

Academic Management Android Application For Student Performance Analytics: A Comprehensive Evaluation Using Iso 25010:2011



Sharmaine Justyne R. Manglapuz, Luisito L. Lacatan

Abstract— *Software quality standards are very significant matters nowadays, especially that this era reigns with software technology and systems to innovate the work process in any institution. Assessments are conducted to measure the quality of services as well as products. This paper focuses on the comparison of the assessment of an existing alumni tracer system and online student portal using ISO/IEC 25010 model, but only seven dimensions was used namely functional suitability, performance efficiency, usability, reliability, security, maintainability and portability. Twenty I.T. experts were invited to test the existing systems and fill in the survey. The results as describe in this paper shows the significant differences of systems as evaluated by the respondents using the ISO/IEC 25010 model. Performance Assessment is very vital to the academic progress of a student. It should be monitored, and evaluated to allow both professors and students create pre-emptive measures to ensure their success rate. This paper focuses on the assessment of the developed system using ISO 25010:2011 Software Quality Management. The following criteria were used Functionality, Usability, Reliability, Portability and Security. 84 respondents comprising of Professors, Department Heads and IT Professionals assessed and evaluated the system through the use of an adapted evaluation tool. The results shown in this paper shows the evaluation of the respondents to the developed system.*

Keywords—*Assessment of Software Quality, Data Analytics, Academic Performance Evaluation*

I. INTRODUCTION

The rapid change of technology has affected almost every aspect of human life compared to the way of living before its existence. Presently, day to day activities, both simple and complex tasks are usually done with the help of devices that enable people to increase productivity without sacrificing the excellence of work and effort one can exert into to a particular task. The quality of life has ultimately changed for the better, due to the change this current millennium is in.

Revised Manuscript Received on October 30, 2019.

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Student Performance Analytics can provide data which can later on describe and analyze meaningful information. It can provide data that could help professors help their students in achieving their target grades. Day to day evaluation of grade will instantaneously be made to maximize the software's capability and reports will be given to help the teacher identify which assessment tools in their course does a significant difference on the results of the grades of the students, because of this, different adjustments in the academic management of a teacher at any point of their course materials to cater to the needs of the student. Currently, the mode of recording and analysis of grades by professors are done in different ways. One of which is the manual writing of grades in an actual old-fashioned class record – its transparency and day to day updated status can be brought by professors everywhere they go. Grades are written in a small notebook type sheet where teachers can put their updated records in with the exclusion of the computation which is done on a different platform. The manual class record is solely used for the purpose of recording grades and not processing them. Oftentimes, there are two ways in which teachers evaluate these grades one of which is the manual computation using a calculator and some evaluate grades with the help of electronic spreadsheets like excel and the like. The evaluation and analysis of grades are usually done manually by professors, which may possibly result in the overlooking of data and inaccurate projection because of the manual procedure. Professors may tend to forget or not notice which students are casually having a decline of performance. They may also only realize the students' already failing grades after finishing the entire semester which could lead into problems most especially when the semester becomes fast-paced during the finals and not much days are given to comply for incomplete requirements and remedial, because of this, the percentage of failing and students with incomplete grade has become significant. The use of statistical methods as input might play an expanded role in educational analytics by giving students automated, real-time information about what their current performance means for eventual success in eLearning environments. [1]

II. AIM OF PAPER

A. Objectives of Paper

The aim of this paper is to evaluate the developed Academic Management Android Application in terms of the criteria based from ISO 25010:2011 Software Quality

Management. Specifically, the study seeks to evaluate the existing system in terms of:

1. Functionality
2. Usability
3. Reliability
4. Portability and
5. Security

Lastly, the results of this paper will provide the recommendations given by the respondents.

B. Theoretical Background

Research and Development (R & D) is a process used to develop and validate educational products which consists of studying research findings pertinent to the product to be developed, developing the product based on the finding, field testing it in the setting where it will be used eventually, and revising it to correct the deficiencies found in the field testing stage. The steps of this process are usually referred to as the R & D cycle which included: (1) research analysis, needs assessment, and proof of concept; (2) product planning and design; (3) preliminary product development; (4) preliminary field testing; (5) product revision; (6) main field testing; (7) the final product revision, and (8) dissemination and implementation.^[7] In more rigorous program of R & D, this cycle is repeated until the field-test data indicate that the product meets its behaviorally defined objectives.

III. RESEARCH METHODS

A. Research Design

The purpose of the study is the evaluate the Academic Management Android Application and utilized the descriptive method of research for the systematic study of designing, developing and evaluating instructional programs, processes and products that must meet the criteria of internal consistency and effectiveness. It was used by the researcher to establish new procedures, techniques and tools based upon the methodical analysis of specific cases. The study used the software management criteria of ISO 25010:2011 that tests the software quality of the systems as assessed by the experts through testing.

B. Research Methods

The developed Academic Management Android Application was evaluated by Professors, Department Heads and IT Experts in 2 different universities in Sta. Cruz, Laguna. The respondents used the 5 point likert scale in evaluating the system, the following indicators was used: 5 is Very Effective, 4 – Effective, 3 – Moderately Effective, 2 – Ineffective and 1 – Very Ineffective.

C. Analysis of Data

The study used weighted mean to evaluate the developed android application according to the criteria adapted from ISO 25010:2011. The criteria Functionality was further analyzed using the sub criteria of Suitability, Accuracy and Security. Usability has Learnability, User Error Protection and User Interface Aesthetics. Reliability has Maturity, Availability and Recoverability. Portability has Adaptability, Instability and Replaceability. Lastly, Security has Confidentiality and Non-repudiation for its sub criteria. The results of the evaluation was interpreted using the indicators below:

Range	Scale	Interpretation
4.50 – 5.0	5	Very Effective
3.50-4.49	4	Effective
2.50- 3.49	3	Moderately Effective
1.50-2.49	2	Ineffective
1.00-1.49	1	Very Ineffective

After the responses were obtained from the questionnaire checklist, the mean of the scores were calculated and were used to determine the average of response on the evaluation of the application based on the criteria from the ISO 25010:2011 Survey tool. The formula used for the weighted mean is the following:

$$\text{Formula: } \bar{x} = \frac{\sum fx}{N}$$

Where:

- \bar{x} = Weighted Mean
- N = Total Number of Respondents
- x = Number of Respondents
- E = Summation

IV. RESULTS AND DISCUSSIONS

The evaluation of the Faculty, IT Practitioners and Academic Heads are presented and was evaluated in terms of: Functionality, Usability, Reliability, Portability, and Security. Table 1 shows the evaluation of the respondents on the Academic Management Android Application based on Functionality and is determined specifically by its Suitability, Accuracy and Security, with a weighted mean of 4.68, 4.74 and 4.75, respectively having a verbal interpretation of Very Effective by the three categories of respondents and an over-all weighted mean of 4.73 and is verbally interpreted as Very Effective. The Suitability criteria refers to the appropriateness of the different functions of the Academic Management Android Application. The evaluation of the developed application had a weighted mean of 4.68 with a verbal interpretation of Very Effective. For Accuracy, referring to the correctness of the process of data by the Academic Management Android Application had an overall weighted mean of 4.74 with a verbal interpretation of Very Effective. For Security the capability of providing denial of use to unauthorized access to the software functions has a verbal interpretation of Very Effective and an overall weighted mean of 4.75.

The results of the evaluation show that the study which uses data-driven influence and data tools made by the functional characteristics of the system as adaptation to the school academic activities can fully optimize the capability of analytics in education.[2]

Table 1. Evaluation of respondents of the Academic Management Android Application in terms of Functionality

Indicators	TOTAL WM	VI
1)Suitability	4.68	Very Effective
2)Accuracy	4.74	Very Effective
3) Security	4.75	Very Effective
OVERALL	4.73	Very Effective

Table 2 shows the evaluation of the Faculty, IT Practitioners and Academic Heads on the Academic Management Android Application based on its Usability and is determined by three criteria: Learnability, User Error Protection, and User Interface Aesthetics.

Learnability, referring to the degree to which the Academic Management Android Application can be used to achieve specified goals has a weighted mean of 4.74 with a verbal interpretation of Very Effective. User Error Protection referring to the degree to which the Academic Management Android Application protects users against making errors has an evaluation of 4.12 with a verbal interpretation of Effective. User interface aesthetics defined as the degree to which the user interface enables pleasing and satisfying interaction for the user has an evaluation of 4.36 with a verbal interpretation of Effective.

Overall, the evaluation of the Usability criteria of the Academic Management Android Application from the respondents has an over-all weighted mean of 4.41 and has a verbal interpretation of Effective which shows that according to the respondents, the application was able to provide Software Effectivity in terms of Usability. The results of the evaluation of the application in terms of usability shows the study which uses the learnability of systems can be applied with Educational Data Mining, specifically educational database can be used for many purposes including the prediction of students' success.[3]

Table 2 Evaluation of respondents of the Academic Management Android Application in terms of Usability

Indicators	TOTAL WM	VI
1)Learnability	4.74	Very Effective
2)User Error Protection	4.12	Effective
3) User Interface Aesthetics	4.36	Effective
OVERALL	4.41	Effective

Table 3 shows the evaluation of the respondents on the Academic Management Android Application based on Reliability and is determined specifically by its Maturity, Reliability and Portability. Maturity, defined as the degree to which the Academic Management Android Application meets the needs for reliability under normal operation has an over-all weighted mean of 4.55 with a verbal interpretation of Very Effective. Availability, defined as the degree to which the Academic Management Android Application is operational and accessible when required for use has an overall weighted mean of 4.65 and is verbally interpreted as

Very Effective. Lastly, for the Recoverability criteria which is defined as the degree to which, in the event of an interruption or failure, the Academic Management Android Application can recover the data directly affected and re-establish the desired state of the system had an overall weighted mean of 4.47 which is verbally interpreted as Very Effective. Overall, for the Reliability criteria had an average weighted mean of 4.56 and is verbally interpreted as Very Effective. The evaluation of the application in terms of Reliability shows the study that the availability of data has led to the development of data science and ensure the quality of results and understand the models which can further lead into a more reliable knowledge discovery.[4]

Table 3 Evaluation of respondents of the Academic Management Android Application in terms of Reliability

Indicators	Total WM	VI
1) Maturity –	4.55	Very Effective
2) Availability	4.65	Very Effective
3)Recoverability	4.47	Very Effective
Overall	4.56	Very Effective

Table 4 shows the evaluation of the respondents on the Academic Management Android Application based on its Portability and is determined by three criteria: Adaptability, Instability, and Replaceability.

Adaptability, defined as the degree to which the Academic Management Android Application can adequately and productively be adjusted for various or developing equipment, programming or other operational or utilization situations has an evaluation of a weighted mean of 4.69 with a verbal interpretation of Very Effective. Instability, defined as the degree of effectiveness and efficiency with which the Academic Management Android Application can be successfully installed and/or uninstalled in a specified environment has a weighted mean of 4.72 with a verbal interpretation of Very Effective. Replaceability which is the degree to which the Academic Management Android Application can replace another specified software product for the same purpose in the same environment has an evaluation 4.76 with a verbal interpretation of Very Effective. The study shows the application of mobile technology to the field of education to allow students and teachers alike to bring their academic materials and access them anywhere at any given time.[5]

Table 4 Evaluation of respondents of the Academic Management Android Application in terms of Portability

Indicators	WM	VI
1) Adaptability	4.69	Very Effective
2) Instability	4.72	Very Effective
3) Replaceability	4.76	Very Effective
OVERALL	4.72	Very Effective

Table 5 shows the evaluation of the respondents on the Academic Management Android Application based on its Security and is determined by three criteria: Confidentiality, Non-Repudiation and Integrity.

Non-Repudiation which is defined as the degree to which data input and processes can be proven to have taken place, so that information cannot be repudiated later has a weighted mean of 4.71 with a verbal interpretation of Very Effective. Integrity defined as the degree to which the Academic Management Android Application prevents unauthorized access to, or modification of, computer programs or data got a weighted mean of 4.82 with a verbal interpretation of Very Effective. Overall, the Security criteria of the Academic Management Android Application has an over-all weighted mean of 4.64, 5.00 and 4.70 from the Confidentiality, Non-Repudiation and Integrity indicators and has a verbal interpretation of Very Effective which shows that according to the respondents, the application was able to provide Software Effectivity in terms of Security.

The study shows the importance areas that will be used in big data cloud computing, one of which is security and will serve as the primary foundation of the type of technology needed to be implemented and it shows the importance areas that will be used in big data cloud computing, one of which is security and will serve as the primary foundation of the type of technology needed to be implemented.[6]

Confidentiality defined as the degree to which the Academic Management Android Application ensures that data are accessible only to those authorized to have access has an evaluation of of 4.81 with a verbal interpretation of Very Effective. Non-Repudiation which is defined as the degree to which data input and processes can be proven to have taken place, so that information cannot be repudiated later has a weighted mean of 4.71 with a verbal interpretation of Very Effective. Integrity defined as the degree to which the Academic Management Android Application prevents unauthorized access to, or modification of, computer programs or data got a weighted mean of 4.82 with a verbal interpretation of Very Effective. Overall, the Security criteria of the Academic Management Android Application has an over-all weighted mean of 4.64, 5.00 and 4.70 from the Confidentiality, Non-Repudiation and Integrity indicators and has a verbal interpretation of Very Effective which shows that according to the respondents, the application was able to provide Software Effectivity in terms of Security. The study of shows the importance areas that will be used in big data cloud computing, one of which is security and will serve as the primary foundation of the type of technology needed to be implemented. It shows the importance areas that will be used in big data cloud computing, one of which is security and will serve as the primary foundation of the type of technology needed to be implemented.[7]

Table 5 Evaluation of respondents of the Academic Management Android Application in terms of Portability

Indicators	Total WM	VI
1) Confidentiality	4.81	Very Effective
2) Non-repudiation	4.71	Very Effective
3) Integrity	4.82	Very Effective
OVERALL	4.78	Very Effective

V. CONCLUSION

Based from the results and discussions presented above, the following conclusions have been drawn:

- 1.) The Faculty, IT Practitioners, and Academic Heads evaluated the Academic Management Android Application as Very Effective based on a Software Quality Assessment Tool in respect to ISO 25010 in terms of Functionality, Usability, Reliability, Portability & Security.
- 2.) The respondents encountered problems mostly regarding lack of functionalities and user-interface design inconsistencies.
- 3.) Enhancements can be done to solve the problems encountered by respondents in the use of the Academic Management Android Application are developed such as adding features and improving its user interface aesthetics

REFERENCES

1. Importance of Big Data Analytics (n.d), Retrieved January 30, 2018, from https://www.sas.com/en_us/insights/analytics/big-data-analytics.html#
2. Murali, V. (2014). "Data Driven Influence". Retrieved January 20, 2018, from <https://www.edsurge.com/news/2014-10-06-diving-into-data-analytic-s-tools-in-k-12>
3. "Text and Data Mining in Europe", Retrieved January 5, 2018, from <http://Liber-TDM-Factsheet-v2.pdf> use by school staff" Retrieved October 2, 2017, from <https://eric.ed.gov/?id=ED547988>
4. Liu, M. and Huang Y. (2016) "Data Science for Education", Retrieved November 9, 2017, from <http://www.learnyst.com/assessing-student-learning>
5. El-Sofany, H. , El-Seoud, S., Hassan M., Alwadani A. (2014), "Development of Mobile Educational Services Application to Improve Educational Outcomes using Android Technology", International Journal of Interactive Mobile Technologies (2015)
6. S Assuncao, M. and Calheiros R. N, (2015), "Application of Cloud Computing in Big Data, Journal of Parallel and Distributed Computing". Retrieved January 30, 2018 from <https://arxiv.org/pdf/1312.4722.pdf>
7. Gall, D Meredith. Joyce P Gall and Walter R, Borg (2003). Educational Research an Introduction. New York: Pearson Publishing, pp. 124-126

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