

web-based accreditation with mobile data reporting and visualization

Jackelyn Trinidad^a

^aTaguig City University, Philippines

Corresponding author.

Correspondence: Jackelyn Trinidad

E-mail: trinidadjt03061979@gmail.com

Article info

Received 30th November 2021

Received in revised form 25 January

2022 Accepted 14 March 2020

Keywords

Analytics, Evaluation, Data, Faculty

Abstract

Accreditation is the formal recognition of an educational program that possesses a high level of quality based on the analysis of the merits of its educational operations in attaining its objectives and its role in the community that it serves. Institutions in Higher Education (HEIs) play a very significant role in making a country to be competitive globally through the skilled human capital resources it produces. The function is intimidating as the institution has to regularly check itself against the global standards in place and keep itself updated on the latest demands of the labor market. This is about investing in a considerable amount of resources to develop its faculty, research, and facilities. (Pacquiao et. Al; 2012)The study aimed to develop a Web-based Accreditation with Data Reporting and Visualization for Program Accreditation. The study was for the management and monitoring of the required documents in all areas of accreditation especially in the Computer Science Program by utilizing this system. This system would assist the users to monitor the progress of each area of accreditation effectively. It is controlled by the system administrator that can add and manage user accounts, programs, and content to the system. The people assigned can upload documents in PDF (Portable Document Format) or .pdf and exchange notes with each other.The system evaluation was based on the standard set by International Standardization Organization, the ISO 25010 which was used to evaluate software products. The variables that were needed to test the system were functional suitability, usability, security, compatibility, portability, and maintainability provided in the questionnaire which would establish the credibility of this research through the scientific approach used in statistical treatment which was later interpreted and analyzed to give findings.The system was assessed by the three groups of participants, the accreditation personnel, faculty members, and IT staff that yielded mostly "highly acceptable" and "acceptable responses on the features of the system. The proponent found that there was a significant difference between the evaluations of the three groups of participants by utilizing Analysis of Variance (ANOVA); thus the null hypothesis was rejected. These features and functionalities of the system were beneficial in accreditation and complied with the international standards of software product quality in the development of systems.

I. INTRODUCTION

Accreditation is the formal recognition of an educational program that possesses a high level of quality or excellence based on the analysis of the merits of its educational operations in attaining its objectives and its role in the community that it serves. The Commission on Higher Education plays a very crucial role in preparing and making a country to be competitive worldwide using the skilled human capital resources it provides. The function is intimidating as the higher institution has to constantly check itself against the standards in place and keep itself updated on the demands of the labor market. This is investing in a considerable amount of resources to develop its faculty, research, and facilities. (Pacquiao, Orbeta & Albert;2012)

Bringing up the quality or excellence of higher education institutions is probably one of the motivations the government agencies such as the Commission on Higher Education are continuously looking for ways to address the problem. The Commission on Higher Education (CHED) requires all colleges and universities to gather, compile and submit pertinent documents and files to assess the quality of education delivered to measure if the institution is meeting the standard. Another means of educational quality measurement is by allowing the university to be assessed by a group of experts for example is the Association of Local Colleges and Universities-Commission on Accreditation (ALCU-COA). Each agency for sure has its own set of requirements and needed documents for the institution to meet. These are the set of bulky papers, and documentation of this requirement is particularly burdensome to the people directly involved before, during, and after the accreditation. The researcher is also a faculty member; thus the experienced a lot of issues and problems in the process. Faculty members, the accreditation personnel, and staff have a lot of difficulties in retrieving, classifying, and keeping these documents intact.

A Web-based platform is just one of many methods by which computers can communicate and collaborate by the use of markup languages and multimedia packages. Web technology has undergone a dramatic transition and evolution, from a few marked-up and linked web pages to the ability to do very specific work on a network without interruption.

This accreditation involved manual collection of documents in different formats, which is very time-consuming and tedious. It requires classifying gathered documents, storing them in a physical folder, and segregating them individually per area, getting ready for the assessment but when the time comes, still efforts and time are not enough; so these were the ideas of the study came from. So the researcher conceptualized a software named Web-based Accreditation with Data Reporting and Visualization that systematically facilitates the collection of documents and automatically generates reports that would save time and effort to the people involved.

II. LITERATURE REVIEW

This review of different literature and studies was done where the researcher discovered that there was already existing software used in accreditation/assessment in different fields while the researcher assumed that the accreditation process was being prepared, managed, and was done manually by the people directly involved when accreditation was conducted. Probably the gathered literature and studies have had a very important contribution to the study. These studies were related in the aspect of web-based/mobile uploading of files, processing, storage, and accessibility. The researcher also found out that the system is fast in terms of searching records from the databases.

A. Effectiveness of Agile Software Development Model

According to McCannon, (2019) who conducted a study on How Agile methodology is used in Cloud Service Delivery by the Professional Services Organisation of a leading Global Virtualisation Software Company. Enterprise Customers use the Software produced by the Global Software Company to build Clouds and Services and engage the Organisation to help them build the required infrastructure, automation, and in some cases the services themselves.

Fitzer, (2015) studied Agile Information Security Using Scrum as a thesis at the American Military University. The study used agile as a tool for rapid development in an attack tool for computer and information technology. Fitzer used agile because of its adaptive properties that can easily be changed when threats arise.

Yau, A. and Murphy, C., (2013) conducted a study “Is a Rigorous Agile Methodology the Best Development Strategy for a Small Scale Technology Start-ups?”, the researcher posited that Agile development processes have become popular in the software development community, and be effective in large organizations.

B. Good Software Characteristics

Mireles, (2016) studied identifying relevant product quality in the context of a very small organization. To assess the user interface, the functional suitability of ISO 25010 was used. The study aimed to investigate the quality characteristics that the practitioners at very small organizations consider relevant.

Abdelaziz, T. & Maatuk, A., (2016) posited that one of the significant aspects of software quality is its usability. The success or failure of the software application is one of the characteristics of software. Facing the software application usability where it may lead to the existence of a gap between users and systems is the most important risk because the design is not based on the wants and requirements of the target clients.

Knodel, J., and Naab, M., (2016) listed the characteristics of software product standards from the ISO. Compatibility is one of the characteristics that they listed which is considered very important in software product development. They emphasized that the software can be installed and uninstalled in a specified condition and environment.

C. Easing the Burden of Program Assessment: Web-based Tool Facilitates Measuring Student Outcomes for ABET Accreditation

Schahczenski, C., and Van Dyne, M., (2019) posited that the rapid pace of technology and social change signifies a process of constant program progress for academic programs. ABET accredits educational programs, making sure that these programs meet criteria and constantly collecting data, analysis of that data to know what is, and is not functioning, and making programs updated accordingly that consumes considerable faculty and administrative time. These software tools could help to reduce or eliminate the burden of measuring student outcomes, received praise by members of two ABET accreditation teams who suggested marketing the software to help other programs seeking, or maintaining, ABET accreditation and is undergoing enhancements.

D. A Web-Based System for Course and Program Assessment: Prototype to Product

Poger, S. & Bailie, F., (2006) did a study on how a prototype web-based system developed in the Computer Science Department of Iona College for online evaluation of course objectives and prerequisites have been implemented as a product for significant assessment and accreditation purposes. The system was piloted by faculty and students for a year, gathering proposed modifications. These suggestions were implemented to release a usable system to fulfill departmental, institutional, and accrediting requirements as part of the software cycle. This automated system is designed and currently used to assess ABET accreditation to simplify faculty assessment responsibilities while meeting accreditation.

E. Web-Based Course Information System Supporting Accreditation

Kumaran, V.S & Lindquist T. E, (2007) according to them a critical aspect of accreditation and program evolution in many universities, transitioning to outcome-based processes pushes universities to document, coordinate, and maintain additional information is an outcome-based assessment process. The added burden of managing the process and maintaining additional documentation stresses resources in most departments while these processes can improve the course and program offering. This study discusses a web-based database-driven software system called (CISA) designed and developed to help the accreditation process by maintaining course and program objective/outcome information together with relationships among this descriptive information. These web pages provided public and password-protected user-interface for viewing and maintaining course information and the relationships among this information. Although the paper does not presume specific measures it suggests an approach that would work well with typical academic duties and responsibilities.

F. Design of Assessment Information System for Program Accreditation

Bhatti, A., and Ahmed, I., (2015) according to them, to raise the Academic programs to profile they seek accreditation. Program assessment and continuous improvements of processes establishment are required to gain and maintain accreditation. Assessment processes are about defining course learning outcomes, student outcomes, and program educational objectives; collecting course assessment data, performing statistical evaluations, and deriving meaningful conclusions to improve the program. Web-based technologies can be used to improve communication, collaboration, coordination, and flow control among different entities involved in the processes. This paper presents a web-based system that was designed to assist in the assessment and continuous improvement processes to meet the requirements of two accreditation bodies in a program that has academically diverse faculty.

III. RESEARCH METHODOLOGY

The researcher used descriptive and developmental approaches in this study. In the descriptive side of the study, the researcher used the survey method which described the evaluation of the respondents on the use of Web-based Accreditation with Data Reporting and Visualization based on the standards set by the ISO 25010 which are functional suitability, compatibility, usability, security, maintainability, and portability of the developed software. In the developmental side of the study, the researcher used a systematic process to develop the system prototype from conception until its completion.



Figure 1.0 The Agile Model Phases

Figure 1.0 shows what the researcher used in the project development method on the concept of Systems Development Life Cycle (SDLC) Agile model as a guide through step by step process during the system analysis and design. The SDLC Methodology produces high-quality systems that are well designed and contrasted. Agile is research and industry-proven as a software development model that produces a well-designed and robust system.

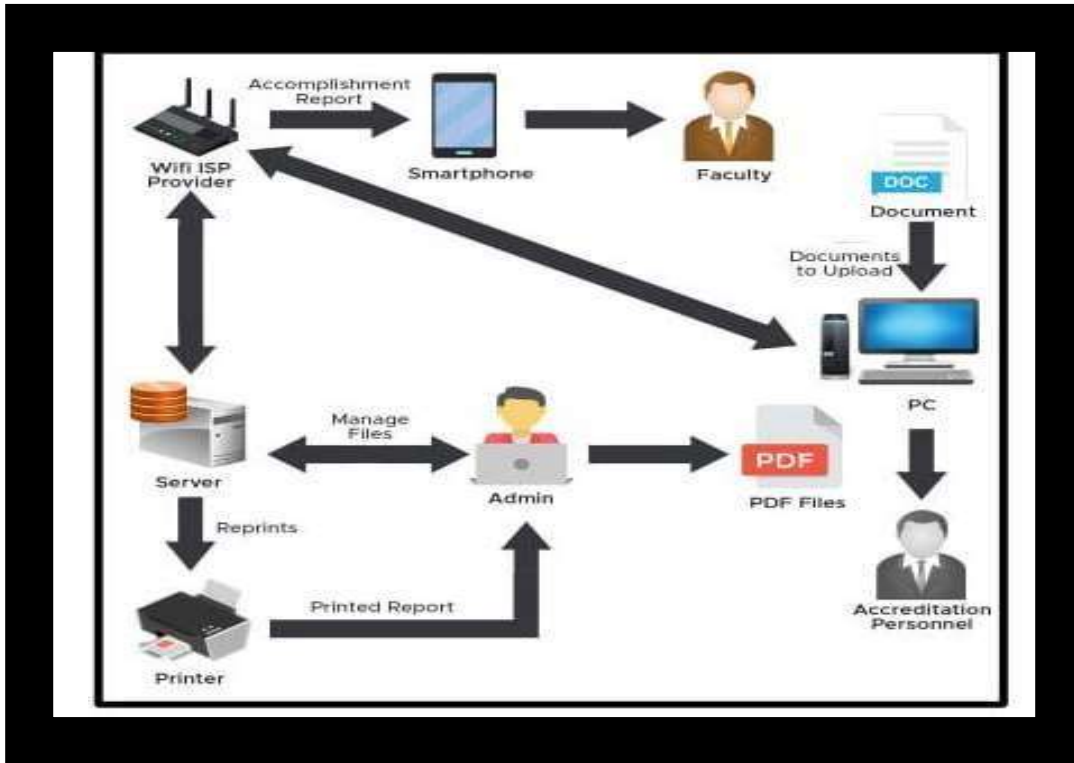


Figure 2. Conceptual Diagram

Figure 2.0 shows the network and system architecture of the Web-based Accreditation with Mobile Data Reporting and Visualization which was composed of the software connection of the system as a whole. The data are stored in the database of the system and can be accessed online with the URL (Uniform Resource Locator). The administrator is responsible to maintain the integrity and credibility of the file or documents stored in the database. For the system to be fully functional, the first operation starts with the registration of the users' information and details that are managed by the super administrator. After this, the three levels of user accounts will have different functions in the system. The Staff page is where the user can classify the file or document uploaded and will create an appropriate storage area for the file. The evaluator can view and give a rate to the file uploaded, also the evaluator after inspecting files uploaded thereafter will evaluate the system and give comments, remarks, recommendations, conclusions, and the final rating in each area of accreditation. The manager or the dean can view all the areas and sub-areas to monitor, inspect, and validate the file/documents uploaded in each area and will send notice to the assigned faculty if the document is appropriate or not.

IV. FINDINGS AND DISCUSSION

To summarize the result, there was significant difference existed among the evaluation of faculty, IT Practitioner and Accreditation Personnel on the evaluation of the developed Web-based Accreditation with Mobile Data Reporting and Visualization in terms of functional suitability, usability, security, maintainability, and portability of the system while there is no significant difference found on the variable compatibility of the system.

The weighted mean used a Likert scale to be able to know how the respondents of the study assess the system. A Likert-type scale assumes that the strength or intensity of the experience is linear. The Likert Scale was used with the following scale and corresponding interpretation. The scales used are the following;

Weight	Numerical Rating Range of Weighted Mean	Verbal Interpretation
5	4.50 – 5.00	Highly Acceptable
4	3.50 – 4.49	Acceptable
3	2.50 – 3.49	Moderately Acceptable
2	1.50 – 2.49	Less Acceptable
1	1.00 – 1.49	Not Acceptable

Table 1
The difference in the Evaluation of Web-based Accreditation with
Mobile Data Reporting and Visualization
by the Respondent in Terms of ISO 25010

Variables	Source of Variation	Sum of Squares	Df	Mean Square	F	Decision	Remarks
Functional Suitability	Between Groups	0.1634	2	0.0817	8.36	Not Accepted	Significant
	Within Groups	0.0586	6	0.0098			
	Total	0.221	8				
Compatibility	Between Groups	0.5161	2	0.2581	16.778	Not Accepted	Significant
	Within Groups	0.2307	15	0.01538			
	Total	0.7468	17				
Usability	Between Groups	0.0883	2	0.04415	7.179	Accepted	Not Significant
	Within Groups	0.0185	3	0.00615			
	Total	0.1068	5				
Security	Between Groups	0.1539	2	0.0679	4.258	Not Accepted	Significant
	Within Groups	0.1915	12	0.01596			
	Total	0.3274	14				
Maintainability	Between Groups	0.3173	2	0.1587	10.015	Not Accepted	Significant
	Within Groups	0.1426	9	0.0158			
	Total	0.4599	11				
Portability	Between Groups	0.4604	2	0.2302	37.734	Not Accepted	Significant
	Within Groups	0.0366	6	0.0061			
	Total	0.497	8				

Table 1 shows the result where a significant difference was found to the assessment of the group of respondents on the evaluation of the proposed development of Web-based Accreditation with Mobile Data Reporting and Visualization in terms of *functional suitability*. This finding was inferred from the obtained F-value of 8,36 which is higher than the critical F-value of

5.43 at a 0.05 level of significance. Thus the hypothesis of no significant difference was not accepted.

The same is true with the variable *usability* in which a significant difference was found, wherein the obtained value of 16.778 was higher than the critical F-value of 3.682 at 0.05 level of significance thus the hypothesis is not accepted. Whilst, there was no significant difference found in terms of the variable *compatibility*, this finding was inferred from the obtained F-value of 7.179 which was higher than the critical F-value of 9.552 at a 0.05 level of significance thus the hypothesis is accepted.

Furthermore, the result that significant difference was found in the assessment of the group of respondents on the variable *security* where the obtained F-value of 4.258 which is higher than the critical t F-value of 4.257 at 0.05 level of significance thus the hypothesis is not accepted. On the other, there was no significant difference found on the variable *maintainability* where the obtained F-value of 10.015 is higher than the critical F-value of 3.885 at 0.05 level of significance thus the hypothesis was not accepted.

The result also shows that a significant difference was found to the assessment made by the group of respondents on the evaluation of the proposed development of web-based accreditation with mobile data reporting and visualization in terms of *portability* where the obtained F-value of 37.734 is higher than the critical F-value of 5.143 at 0.05 level of significance, this hypothesis was not accepted.

V. CONCLUSION AND FURTHER RESEARCH

On the account of the foregoing significant finding, the following conclusions were delivered; Different stages in the design and development of Web-based Accreditation with Data Reporting and Visualization were undertaken using the Agile Model in SDLC.

The developed Web-based Accreditation with Data reporting and Visualization used criteria based on ISO 25010 was evaluated by the faculty, IT Practitioner and Accreditation personnel in terms of Faculty is "Highly Acceptable", and for IT Practitioners and Accreditor is "Acceptable" in the functional suitability, compatibility, usability, security, maintainability, and portability. of the system while there was no significant difference found on the variable compatibility.

Issues and concerns that the group of respondents has experienced on the use of the system were all taken action and were addressed. A Training program plan was developed to be used as a guide to users in the operation of the system. It consists of the training schedule, operational plan, and user manual for all types of users.

The proponent encourages the school that Web-based Accreditation with Mobile Data Reporting and Visualization should integrate and be used to improve the overall process in managing school accreditation. Follow-up studies and research should be done to make the scope of coverage wider than the system could be used not only for ALCU-COA accreditation but other accreditation bodies. Incorporate and maximize the use of the proposed Web-based Accreditation with Mobile Data Reporting and Visualization in terms of overall functionalities. Future researchers may add other advanced functionalities or another performance improvement to the design of the system

REFERENCES

1. Abdelaziz, T. & Maatuk, A. (2016, April). An Approach to Improvement of Usability in Software Products. Retrieved from https://www.researchgate.net/publication/2995123_An_Approach_to_Improvement_The_Usability_in_Software_Products.
2. Bhatti, A., and Ahmed, I., (2015) Design of Assessment Information System for Program Accreditation Retrieved from https://www.google.com/Design_of_Assessment_Information_System_or_Program_Accreditation
3. Fitzer, G., (2015) Agile Information Security Using Scrum as a thesis at the American Military University.
4. ISO/IEC 25010:2009 Software -Engineering-Software Product Quality Requirements and Evaluation (SQuARE)Quality Model. (2009). ISO/IEC JTC1/SC7 N4321. 17.02.2009, CD 25010.3, . Retrieved from <https://www.iso.org/standard/35733.html>
5. Knodel, J., and Naab, M. (2016). Pragmatic Evaluation of Software Architecture -Springer International Publishing (2016)
6. Kumaran, V.S & Lindquist T. E, (2007) Web-Based Course Information System Supporting Accreditation November 2007 Conference: Frontiers In Education Conference - Global Engineering: Knowledge Without Borders, Opportunities Without Passports, 2007. FIE '07. 37th Annual
7. Jeyaselvi, M., M. Sathya, S. Suchitra, S. Jafar Ali Ibrahim, and N. S. Kalyan Chakravarthy. "SVM-Based Cloning and Jamming Attack Detection in IoT Sensor Networks." *Advances in Information Communication Technology and Computing*, pp. 461-471. Springer, Singapore, 2022.
8. McCannon,(2019) conducted a thesis that studied how Agile methodology is used in Cloud Service Delivery by the Professional Services Organization of a leading Global Virtualisation Software Company.
9. Mireles, G. A. (2016). Identifying Relevant Product Quality Characteristics in the Context of Very Small Organizations, Universidad de Sonora.
10. Karthikeyan, B., K. Alhaf Malik, D. Bujji Babbu, K. Nithya, S. Jafar Ali Ibrahim, and NS Kalyan Chakravarthy. "Survey of Cooperative Routing Algorithms in Wireless Sensor Networks." *Annals of the Romanian Society for Cell Biology* (2021): 5316-5320
11. Poger, S. & Bailie, F., (2006) A Web-Based System for Course and Program Assessment: Prototype to Product Society for Information Technology & Teacher Education International Conference, Mar 19, 2006, in Orlando, Florida, USA ISBN 978-1-880094-58-7 Publisher: Association for the Advancement of Computing in Education (AACE), Waynesville, NC USA
12. C. Narmatha , Dr. M. Thangamani , S. Jafar Ali Ibrahim, “ Research Scenario of Medical Data Mining Using Fuzzy and Graph theory”, *International Journal of Advanced Trends in Computer Science and Engineering*, Vol 9, No 1 (2020): 349-355, <https://doi.org/10.30534/ijatcse/2020/52912020>

13. Schahczenski, C., and Van Dyne, M., (2019)The rapid pace of technology and social change necessitates a process of continuous program improvement for academic programs. ABET accredits educational programs,
14. Yau, A and Murphy, C. (2013). "Is A Rigorous Agile Methodology the Best Development Strategy for a Small Scale Technology Startups?".