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Performance Portability, Reliability, Usability, and Maintainability of PT. ASDP Indonesia Ferry's E-Procurement Website Based on ISO/IEC 25010 Standards)

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Abstract — Website quality influences customer satisfaction, building a positive reputation, time, cost, and process efficiency. The importance of a website for a company's professionalism means that website quality assurance is crucial. A comprehensive software quality assurance standard is ISO/IEC 25010. This international standard serves as the basis for measuring the quality of web-based software. The software product quality model includes eight characteristics: functional suitability, performance efficiency, compatibility, security, usability, reliability, portability, and maintainability. The E-Procurement website is the operational medium for PT. ASDP Indonesia Ferry's digital business. The company's efforts to ensure website quality have been measured using the ISO/IEC 25010 standard, which is limited to four characteristics: functional suitability, performance efficiency, compatibility, and security. This study proposes measuring website performance by examining four other characteristics: usability, reliability, portability, and maintainability. Performance measurement was carried out using the Mean Opinion Score (MOS) method and the WAPT test tool. The results showed that the usability characteristic reached 83%, meaning the system is simple enough to be used and understood by users. The website's reliability proved stable and capable of handling access loads without failure, according to WAPT testing. In terms of maintainability, the use of the component-based Angular framework simplifies system development and maintenance. Portability testing showed the website experienced no significant issues across browsers and operating systems. These four characteristics demonstrate that the E-Procurement website is easy to use, highly reliable, easy to maintain, and compatible with various platforms.

Keywords – E-Procurement, ISO/IEC 25010, Software Quality Assurance, MOS, WAPT.

I. INTRODUCTION

Information technology has brought major changes to human life, including the procurement process of goods and services in companies. One form of this transformation is the implementation of E-Procurement, namely an information technology-based procurement system for goods and services that allows transactions to be carried out electronically with the aim of increasing efficiency, transparency, and accountability. PT ASDP Indonesia Ferry (Persero) as a state-owned company engaged in the field of marine transportation adopted this system to support the procurement process in all its branches. Given the wide scope of ASDP's services, the existence of an E-Procurement system is very important to ensure the company's operational activities continue to run smoothly. Therefore, software quality must be maintained. Because the quality of a software affects customer satisfaction [1]. Websites are an example of software. A quality and reliable website will be able to help provide optimal and efficient services to users [2].

However, the implementation of this system still presents a number of issues. These include a suboptimal interface on mobile devices, slow access speeds, and security vulnerabilities due to the use of outdated components. This situation highlights the gap between ideal software quality standards and the performance of the existing system.

Good software quality contributes significantly to the success of implementation in a company [3]. The company's efforts to ensure website quality have been measured through the E-Procurement quality assessment of PT ASDP Indonesia Ferry. The measurement, based on the ISO/IEC 25010 standard, uses four characteristics: functional suitability, performance efficiency, compatibility, and security. This study proposes how to measure the performance of PT ASDP In-

donesia Ferry's E-Procurement website by examining four other characteristics, namely usability, reliability, portability, and maintainability based on the ISO/IEC 25010 Standard . The benefit is that, from an academic perspective, this research contributes to the development of science in the fields of software engineering, information technology, and information systems [4]. Meanwhile, for PT ASDP, this research can provide valuable input for improving website quality

II. RESEARCH METHOD

The achievement of the research objectives requires a structured method so that each stage can be implemented systematically and interconnectedly. This research follows a workflow that begins with problem identification and continues through to recommendations for improvement, involving data collection, system testing, and performance analysis. The flowchart in Fig. 1 illustrates the steps taken in this investigation.

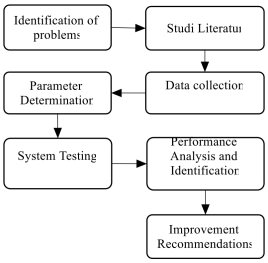


Fig. 1. Research method.

This research method is carried out in several stages. Each stage is explained in the following.

1) Identification of problems The first step begins with identifying problems in the characteristics of usability, reliability, portability, and maintainability on the PT. The ASDP E-Procurement website is then formulated as the main focus of the research.
2) Literature review At this stage, explore various sources such as journals, websites, and supporting documents to understand relevant theories, especially those related to measuring website quality based on the ISO/IEC 25010 standard.
3) Data collection Data collection was conducted through direct observation of the website, review of system documentation, and distribution of questionnaires to internal users. This was done to ensure that the assessment was objective and reflected the actual situation.
4) Parameter determination Next, determine four main characteristics which include usability, reliability, portability, and maintainability identified to measure their performance based on the ISO/IEC 25010 standard.
5) System testing This website was tested using the MOS method for usability testing and the WAPT tool for reliability testing. Maintainability testing was conducted by observing features and evaluating available technical documentation. Portability testing measured the system's flexibility when running on various platforms.
6) Performance Analysis and Identification Based on the test results, an analysis is then carried out to determine which parts are performing well and which still need improvement.
7) Recommendations for Improvement The final stage is to develop recommendations for improvements that can be implemented to optimize the system in terms of usability, reliability, portability, and maintainability.

III. RESULTS

This study successfully measured the performance quality of PT. ASDP Indonesia Ferry's E-Procurement website software using the ISO/IEC 25010 standard. The measurement results were carried out through the following stages:

A. Identification of problems

The PT. E-Procurement website. ASDP Indonesia Ferry (Persero) plays a crucial role in streamlining the digital procurement process for goods and services. However, to date, no one has assessed the quality of the website in terms of usability, reliability, portability, and maintainability. Given ASDP's extensive operations, the system is required to operate optimally under various conditions. Therefore, a comprehensive website quality assessment using the ISO/IEC 25010 standard is necessary to determine whether the system meets the expected standards and what needs to be improved. Several issues were identified with the PT. ASDP E-Procurement website. The usability of the interface is suboptimal, especially on mobile devices. Reliability was poor for access speeds. Security maintenance vulnerabilities were identified as a result of the use of outdated components. Furthermore, while no bugs were found in portability, more responsive and modern features are needed.

B. Literature review

A literature review was conducted to improve the understanding of system quality measurement. According to the IEEE, Software Quality Assurance (SQA) is a systematic and planned action. This is done to ensure that the goods or products meet predetermined technical requirements. This activity is designed for product evaluation. The product is currently in development or production. Testing is necessary to determine whether the website is running as expected [5].

SQA is also defined as a series of systematic processes aimed at ensuring that software products conform to predetermined quality standards. The implementation of SQA encompasses quality monitoring activities throughout the Software Development Life

Cycle (SDLC), from the planning stage to implementation. SQA extends beyond final testing. Properly implemented SQA can detect software defects and bugs early, reducing repair costs and ultimately improving end-user satisfaction [6].

The ISO/IEC 25010 standard is part of Systems and Software Engineering, or also called Systems and Software Quality Requirements and Evaluation (SQuaRE). This standard is an evolution of ISO/IEC 9126. This standard officially replaces ISO/IEC 9126:2001 (ISO and IEC, 2011). ISO/IEC 25010 was chosen because it is the most comprehensive software quality measurement standard compared to previous versions and other standards [7]. The ISO/IEC 25010 standard has two types of categories, namely Product Quality and Quality in Use [8]. In the product quality model according to ISO/IEC 25010, it consists of eight characteristics. Aspects of capability, applications to provide functions according to user needs. 2) Aspects of performance efficiency, which means the application can operate well under workload conditions. 3) Aspects of compatibility, that is, the application can function well with other components. 4) Aspects of ease of use, meaning the application is easy to use. 5) The fifth aspect of reliability, is the ability of the application to perform functions with a low error rate. 6) Security aspects, that the application can protect data and information from unauthorized persons. 7) Maintenance aspects, that the application can be developed and repaired at low cost. 8) Portability aspects, that the application can be used on various different platforms [9], [10]. This standard provides guidelines for determining, measuring, and assessing software quality based on a set of relevant quality criteria.

E-Procurement is a term that refers to the electronic procurement of goods and services conducted through information technology and electronic transactions in accordance with laws and regulations. E-tendering or e-purchasing is a method of procuring goods and services using the Internet technology [11]. The E-Procurement website can be accessed at https://eproc.asdp.id/

Various previous studies include the first study that tested the quality of the Halodoc application using the ISO/IEC 25010:2011 model. Software quality assurance includes 8 characteristics and 29 subcharacteristics. The characteristics of Functional Suitability, Compatibility, Reliability, and Ease of Maintenance received a maximum score of 5. Performance Efficiency received a score of 4,886, Usability received a score of 4, Security received a score of 3,549, Portability received a score of 3,718. The total results of the Halodoc application assessment received a score of 4,515 out of a maximum score of 5 [12].

The second study of the quality testing of the digital library of SMK Darul Mustofa, Bangkalan, used 4 characteristics of the international standard ISO 25010 testing, namely functional suitability, performance efficiency, portability and usability. The test results on the functional suitability aspect were stated as 100% very good for all functions provided. This system has an average response time of 1.017 s, which is very good in the performance efficiency aspect test. This system was tested using 3 different browsers in the portability test which was stated as 100% very good. The usability test of this system was stated as 95 which means that it is very suitable to be operated in schools [13].

The third study evaluated the Alumni Information Management System (AIMS), developed to improve alumni tracking, career services, and institutional engagement, using the ISO/IEC 25010:2015 software quality model. The testing covered 8 characteristics: Functional Suitability, Performance Efficiency, Compatibility, Usability, Performance Efficiency, Security, Maintainability, and Portability. The results showed that AIMS was rated “Very High” on all the characteristics assessed, with an overall average score of 4.68 indicating strong system performance and user satisfaction [14]. The Mean Opinion Score (MOS) is a way to evaluate the performance and quality of applications built from the user’s perspective to help evaluate user satisfaction with various aspects of the system, providing an indication of the performance and quality of the system from the user’s perspective. This testing process is carried out through a questionnaire involving users. Equation (1) is used to process the questionnaire data using MOS [15].

$$P = \frac{f}{N} \times 100 \tag{1}$$

where P represents the percentage score sought, f represents the score obtained by the validator, and N represents the maximum percentage of scores. The percentage score results are then compared in Table 1. This table is the standard for scoring interpretation. The standard for scoring interpretation is presented in Table 1 [2], [9].

Table 1. Standard score interpretation

Percentage	Interpretation
0% - 20%	Totally Unworthy
21% - 40%	Not feasible
41% - 60%	Quite Decent
61% - 80%	Worthy
81% - 100%	Very Worthy

Web Application Load, Stress, and Performance Testing (WAPT), which means an application to perform load tests, stress tests, and performance tests. Website performance [2], [16], [17]. Because websites have fluctuating visitor numbers every day, this testing is used to determine the server’s performance and speed in handling traffic, as well as to test stress levels to see if the server experiences stress or problems when the website is visited by a large number of users.

C. Data collection

Data collection in this study was carried out using several methods to obtain accurate and relevant information on the quality of PT. ASDP Indonesia Ferry's e-Procurement website. The methods used included direct observation, interviews, and documentation studies. Direct observation was conducted to understand the usage flow of the system and the available features. The interviews included discussions and questions and answers during user interactions with the website. Meanwhile, documentation studies were conducted referring to relevant references, such as scientific journals, the ISO/IEC 25010 standard, and the technical documentation of the system used.

D. Parameter determination

The parameter selection process to measure the quality of the website focuses on the fundamental aspects of the website. The goal is to ensure that the results of the evaluation are relevant and meet established quality goals [10].

The evaluation parameters in this study were determined based on four software quality characteristics based on the ISO/IEC 25010 standard. Each characteristic serves as the basis for assessing the overall quality of PT. ASDP Indonesia Ferry's E-Procurement website, both technically and from a user experience perspective. The parameters determined are:

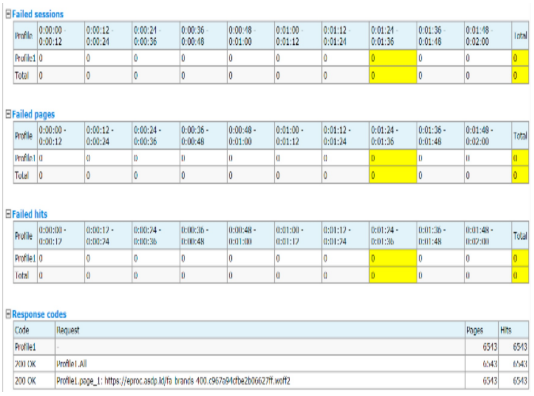
1) Usability, testing the user's level of ease in accessing, understanding, and using the system. , assesses the reliability of the system in carrying out its functions consistently without interruption or fatal errors.
2) Maintenanceability, assessing ease of repair, modification, or further development of the system as needed.
3) Portability measures the flexibility of a system when running on multiple platforms without significant changes in performance or appearance.

E. System testing

Performance tests were conducted to measure the quality of PT. ASDP Indonesia Ferry's E-Procurement website based on the four characteristics of ISO/IEC 25010. This testing used a questionnaire method and the use of tools to obtain objective and measurable data.

1) Usability

Usability testing was conducted using a questionnaire using the Mean Opinion Score (MOS) approach and a Likert scale. This testing was conducted to determine whether the website's functions met user needs. Several components were presented in the form of questions posed to respondents, who then had to assess whether the website functioned according to their needs. The results of the usability test with 34 respondents are presented in Table 2.


Failed sessions

Profile	0:00:00 - 0:00:12	0:00:12 - 0:00:24	0:00:24 - 0:00:36	0:00:36 - 0:00:48	0:00:48 - 0:01:00	0:01:00 - 0:01:12	0:01:12 - 0:01:24	0:01:24 - 0:01:36	0:01:36 - 0:01:48	0:01:48 - 0:02:00	Total
Profile1	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0

Failed pages

Profile	0:00:00 - 0:00:12	0:00:12 - 0:00:24	0:00:24 - 0:00:36	0:00:36 - 0:00:48	0:00:48 - 0:01:00	0:01:00 - 0:01:12	0:01:12 - 0:01:24	0:01:24 - 0:01:36	0:01:36 - 0:01:48	0:01:48 - 0:02:00	Total
Profile1	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0

Failed hits

Profile	0:00:00 - 0:00:17	0:00:17 - 0:00:34	0:00:34 - 0:00:51	0:00:51 - 0:01:08	0:01:08 - 0:01:25	0:01:25 - 0:01:42	0:01:42 - 0:01:59	0:01:59 - 0:02:16	0:02:16 - 0:02:33	0:02:33 - 0:02:50	Total
Profile1	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0

Response codes

Code	Request	Pages	Hits
Profile1		6543	6543
200 OK	Profile1.All	6543	6543
200 OK	Profile1.page_1: https://eproc.asdp.id/fo brands 400.c967b94cfbe2b06627ff.woff2	6543	6543

Fig. 2. WAPT Test Results for the June 2025 Period

Based on the answers to the questionnaire given by the user, it was then implemented in eq. (1). The calculation results show a P value of 83% so it can be said that the PT. ASDP Indonesia Ferry E-Procurement website is in accordance with the ISO/IEC 25010 standard or is included in the very suitable interpretation category in the usability test.

2) Reliability

This characteristic tests the stability of the system= during use, determining whether the system frequently experiences errors. This test uses the WAPT application. The results of the system performance test are shown in Fig. 2. Testing the E-procurement website demonstrated excellent system performance.

There were no failures in user session access, either page access or data requests. The system handled user traffic smoothly and each request was executed smoothly and efficiently. There were 6,543 successful page accesses and 6,543 hits or requests sent to the server. This indicates that there are no missed or failed requests. A 200 OK status was displayed in all server responses, indicating that the system responded to all requests correctly. In general, these findings indicate that the system is running smoothly, responsively, and capable of handling user load well. This system is suitable for use in a real-world operational environment, as there were no technical errors.

3) Maintainability

This testing was conducted to determine whether ASDP E-Procurement is easily modified to allow maintenance, improvements, and enhancements to features. ASDP e-Procurement was developed using the Angular framework, which is TypeScript-based and supports component architecture and modularization. Angular utilizes the concept of component-based architecture and logic separation through services, which facilitates code management and further development [18]. After the application was launched in June 2024, the E-Procurement application underwent routine monthly maintenance to improve website reliability, indicating that the project architecture is easy to maintain.

Table 2. Results of the questionnaire

Question Mark	Mark				
	5	4	3	2	1
1. Is the navigation on the main menu on the homepage easy to use for new users?	20	13	1	0	0
2. What is the level of clarity of the information presented in each category in the main menu, such as procurement of goods or services?	9	19	2	4	0
3. Is there a guide or FAQ that helps users understand how to use the E-Procurement platform?	10	19	4	1	0
4. How responsive is this website when accessed via mobile devices compared to desktop?	8	19	6	1	0
5. How does the user (vendor/provider) registration system work on this website? Is it easy to follow and does it have sufficient security validation?	14	17	2	1	0
6. Does the search feature work well to find specific documents or information quickly?	17	12	4	1	0
7. What is the notification mechanism for the latest information, such as tender or auction announcements?	11	14	7	2	0
8. Is the process of uploading documents through this platform secure and is there clear guidance for each step?	10	15	8	1	0
9. How fast is the response rate of the contact service or technical support features provided on this website?	12	12	7	3	0
10. Are there any reports or statistics related to E-Procurement activities that users can access, for example data transparency or procurement summaries?	16	13	4	1	0
Amount	127	153	45	15	0
Amount × Value	635	612	135	30	0
Total Value	1,412				

Table 3. Portability test results

Browser	**Operating System**	**Device**	**Results**
Google Chrome	Windows 10	ThinkPad L13	Website is running fine, looks perfect.
Google Chrome	MacOS	Macbook Air M1	Website is running fine, looks perfect.
Mozilla Firefox	Windows 10	ThinkPad L13	Compatible, normal appearance and function.
Mozilla Firefox	MacOS	Macbook Air M1	Compatible, normal appearance and function.
Microsoft Edge	Windows 10	ThinkPad L13	All elements run smoothly.
Microsoft Edge	MacOS	Macbook Air M1	All elements run smoothly.
Opera	Windows 10	ThinkPad L13	Responsive website, can be used like on other browsers.
Opera	MacOS	Macbook Air M1	This website is responsive, can be accessed well with Opera browser.
Internet Explorer	Windows 10	ThinkPad L13	The website is accessible, but the animation is not optimal (limited by IE capabilities).
Google Chrome	Linux	ThinkPad t480s	Website consistency and browser compatibility.
Safari	MacOS	Macbook Air M1	Website consistency and compatibility across browsers.

4) Portability

This parameter was tested through feature observation and evaluation of available technical documentation.

The E-Procurement website was tested for portability using six browsers: Google Chrome, Firefox, Microsoft Edge, Opera, Safari, and Internet Explorer. The website was also tested using three operating systems: Windows 10, macOS, and Linux. Three mobile devices: a ThinkPad L13, a Macbook Air M1, and a Thinkpad t480s were used. The results showed no bugs or compatibility issues, thus categorizing the portability aspect as very good, as shown in Table 3. The findings from this assessment can be used by the company as an empirical basis for formulating prospective improvement policy recommendations [19].

F. Performance analysis and identification

Next, the test results are analyzed and system performance is identified. This stage is carried out by comparing the test results for each parameter with the ISO/IEC 25010 assessment standard. This process includes:

1) Usability Analysis: Based on the results of the questionnaire completed by 34 respondents using the MOS method, a score of 1,412 was obtained out of a maximum total score of 1,700, equivalent to 83%. Performance identification: Referring to Table 1, it shows that this website is easy to use and very feasible to implement.
2) Reliability Analysis: Testing using WAPT shows that the system is quite stable in handling access loads. Performance identification: No errors or downtime were found during testing, indicating that the system is reliable in performing its functions.
3) Maintainability Analysis: The system is built using the modular Angular framework, making it easy to maintain and develop. Performance identification: The component architecture used supports easy system modification and updates.
4) Portability Analysis: Testing was conducted on six major browsers and the results showed that the system was running smoothly. Performance

identification: No bugs or compatibility issues were found, so portability was categorized as very good.

G. Recommendations for improvement

Based on the test results, no significant errors were found in the PT. ASDP Indonesia Ferry E-Procurement website . However, improvements are needed to achieve a higher and more sustainable level of quality in accordance with ISO/IEC 25010. The recommendations for improvement are as follows:

1) Usability improvement exceeds 83% score with UI/UX design improvements using tools such as figma, testing using other methods such as System Usability Scale (SUS) which focuses on user satisfaction.
2) Reliability testing is necessary to ensure the system remains stable and crash-free, using simulations of system failure scenarios, such as internet connection failures, failed data input, or DDoS attacks.
3) In terms of maintainability, It is recommended that regular code audits be combined with tools such as ESLint to maintain code quality.
4) Expand website testing coverage across multiple platforms with holistic risk-based testing for advanced portability testing. Create extreme scenarios, such as testing on low-spec devices. Tools such as Selenium or BrowserStack are available.

Implementation of these recommendations is expected to optimize system performance and ensure compliance with international software quality standards.

IV. CONCLUSSION

This study successfully tested the quality of PT. ASDP Indonesia Ferry's E-Procurement website with an emphasis on usability, reliability, maintainability, and portability, referring to the ISO/IEC 25010 standard. The test results showed that the website scored 83% on the usability scale. In other words, this system is quite easy for users to use and understand. Reliability testing using WAPT showed that the website is stable and able to handle a large number of requests without experiencing any problems. This indicates that the system is ready to support business operations. Maintainability testing, the use of the Angular framework with a component-based architecture makes the system easier to use, better, and more adaptive to changing needs over time. In terms of portability, a well-designed website can function well on various browsers and operating systems without problems, so that user accessibility is not affected.

In general, this study concludes that the PT ASDP Indonesia Ferry e-Procurement website has met four software quality criteria in terms of ease of use, system reliability, ease of maintenance, and cross-platform compatibility.

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