improvement and adaptation based on user input and changing requirements. This methodology is suitable for this research since the output will be software that is tailored to the needs of the users when it comes to the accreditation process. This methodology involves constant collaboration with the users and continuous improvement at every stage. It approaches project management that leans heavily on short time frames, adaptability, and iteration [13].

Figure 1 shows the different phases of the agile methodology and the different activities conducted by the researchers in every phase. This helps in reducing the overall risk and enables the project to adapt to changes more promptly.

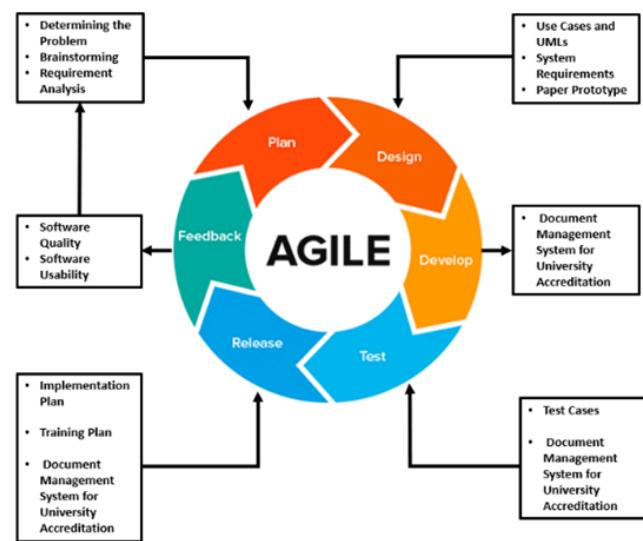


Figure 1. Conceptual framework for adopting the agile methodology.

2.1. Plan phase

Requirements gathering was conducted to determine the modules to be integrated into the developed system. The researchers conducted interviews with the different end-users to understand their needs and expectations from the system [14]. Moreover, the existing system, which was used for accreditation, was also analyzed. Since the pandemic, all collected documents for accreditation have been stored and managed in a cloud-based storage system. Different problems and challenges experienced by the end users in using the storage system for document management during accreditation were also considered. With this analysis, areas of improvement with the existing system are determined, guiding the researchers in the development of the system features.

2.2. Design

The team carefully defined and documented the Accreditation Document Management System's key features, procedures, and interfaces throughout this phase. In addition to being guided by a clearly defined framework for data management, use case diagrams, context diagrams, data flow diagrams, and entity relationship diagrams (ERD) were created to offer an in-depth understanding of user interactions

[15]. Different user roles require different interfaces to ensure customized access and a user-friendly interface.

2.3. Develop

This phase marked the actual development of the system, where the designed framework was translated into a fully functional application. The programming process began with implementing core features aimed at streamlining document organization and management.

For the front-end development, the researchers utilized HTML, CSS, and JavaScript, ensuring a dynamic and interactive user experience. Additionally, Bootstrap was integrated to enhance responsiveness across various screen sizes, optimizing usability on different devices. On the back end, PHP and jQuery were employed as scripting languages to facilitate seamless data retrieval and interaction. The system's database was built using MySQL, enabling efficient storage, management, and access to accreditation-related documents.

This structured development approach ensured that the system was both user-friendly and functionally robust, meeting the requirements for efficient document management in accreditation processes.

Figure 2 illustrates the process flow demonstrating how the tagging mechanism enhances document organization and management. As shown in the figure, users only need to upload a document and provide essential metadata, including the document name (Doc_Name) and document tag (Doc_Tag). The document tag plays a crucial role in the system, as it enables efficient categorization and automated distribution of files according to specific instrument benchmarks. By utilizing tagging, the system eliminates the need for manual sorting, ensuring a more streamlined and accurate document management process.

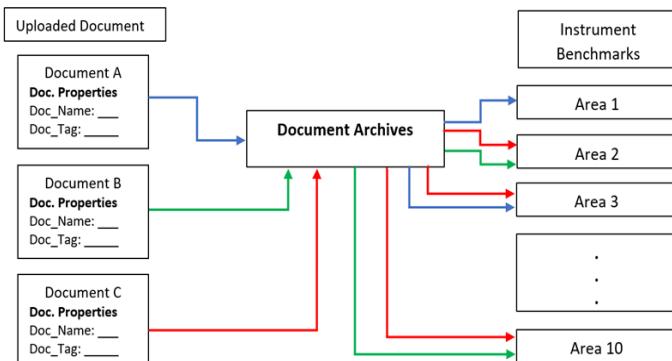


Figure 2. Process flow of document tagging for automated categorization and distribution.

2.4. Test

Upon completion of the initial development, the system underwent thorough testing by a software quality assurance specialist. The testing process involved a comprehensive examination of all modules and features. Any identified issues prompted revisions during the development phase, ensuring that the system met the necessary standards and requirements for accreditation document management.

2.5. Release and feedback

In this final phase, the approved version of the system was deployed to a select group of stakeholders involved in the

accreditation process. During a limited usage period, stakeholders interacted with the system, providing valuable feedback through questionnaires. This user feedback played a crucial role in refining the developed system based on practical experiences, with ongoing improvements contributing to the system's effectiveness in managing accreditation documents.

Figure 3 illustrates the system architecture, offering a comprehensive blueprint and conceptual model. This architectural representation outlines the interaction of various system components, illustrating how they collaborate effectively to achieve the primary goals of the system.

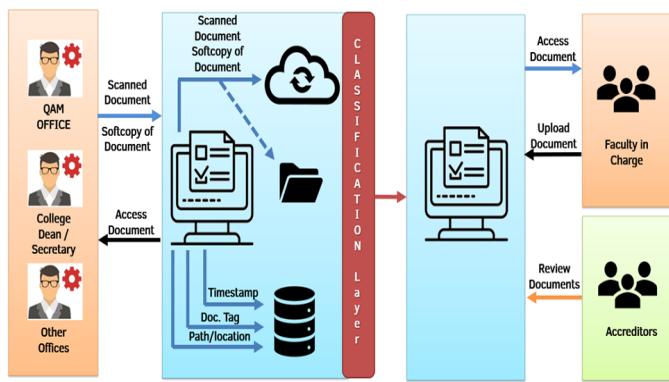


Figure 3. System architecture.

After the development of the system, it is subjected to the evaluation of the intended users. The evaluation process followed ethical guidelines, including informed consent and privacy, ensuring that all participation was voluntary and that collected data remained confidential. Twenty-nine (29) faculty/deans from different colleges, two (2) QAM staff, and three (3) local accreditors were asked to evaluate the developed system. For the end-user's evaluation of the developed system's usability, the researchers utilized the SUS. The SUS is a validated, standardized questionnaire widely used in the usability scales to measure the ease of use, efficiency, and user satisfaction of software systems. It consists of ten (10) questions, and each participant will rank each question from 1 to 5 based on how much they agree with each statement [16]. The formula, $SUS Score = (X + Y) \times 2.5$, is utilized to interpret the result of the SUS. In the abovementioned formula, X represents the sum of the points for all odd-numbered questions – 5, and Y is equal to 25 – the sum of the points for all even-numbered questions.

Table 1 shows how the result of the SUS was interpreted to determine the developed system's usability performance in the aspects of effectiveness, efficiency, and overall ease of use.

Table 1. General guideline on the interpretation of the SUS score

SUS Score	Grade	Adjective Rating
> 80.3	A	Excellent
68.25 – 80.3	B	Good
68	C	Okay
51 – 68	D	Poor
< 51	F	Awful

The technical evaluation of the system was performed by IT experts, consisting of system developers, to determine the conformity of the developed system with ISO 25010. ISO 25010 describes the models, consisting of characteristics and sub-characteristics, for both software product quality and software quality in use, together with practical guidance on the use of the quality models [17]. It is a standard that defines the software quality model, which breaks down quality into eight characteristics. Using these software quality criteria, the researchers developed a questionnaire that evaluates the system in terms of functional suitability, portability, performance efficiency, and security. The ISO 25010-based questionnaire provides a comprehensive evaluation of the developed system by evaluating functional and non-functional attributes. In addition, it focuses not only on the usability but also on the key quality aspects of the developed system.

For the interpretation of the collected results, the researchers utilized the Likert Scale and Weighted Mean. Table 2 shows the guideline interval used for the interpretation of the result.

Table 2. Guideline interval for the level of acceptability

Mean Range	Descriptive Equivalent
4.21- 5.00	Highly Acceptable
3.41- 4.20	Moderately Acceptable
2.61- 3.40	Acceptable
1.80 – 2.60	Slightly Acceptable
1.00 – 1.80	Not Acceptable

3. Results and discussion

3.1. Features of the developed system

Based on the requirements gathering, Table 3 shows the features, along with their functions and description, needed to address the problems and challenges encountered by the end-users on the existing system.

Table 3. Features integrated into the system

Feature	Function	Description
Document Tagging	This helps with the categorization of uploaded documents. These tags are categorized into three types: common, college-specific, and program-specific.	A user-defined tag encompasses related documents needed for every benchmark statement listed on the accreditation survey instrument.
Uploading Documents	This ensures the smooth process of uploading the needed documents.	The process of copying files from the local storage to online platforms.
Dashboard	This displays the compliance progress of each program that will undergo accreditation.	An interface that consists of different graphs showing all the data for analyzing and monitoring.

Feature	Function	Description
Calendar	This helps in monitoring all the events set by the QAM related to accreditation.	A series of pages that consist of days and months, sometimes with schedules and events, either user-defined or regular holidays and events.
Folder Creation	Aids in organizing documents.	The process of creating folders for other documents related to accreditation, such as the compliance report, program performance profile (PPP), and required documents for each area.
Readiness Analysis	To measure the document completeness per benchmark statements	This feature evaluates how well a program meets the accreditation requirements. It can be used for decision-making to understand the level of compliance before the actual evaluation

One of the most essential features of the developed system is document tagging. This feature will make organizing documents into different benchmark statements that need it easier and faster. Unlike the existing system, the faculty-in-charge is responsible for manually organizing and classifying each document for every benchmark statement per area. This process is very tedious and unreliable since it results in some missing documents in other benchmark statements, while in fact, these documents are already classified in other benchmark statements. To avoid this scenario in the developed system, document tags are utilized. These tags are based on the list of documents that are collected by the researchers to the local accreditors during the requirements gathering phase. Using this approach, a specific document will be tagged to every benchmark statement that needs it automatically. Tags for documents were classified into three such as common documents, college-specific documents, and program-specific documents. Table 4 presents how the developed system reduces preparation time, errors, and effort in accreditation tasks.

Table 4. Comparison of the manual preparation and document management for accreditation with the tag-based document management system

Process Area	Manual Preparation And Document Management during Accreditation	With Tag-Based Document Management System
Document Collection and Management	Documents are scattered across various offices	Documents are stored in a centralized repository

Process Area	Manual Preparation And Document Management during Accreditation	With Tag-Based Document Management System
Search and Retrieval	Search is slow because it is done manually	A search facility allows documents to be quickly retrieved when needed.
Collaboration	The faculty-in-charge must visit multiple offices to request the required documents.	Offices upload the documents to the system, and these can be shared directly with the QAM Office
Efficiency	Labor-intensive, as each document must be photocopied and manually sorted.	The process is faster since documents only need to be uploaded, tagged, and are automatically classified under the appropriate benchmark statement.

The succeeding figures display the screenshots of the developed system. The researchers named the developed system “ATOM”, which stands for Accreditation Tool for Optimal Management. It serves as a comprehensive means that assists in the administration and management of accreditation procedures. The system incorporates various features and functionalities aimed at optimizing the accreditation process, ensuring efficiency and effectiveness. In addition, it is a centralized platform for tracking and managing all aspects of accreditation, including documentation, evaluation criteria, timelines, and progress monitoring. It streamlines the workflow, allowing the university to easily navigate through the accreditation process and meet the required standards. Figure 4 shows the module for the QAM Office. The said office will serve as the administrator of the system.

Figure 4. The QAM module.

Figure 5 showcases the system's tag assignment feature. Each document is assigned its corresponding tags, which facilitate the automatic categorization of documents for each benchmark statement that requires them

Figure 5. Tags assignment.

Figure 6 displays the interface for assigning areas to faculty members. Each faculty member is designated to one or more areas, a process exclusively managed by the dean of colleges.

Figure 6. Assignment of faculty per area.

As reflected in Figure 7, every benchmark statement is accompanied by a list of documents to be compiled.

Figure 7. The list of documents interface.

Figure 8 displays the dashboard that assists the QAM staff in analyzing the completion rate of each college. This allows the QAM staff to easily monitor the progress of each program in terms of compiling the necessary documents for accreditation. Hence, a quick overview of the key

performance indicators related to document completion is presented [18].

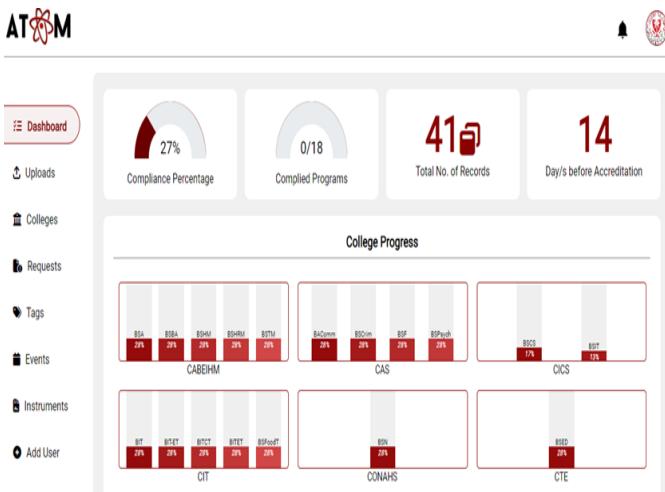


Figure 8. Dashboard for the QAM module.

3.2. System evaluation result

The following tables present the results of the evaluation conducted on the developed system, employing both the ISO 25010 software quality criteria and the System Usability Scale. This comprehensive assessment provides insights into the system's performance, addressing key aspects of software quality and usability. The utilization of these established standards enhances the objectivity and reliability of the evaluation, facilitating a robust understanding of the system's overall effectiveness and user-friendliness.

Table 5. Level of acceptability of the developed system

Software Quality	Overall Weighted Mean	Verbal Interpretation	Avg Std Dev	Avg Variance	Avg. Margin of Error (95%)	Avg 95% Confidence Interval
Functional Suitability	4.67	Highly Acceptable	0.63	0.43	0.78	3.88 - 5.45
Portability	4.73	Highly Acceptable	0.60	0.40	0.74	3.99 - 5.47
Performance Efficiency	4.47	Highly Acceptable	0.75	0.60	0.92	3.61 - 5.46
Security	4.52	Highly Acceptable	0.61	0.42	0.76	3.83 - 5.36

Table 6. Usability score of each respondent type

Respondents	Average Usability Score	Adjective	Avg Std Dev	Avg Variance	Avg. Margin of Error (95%)	Avg 95% Confidence Interval
QAM Staff	77.50	Good	1.28	1.64	0.91	76.58 - 78.42
Local Accreditors	87.50	Excellent	1.75	3.13	1.25	86.25 - 88.75
Dean and Faculty	78.21	Good	1.48	2.22	1.05	77.15 - 79.30

As reflected in Table 5, the evaluation suggests that the system is highly acceptable across all evaluated criteria, reflecting a positive assessment by IT experts in terms of functionality, portability, performance efficiency, and security. Portability receives the highest mean score (4.73), indicating that the IT experts found the system to be easy to adapt to different environments. On the other hand, Performance Efficiency received the lowest mean score (4.53). Crucially, this category also has the highest average standard deviation (0.75), suggesting it is the area with the greatest variability in IT expert opinions and the most potential for minor, focused improvement. Portability and Functionality had a slightly lower average variability (average SD around 0.60), which indicates a higher agreement among IT experts on the scores of these criteria compared to the two other categories.

Table 6 shows the system usability scale evaluation result of the developed system as rated by the QAM staff, local accreditors, deans, and faculty members. The results indicated the differences in the assessment and consistency among the respondents. The local accreditor group provided the highest average SUS score (87.50); however, this group also exhibited the highest level of internal response variability, as indicated by the highest standard deviation (1.75) and variance (3.12). On the contrary, QAM staff gave the lowest SUS average (77.50) and the highest consistency in their ratings, achieving the lowest average standard deviation (1.28) and the most precise 95% confidence interval (76.58 to 78.42).

4. Conclusions

Based on the evaluation conducted using the ISO 25010 software quality standard, the developed system has been proven to be functional, portable, efficient, and secure. Relatively, the score obtained in the SUS suggests that the developed system meets the user expectations in terms of usability. This result indicates that the intended users of the system experience minimal difficulties in performing tasks, proving the system's usability by providing a positive user experience. This result further suggests that the different features integrated into the developed system support the needs of the users to have an efficient and effective document management system for accreditation. Subsequently, preparing and organizing needed accreditation documents will be easier, secured, and efficient, thus reducing the workload of the faculty-in-charge and QAM staff. The highly favorable evaluation result validates the system's reliability, usability, and adherence to industry standards, establishing it as a robust and dependable solution for its intended purpose.

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