

The Evaluation of Enterprise Resource Planning using ISO 25010 Based Quality Model

Mazharul Islam
Electrical and Computer Engineering
North South University
Dhaka, Bangladesh
mazharul.islam1@northsouth.edu
ORCID: abcd-efgh-klmn-oprs

Rajib Imran
Electrical and Computer Engineering
North South University
Dhaka, Bangladesh
rajib.imran@northsouth.edu
ORCID: abcd-efgh-klmn-oprs

Shazzad Hosain
Electrical and Computer Engineering
North South University
Dhaka, Bangladesh
shazzad.hosain@northsouth.edu
ORCID: abcd-efgh-klmn-oprs

Abstract— *Software quality standards are fundamental today, particularly as the age of software technology and systems in every organization innovates the work process. Evaluations are carried out to assess service quality and product quality. In this paper, we present the evaluation of Enterprise Resource Planning (ERP) using eight major characteristics of ISO25010 Based quality model. Fifty functional users participated in the survey who used the ERP in day-to-day business to test and complete the existing system. The emphasis of this paper is on evaluating the framework built using the software quality Control ISO 25010:2011 based on the business and IT field. The method was tested and validated by 50 respondents consisting of users, heads of departments, and IT professionals using an adapted evaluation instrument. The findings shown in the paper demonstrate the assessment of the framework respondents with each characteristic of ISO25010.*

Keywords— ISO25010, ERP, SAP, Assessment of Software Quality, Data Analytics, ERP software Performance Evaluation

I. INTRODUCTION

Enterprise resource planning (ERP) is a managerial and integrating process used by organizations to manage and integrate the many aspects of their operations. Many ERP software systems are beneficial for companies because they assist them in implementing resource planning by combining all of the operations required to manage their businesses into a single system. Planning, inventory, purchasing, sales, marketing, finance, human resources, and other activities may all be integrated with ERP software.

ERP Performance Analytics can provide data that can be used to find and assess relevant information afterward. It will provide data that may assist users in supporting their ERPs to achieve their business goals. The day-to-day examination of business reports will be done in real-time to maximize the software's capabilities. The reports will be produced to assist departments in determining which reporting tools in their organization have a substantial impact on the ERPs' performance while implementing ISO 25010.

ERP software is one of the most popular investments in Bangladesh's booming IT sector, where overall spending has increased significantly in recent years. ERP software has been identified as one of the primary drivers of this, with "dramatic expansion" described as one of its characteristics. Despite accounting for only 2.7 percent of the total number of companies, medium-sized and big businesses account for nearly half of all IT investment. Bangladesh's large and medium firms can monitor the outcomes of numerous group companies in a dashboard-like data analysis thanks to business integration tools like ERP.

ERP system success measurement rate in the area of South Asia and Bangladesh, which is still having not much work done. In addition, we did not get the good usable data of the existing ERP solution's success in the Bangladesh market from the employee who uses it in daily business. Therefore, it is hard to distinguish which part of the ERP system should be improved for more advantages and a user-friendly platform.

Some previous works [1], [2], [3] are demonstrated to evaluate the ERP model and other systems using ISO 25010. Some researchers proposed [4] a new method to assess the ERP system in the Indian market; another one claimed a technique [5] in Service-Oriented Architecture (SOA) of ERP using ISO 25010. The evaluation of the ERP system in different fields like Web-Based Application, Transportation Service Application, Higher Education Institutions software was explored by surveys and figured out the differences of new characteristics of ISO 25010 with ISO 9126.

This paper introduces the evolution of the ERP system in Bangladesh software using ISO 25010 Based Quality Model. We collect the survey result of 50 IT experts from different departments and analyze all attributes of ISO 25010, such as functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability, which provide the overall performance of the ERP solution. From the results, we found compatibility and security have the lowest score from the user perspective. So, enhancements can be done to solve the problems faced by respondents in using the ERP, such as adding features and improving its user interface aesthetics with the focus of these new characteristics for better performance.

The rest of the paper is organized in the following manner. Section II discusses the related work on the ERP model of ISO 25010 and briefly explains its methodology. Section III outlines the brief introduction of ISO 25010 with a description of each characteristic. Then, Section IV defines the ERP quality management model, and Section V discusses the aim of the paper-based ERP management application. Section VI and VII focus on the research method with the result and discussion of each characteristic detail and display the overall results. We conclude this paper with the current gap of new traits and discuss some possible future works in Section VIII and IX.

II. RELATED WORKS

In this section, we reviewed a number of papers to discuss the background and related work on ISO 25010 Based on Quality Model for evaluation of ERP model and other systems.

Fadhel et al. [1] measured a web-based quality model's perspective using Software Engineering Theory (ISO 25010). This research study would be the first to leverage ISO 25010 framework to measure the system's success. The research study also added to the body of knowledge on leveraging web systems satisfaction on universities for practical use in education. The research survey was conducted for the assessment of user perceptions, attitudes, and behaviors. System usage levels can be increased from the perspective or framework of higher education system satisfaction predictors, leading to increased user acceptance and user innovation.

Manglapuz et al. [2] claimed the study was evaluated the Academic Management Android Application and utilized the descriptive method of research for the systematic analysis of designing in terms of the criteria based on ISO 25010:2011 Software Quality Management. 20 IT experts were invited to test the existing alumni tracer system and fill in the survey. The Faculty, IT Practitioners, and Academic Heads evaluated the Academic Management Android Application as Very Effective based on a Software Quality Assessment Tool regarding ISO 25010. The results described in the paper showed the significant differences of systems as evaluated by the respondents using the ISO/IEC 25010 model. The respondents encountered problems mostly regarding lack of functionalities and user-interface design inconsistencies.

Izzatillah [3] measured the GO-JEK application, consisting of all smartphones' functions by ISO 25010 Quality Model. GO-JEK is the most widely used transportation service application by Indonesian society that its users reached 21.6% of the total users of transportation service applications. GO-JEK application has 12 services that include many functions that must be running well. The questionnaire dissemination was conducted online using google form and took the respondents of 100 people from all over the country. These things show GO-JEK application has a good quality in product quality dimension and quality in use dimension or the user's perspective.

Mukti et al. [4] proposed a systematic design of quality evaluation method to investigate the quality of ERP in Indian Industries in terms of the criteria based on ISO/IEC 25010 Software Quality Management. Four quality factors, namely usability, functionality, reliability, and efficiency, have been considered to evaluate the ERP to measure the quality from the user's point of view. It is essential to mention here that it was not an evaluation of a particular ERP product; instead, it evaluates the entire system, which comprises that ERP and the working environment and culture of that enterprise.

Considering the critical role of SOA in organizations, Franc and Soares [5] observed that quality should be treated as a key issue in software industries. There should be a need to develop a specific quality model for SOA based on the latest ISO 25010. Seven volunteers answered a questionnaire to describe the degree of importance of the SOA quality model.

Research by Peters and Aggrey [6] presented a new model based on the ISO/IEC 25010 to evaluate the quality of ERP systems in Higher Education Institutions (HEIs). This model is used to select and adopt ERP systems in higher education institutions. The study brought forth three significant contributions: comparing two popular software quality models, identifying quality factors of ERP systems, and the

ISO 25010 standard as a base for the new quality ERP systems model in HEIs. Based on the ISO 25010, the paper presented a new model for quality ERP systems evaluation in HEIs since models were not static.

All this evaluation have their limitations and complexities. The primary measurement process of an application based on the ISO 25010 Quality Model is by providing the questionnaire to the end-user who uses and operates these systems daily.

III. BRIEF INTRODUCTION TO ISO 25010

ISO 25010 is an international standard for assessing the quality of software and systems. This standard has been updated three times: in 2007, 2011, and 2017 [11]. It also refers to the quality of the software product as well as the quality of use. ISO 25010 was created as an update to the ISO 9126 model, according to [10]. The previous model (ISO 9126) comprises six (6) elements and twenty-one (21) sub-factors, according to them. By comparing the two models, "security" and "compatibility" were the only two elements added into the ISO 25010, together with their sub-factors. ISO 25010, a derivation of ISO 9126, specifies thirty-one (31) characteristics that must be present in every high-quality software product.

A system's quality is determined by how well it meets the stated and implied needs of its many stakeholders and consequently, adds value. The quality model, which divides product quality into characteristics and sub-characteristics, reflects the needs of those stakeholders. The ISO/IEC 25010 product quality model includes the eight quality attributes shown in Fig. 1.

ISO 25010 is more detailed and complete compared to ISO 9126. ISO 9126 (ISO / IEC, 1991) has six characteristics and 27 sub-characteristics, while ISO 25010 compares it. According to (Botella et al., 2004), ISO 9126 has remarkable weaknesses due to its nonexclusive continuation. Any of the ideas introduced in ISO 9126 needs to be refined before applying to a specific project. In addition, the features of the software metrics were not explicit when determining the norm. New features have been added in ISO 25010, such as compatibility and security. The two characteristics were not specified in ISO 9126. Besides, there was a hierarchy of characteristics and sub-characteristics [7].

New characteristics were inserted in ISO 25010, such as security and compatibility. Both characteristics were not defined in ISO 9126. Besides, the hierarchy of characteristics and sub-characteristics was reorganized to improve the understanding of related concepts. This effort of ISO 25010 to reorganize and create new features and improve the understanding of definitions attempts to address the limitations of ISO 9126 concerning the abstract nature, incompleteness, and lack of clarity, as other authors have warned (Al-Kilidar et al., 2005) [8].

A summary of the definition of each character is presented in this section as follows.

When employed under specified conditions, functional suitability refers to the degree to which a product or system offers functions that meet stated and implied needs. This characteristic is composed of sub characteristics Functional Completeness, Functional Correctness, and Functional Appropriateness.

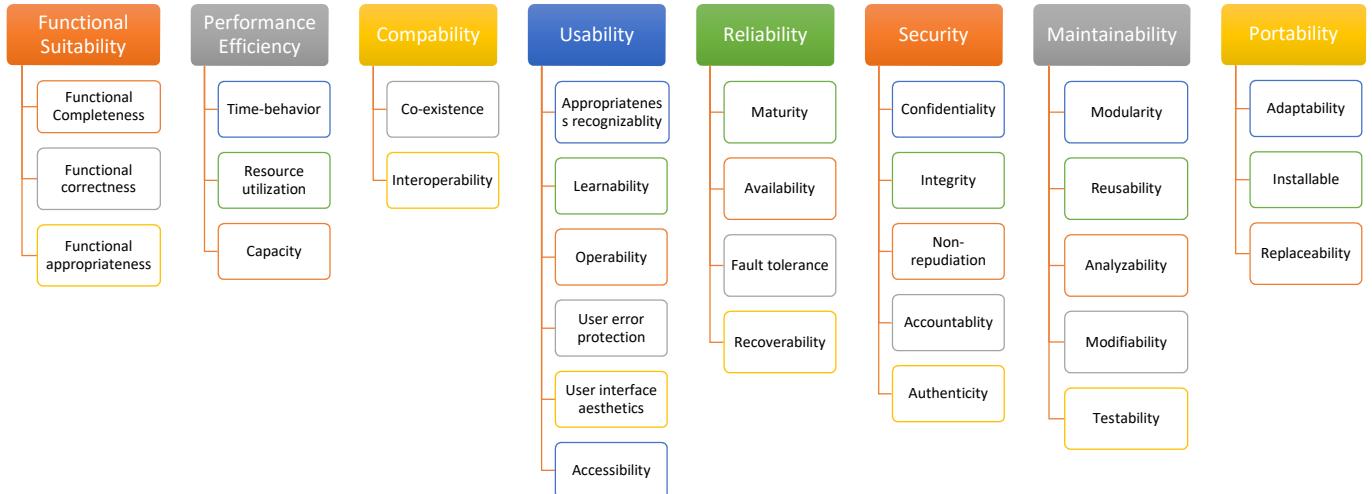


Fig. 1. Overview of ISO/IEC 25010 Product Quality Model characteristics.

When employed under specified conditions, functional suitability refers to the degree to which a product or system offers functions that meet stated and implied needs. This characteristic is composed of sub characteristics Functional Completeness, Functional Correctness, and Functional Appropriateness.

Performance efficiency is output relative to the number of resources used under the stated conditions. This feature consists of the sub-characteristics of time actions, use of resources, and ability.

Compatibility implies the degree to which a computer, system, or component may share and perform the necessary functions with other commodities, systems, or components to share the same hardware or software.

The degree of usability is to which specific users may use a product or system to reach specific goals with performance, efficiency, and satisfaction within a given context of use [10]. This feature consists of Appropriateness Identification, Learnability, User Error Protection, Operability, and Available Esthetics.

Reliability is the degree to which, under specified circumstances, the device, product, or portion performs specified functions for a specified period. This role consists of the maturity, availability, tolerance, and re-coverability sub-characteristics.

Security is how a product or system protects information and data. Persons or other products or systems have the degree of data access appropriate to their authorization category and standard. This feature consists of Anonymity, Integrity, Non-Repudiation, Openness, and Authenticity sub-features.

Maintainability refers to a product's or system's ability to improve, rectify, or adapt to changes in the environment and requirements. It also refers to the consistency and effectiveness with which a product or system can be adjusted. This function consists of the Modularity, Reusability, Analyzability, Modifiability, and Testability sub-characteristics.

Portability is a level of reliability that enables devices, items, or parts to switch from one hardware, software, or device to another to use the environment.

ISO 25010, for example, includes general elements for evaluating the quality of any sort of system or software product. As a result, existing software quality models should be carefully selected, changed, or extended for evaluating software and systems products.

IV. ERP QUALITY MANAGEMENT MODEL

Enterprise resource planning (ERP) is a business technique that allows firms to manage and connect their vital components. Many ERP software systems are crucial to businesses because they assist them in implementing resource planning by unifying all of the activities required to manage their businesses into a single system. Planning, buying, inventory, sales, marketing, finance, human resources, and other functions may be integrated with ERP software [11].

ERP software also makes it easier for different departments to communicate and exchange information with the rest of the organization. It can help a corporation become more self-aware by linking production, finance, distribution, and human resources.

We measured a level of importance based on the daily production of ERP, which defines which features are most essential and suitable for a user. A quantitative research method was used to collect data. As a survey was distributed to five companies, 50 volunteers answered the questionnaire to determine the relevance of different designations using the ERP system from their business perspective. The purpose was to find their views of the ERP system, including its interfaces by ISO 25010 of each position role. The overall respondent's results are scaled from 1 to 5 score and are shown in Fig. 2.

V. AIM OF THE PAPER

This paper aims to evaluate the defined ERP Management Application in terms of the criteria based on ISO 25010:2011 Software Quality Management. The research aims to examine the current structure in terms of:

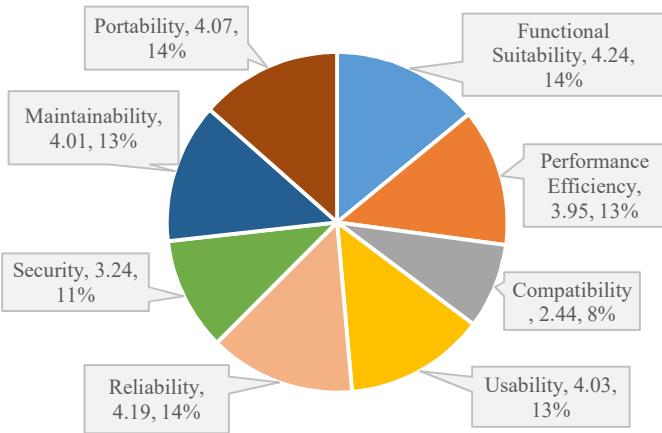


Fig. 2. ERP Quality Model Survey Results

1. Functional Suitability
2. Performance Efficiency
3. Compatibility
4. Usability
5. Reliability
6. Security
7. Maintainability and
8. Portability

The result section will discuss the study's findings of each characteristic of ISO 25010 and their applicability to ERP ventures. The first columns of those Tables show all the sub-characteristics suggested by ISO 25010. The second column introduces the total weight average of each quality, and the third column sets the degree of interpretation of each sub-characteristic concerning the ERP context. Significant or more significant quality attributes for ERP applications are highlighted subcontracting assets.

Finally, each quality part provides possible explanations that explain the findings. The remainder of the segment discusses a quality model of the eight subsections, addresses one of the ISO quality characteristics, and explores how they can be adapted in the ERP context.

VI. RESEARCH METHODS

A. Research Design

The purpose of the review is to analyze the Corporate Business Management ERP and use the descriptive test method for the systematic study of the design, production, and evaluation of educational programmers, processes, and products that must meet internal continuity and efficacy requirements. The study used information management parameters of ISO 25010:2011 that measure the software quality of systems as assessed by experts through testing. We created google form-based questions and shared them online with 30 regular users and 20 IT professionals from different departments that use ERP applications.

B. Research Methods

IT Specialists, Departmental heads, and IT authorities at 5 different corporate companies in Bangladesh have evaluated ERP Applications. In assessing the method, the respondents used the 5-point Likert scale, using the following indicators: 5 is Very Efficient, 4 – Efficient, 3 – Somewhat Effective, 2 – Ineffective, and 1 – Very Ineffective.

C. Analysis of Data

The study used a weighted mean to evaluate the developed android application according to the criteria adapted from ISO 25010:2011. The criteria were further analyzed using the sub-criteria of each characteristic. The results of the evaluation were interpreted using the indicators below:

Range	Scale Interpretation
1.00 – 1.49	Very Ineffective
1.50 – 2.49	Ineffective
2.50 – 3.49	Moderately Effective
3.50 – 4.49	Effective
4.50 – 5.00	Very Effective

The average of the scores were determined after the answers were collected from the questionnaire checklist and were used to assess the average response to the application evaluation based on the parameters of the ISO 25010:2011 survey tool. The method applied for the weighted average is as follows:

Formula:

$$\bar{x} = \frac{\sum fx}{N}$$

Where:

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

VII. RESULT ANALYSIS

The evaluation of Software Quality for Enterprise Resource Planning using ISO 25010 is presented and was evaluated in terms of each attribute. Here, we made a survey form filled by various departments of the 5 companies from where we can get the information of the software's quality from the user's perspective.

Table: I shows the respondents' evaluation on the Enterprise Resource Planning based on functionality and is explicitly determined by its Completeness, Correctness, and Appropriateness with a weighted mean of 4.18, 4.22, and 4.34, respectively. It has a verbal interpretation of Effective by the three categories of respondents and an overall weighted mean of 4.25 and is verbally interpreted as Effective.

TABLE I EVALUATION OF RESPONDENTS IN TERMS OF FUNCTIONALITY OF SAP ERP

Indicators	Total WM	VI
Functional completeness	4.18	Effective
Functional correctness	4.22	Effective
Functional appropriateness	4.34	Effective
Overall	4.25	Effective

The developed Enterprise Resource Planning evaluation had a weighted mean of 4.18 with a verbal interpretation of Effective. The correctness of the services should provide the correct results with the needed degree of precision had an overall weighted mean of 4.22 with a verbal interpretation of Effective. For appropriateness, the Services are designed to facilitate accomplishing specified tasks; more precisely, the

execution of a business process had a verbal interpretation of an effective and overall weighted mean of 4.34.

Table: II shows the respondents' evaluation of the Enterprise Resource Planning based on Performance Efficiency and is determined by three criteria: Time Behavior, Resource Utilization, and Capacity with a weighted mean of 4.06, 4.10, and 3.69, respectively. It has a verbal interpretation of Effective by the three categories of respondents and an overall weighted mean of 3.95 and is Verbally Interpreted as Effective.

TABLE II EVALUATION OF RESPONDENTS IN TERMS OF PERFORMANCE EFFICIENCY OF SAP ERP

Indicators	Total WM	VI
Time behavior	4.06	Effective
Resource utilization	4.10	Effective
Capacity	3.69	Effective
Overall	3.95	Effective

Table: III shows the respondents' evaluation of the ERP based on its compatibility and is determined by two criteria: Co-existence and Interoperability. Co-existence, has an evaluation of a weighted mean of 2.41 and interoperability has 2.47 as well with a verbal interpretation of Ineffective.

TABLE III EVALUATION OF RESPONDENTS IN TERMS OF COMPATIBILITY OF SAP ERP

Indicators	Total WM	VI
Co-existence	2.41	Ineffective
Interoperability	2.47	Ineffective
Overall	2.44	Ineffective

The study shows the Compatibility degree has an overall weighted mean of 2.44 with a Verbal Interpretation of Ineffective.

Table: IV shows the respondents' evaluation of the Enterprise Resource Planning based on its usability and is determined by six criteria: Appropriateness recognizability, Learnability, Operability, User Error Protection, and User Interface Aesthetics, and Accessibility.

Appropriateness recognizability, Learnability can be used to achieve the specified goal with a weighted mean of 3.57 and 3.95 with a verbal interpretation of Effective. Operability that allows exchange messages between ERP services has a weighted mean of 2.46 with a Verbal Interpretation Ineffective. User Error Protection referring to the degree to which ERP protects users against making errors, has an evaluation of 4.32 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 3.48 with a verbal interpretation of Moderately Effective. Accessibility has a weighted mean of 4.08 with a Verbal Interpretation Effective.

TABLE IV EVALUATION OF RESPONDENTS IN TERMS OF USABILITY OF SAP ERP

Indicators	Total WM	VI
Appropriateness recognizability	3.57	Effective
Learnability	3.95	Effective
Operability	2.46	Ineffective
User Error Protection	4.32	Effective
User Interface Aesthetics	3.48	Moderately Effective
Accessibility	4.08	Effective
Overall	3.65	Effective

Overall, the evaluation of the Usability criteria of the ERP from the respondents has an overall weighted mean of 3.65 and has a verbal interpretation of Effective, which shows that the system provided software Effectively.

Table: V shows the evaluation of the respondents on the Enterprise Resource Planning based on reliability. Maturity have a weighted mean of 4.24 with a verbal interpretation of Effective. Availability has a weighted mean of 4.65 and is Verbally Interpreted as Very Effective. Fault Tolerance services can create strategies that may be performed when a failure happens on some hardware or software has a weighted mean of 4.16 that Verbal Interpretation is Effective. Lastly, for the re-coverability criteria has a weighted mean of 4.51, which is verbally interpreted as Very Effective. Overall, the Reliability criteria has an average weighted mean of 4.39 with verbally Interpreted as Effective.

TABLE V EVALUATION OF RESPONDENTS IN TERMS OF RELIABILITY OF SAP ERP

Indicators	Total WM	VI
Maturity	4.24	Effective
Availability	4.65	Very Effective
Fault Tolerance	4.16	Effective
Re-coverability	4.51	Very Effective
Overall	4.39	Effective

Table: VI shows the respondents' evaluation of the Enterprise Resource Planning based on its security and is determined by five criteria: Confidentiality, Integrity, Non-Repudiation, Accountability, and Authenticity.

Confidentiality is defined as the degree to which the Enterprise Resource Planning ensures that data are accessible only to those authorized to have access has an evaluation of 3.65 with a verbal interpretation of Effective. Integrity, defined as the degree to which the Enterprise Resource Planning prevents unauthorized access to, or modification of, computer programs or data, got a weighted mean of 2.41 with a verbal interpretation of Ineffective. Non-Repudiation, accountability has a weighted mean of 3.37 and 3.18 with a verbal interpretation of Moderately Effective. Authenticity means the external service provider's identity should be authenticated got a weighted mean of 3.18 with a Verbal Interpretation of Moderately Effective.

TABLE VI EVALUATION OF RESPONDENTS IN TERMS OF SECURITY OF SAP ERP

Indicators	Total WM	VI
Confidentiality	3.65	Effective
Integrity	2.41	Ineffective
Non-repudiation	3.37	Moderately Effective
Accountability	3.18	Moderately Effective
Authenticity	2.49	Ineffective
Overall	3.02	Moderately Effective

Overall, the Security criteria of the Enterprise Resource Planning has an overall weighted mean of 3.02 from the above five criteria and has a verbal interpretation of Moderately Effective.

Table: VII shows the respondents' evaluation of the Enterprise Resource Planning based on its maintainability and is determined by five criteria: Modularity, Reusability, Analyzability, Modifiability, and Testability.

Modularity is defined as the degree to which the Enterprise Resource Planning system is composed of discrete components. A change to one part has minimal impact on other components. It has a weighted mean of 2.45 with a Verbal Interpretation of Ineffective. Reusability, Analyzability is weight 4.14 and 3.83 with a Verbal Interpretation of Effective.

TABLE VII EVALUATION OF RESPONDENTS IN TERMS OF MAINTAINABILITY OF SAP ERP

Indicators	Total WM	VI
Modularity	2.45	Ineffective
Reusability	4.14	Effective
Analyzability	3.83	Effective
Modifiability	3.41	Moderately Effective
Testability	4.08	Effective
Overall	3.58	Effective

Modifiability means that the ERP system can be effectively and efficiently modified without introducing defects or degrading existing product quality, which has a weighted mean of 3.41 with the Verbal Interpretation of Moderately Effective. Lastly, Testability is a degree of effectiveness and efficiency with which test criteria can be established for the ERP system, and tests can be performed to determine whether those criteria have been met. It is maintained 4.08 weighted mean with Verbal Interpretation of Effective. It has a verbal interpretation of Effective as 3.5, which shows that according to the respondents, the system provided Software Effectivity in terms of maintainability.

Table: VIII shows the respondents' evaluation of the ERP based on its portability and is determined by three criteria: Adaptability, Instability, and Replaceability. Adaptability, Instability has an evaluation of a weighted mean of 3.96, 4.02 with a verbal interpretation of Effective. Replaceability, which can replace another specified software product Enterprise Resource Planning for the same purpose in the same environment, has an evaluation of 3.40 with a verbal interpretation of Moderately Effective. It has an overall weighted mean of 3.87 with a Verbal Interpretation of Effective.

TABLE VIII EVALUATION OF RESPONDENTS IN TERMS OF PORTABILITY OF SAP ERP

Indicators	Total WM	VI
Adaptability	3.96	Effective
Instability	4.02	Effective
Replaceability	3.40	Moderately Effective
Overall	3.87	Effective

VIII. CONCLUSION

With the continuous development and progress of the times, the software quality standard has made significant contributions to software engineering development and improvement. The high-quality deposit of software needs in South Asia and Bangladesh by scientific researchers continuously refine and improve software quality standards. We need to develop software-testing methods more, create automated software testing tools, and continually improve the testing process management mechanism.

However, the respondents encountered problems mainly regarding lack of Compatibility and Security design inconsistencies. So, enhancements can be done to solve the problems faced by respondents in using the ERP, such as

adding features and improving its user interface aesthetics with the focus of these new characteristics.

IX. FUTURE WORKS

The ISO 25010 model is still not being used much in the research; researchers are in the open call to conduct studies and create their models using ISO 25010 and other frameworks. The researcher also faces problems using ISO 25010 or its features, such as security, compatibility to solve the issues. Results of commerce systems studies are not applicable in non-commerce systems; products in the developed countries are not relevant in the least developed countries. The software development companies need future research in this field because there is a lack of studies and frameworks; most of the reviews are targeted health and business domains.

REFERENCES

- [1] Fadhel, I.E.I., Idrus, S.Z.B.S., Abdullah, M.S.Y., Ibrahim, A.A.E.A., Omar, M. and Khred, A., 2020, April. A New Perspective of Web-Based Systems Quality Engineering Measure by Using Software Engineering Theory (ISO 25010): An Initial Study. In *Journal of Physics: Conference Series* (Vol. 1529, No. 2, p. 022004). IOP Publishing.
- [2] Manglapuz, S.J.R. and Lacatan, L.L., Academic Management Android Application For Student Performance Analytics: A Comprehensive Evaluation Using Iso 25010: 2011.
- [3] Izzatillah, M., 2019. Quality Measurement of Transportation Service Application GO-JEK using ISO 25010 Quality Model. *Simetris: Jurnal Teknik Mesin, Elektro dan Ilmu Komputer*, 10(1), pp.233-242.
- [4] Mukti, S.K., Tripathi, P. and Rawani, A.M., 2013. A Framework for Investigating the ERP System Quality from Users Point of View in Indian Industries. *Journal of Economics, Business and Management*, 1(4).
- [5] França, J.M. and Soares, M.S., 2015. SOAQM: Quality Model for SOA Applications based on ISO 25010. In *ICEIS* (2) (pp. 60-70).
- [6] Peters, E. and Aggrey, G.K., An ISO 25010 Based Quality Model for ERP Systems.
- [7] 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>
- [8] Al-Kilidar, Hiyam & Cox, K. & Kitchenham, B.. (2005). The use and usefulness of the ISO/IEC 9126 quality standard. International Symposium on Empirical Software Engineering. 7 pp.- 10.1109/ISESE.2005.1541821.
- [9] Amin, F.M. and Salih, N.K., 2017. New model to achieve software quality assurance in e-learning application. *International Journal of Computer Science Issues (IJCSI)*, 14(3), p.65.
- [10] O. LaBarre, 2021. Enterprise Resource Planning (ERP) S. Anderson, ed. Investopedia. Available at: <https://www.investopedia.com/terms/e/erp.asp> [Accessed April 1, 2021].
- [11] Peters, E., & Aggrey, G. K. (2019a, March). "Evaluating the Effectiveness of ERP Systems in HEIs: A Proposed Analytic Framework". In 2019 International Conference on Computing, Computational Modelling and Applications (ICCMCA) (pp. 40-45). IEEE.
- [12] Importance of Big Data Analytics (n.d), Retrieved January 30, 2018, from https://www.sas.com/en_us/insights/analytics/big-data-analytics.html#
- [13] Liu, M. and Huang Y. (2016) "Data Science for Education", Retrieved November 9, 2017, from <http://www.learnyst.com/assessing-student-learning>
- [14] França, J.M. and Soares, M.S., 2015. SOAQM: Quality Model for SOA Applications based on ISO 25010. In *ICEIS* (2) (pp. 60-70).
- [15] Karnouskos, S., Sinha, R., Leitão, P., Ribeiro, L. and Strasser, T.I., 2018, July. Assessing the integration of software agents and industrial automation systems with ISO/IEC 25010. In 2018 IEEE 16th International Conference on Industrial Informatics (INDIN) (pp. 61-66). IEEE.