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QUALITY ANALYSIS OF INTERNET OF THINGS-BASED INVENTORY AND LENDING SYSTEM USING ISO/IEC 25010

Mursyidin[1*], Sadrina[1], Fitrah Qadri[1]
[1]Electrical Engineering Education, Universitas Islam Negeri Ar-Raniry Banda Aceh
email: *mursyidin@ar-raniry.ac.id

Abstract: Learning media as a supporting tool for the teaching and learning process. For its use, it is borrowed from the Academic Division and the study program. Often lost and not properly recorded are problems that are often experienced. Inventory management allows proper recording of assets owned. The availability of well-managed goods ensures timely academic services. This research aims to design a multisensor-based inventory and lending system that can improve the efficiency, transparency, and competitiveness of the organization. the method used is prototype with Evaluation of the prototype interface using heuristic evaluation, system quality testing using ISO 25010. Evaluation results obtained that the Internet of Things-based inventory and lending application has been well designed and meets the heuristic criteria. system quality test results have met stakeholder expectations, especially in terms of innovation and competitive advantage and provide satisfaction to users.

Keywords: inventory and lending system; ISO 25010; internet of things

Abstrak: Media pembelajaran sebagai alat pendukung terjadinya proses belajar mengajar. Untuk penggunaannya meminjam pakai dari Bidang Akademik maupun program studi. Sering hilang dan tidak tercatat dengan baik menjadi permasalahan yang sering di alami. Pengelolaan inventaris memungkinkan pencatatan yang tepat terhadap aset yang dimiliki. Ketersediaan barang yang terkelola dengan baik memastikan pelayanan akademik yang tepat waktu. Penelitian ini bertujuan untuk merancang sistem inventaris dan peminjaman barang berbasis multisensor yang dapat meningkatkan efisiensi, transparansi, dan daya saing organisasi. metode yang digunakan adalah prototype dengan Evaluasi antarmuka prototype menggunakan evaluasi heuristic, pengujian kualitas sistem menggunakan ISO 25010. Hasil evaluasi Evaluasi didapat bahwa aplikasi inventaris dan peminjaman barang berbasis Internet of Things telah dirancang dengan baik dan memenuhi kriteria-kriteria heuristic. hasil uji kualitas sistem telah memenuhi harapan stakeholder, terutama dalam hal inovasi dan keunggulan kompetitif serta memberikan kepuasan kepada pengguna.

Kata kunci: sistem inventaris dan peminjman; ISO 25010; internet of things

INTRODUCTION

Learning media functions as an educational tool that supports the teaching-learning process. the teaching and learning process will be easier when assisted by the use of appropriate learning media [1] [2]. Learning media are usually provided by the faculty or study program. Course instructors and students can borrow the equipment. Some of the learning media equipment

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that can be borrowed are LCD projectors, audio devices, and others [3].

To make a loan, the borrower must come to the academic department of the faculty or study program to check the availability of the media. if the media is available, you can borrow it.

At this time, borrowing records are still using paper [4], the borrower must write his identity in the book that has been provided and leave his identity card at the academic department. this is deemed less effective and less efficient. therefore a technology-based lending system is needed that can facilitate borrowing records [5]. One of the technologies that can answer this problem is Internet of Things technology [6].

Internet of Things technology can be utilized in inventory and lending systems to provide up-to-date information [7]. According to [8] The internet of things is a development that can optimize human life with the help of sensors and artificial intelligence that uses the internet network to execute commands, and connects humans with devices and devices with devices.

The purpose of this research is to determine the quality of the Internet of Things-based inventory and lending system using the ISO 25010 standard [9]. The implementation of an IoT-based inventory and lending system can simplify the process by automating inventory tracking and providing real-time updates on the availability of educational media [10]. This will improve efficiency and user experience in academic environments.

Studies related to the application of IoT in inventory and lending of goods such as research [10] which found that libraries that adopt IoT can increase efficiency, improve service quality, and facilitate collection access, and the application of IoT can be done for inventory management identification, user tracking, and automatic notifications.

Research [11] using IoT technology, particularly through the application of RFID, shows great potential in improving the lifecycle management of electric energy meters. This system not only solves existing problems but also contributes to operational efficiency and better information management within electricity supply companies.

Research [12] which shows that the application of RFID and IoT technologies in library management can bring many benefits, including better operational efficiency and improved user experience.

Research combining information technology and sensor devices, IoT creates large networks that enable interconnection between people, machines, and goods [13]. This article concludes that social connections between firms and banks play a significant role in influencing firms' financial behavior, particularly in the context of China's IoT industry.

METHOD

The research method used refers to the characteristics possessed by ISO / IEC 25010 which is adjusted to the opinion of Pressman and Olsina to assess the quality of the website. the object to be studied is an Internet of Things-based inventory and lending system that is applied to a college or academic.

Quality testing of the Internet of Things-based inventory and lending

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system uses the ISO / IEC 25010 standard which is adjusted to the opinions of Pressman and Olsina. This test will involve an assessment of software quality characteristics consisting of several characteristics such as Performance Efficiency, Reliability, Security, and Portability.

1. Efficiency

Assessment of RFID card reading speed is done by testing the system's ability to process data effectively. Assessment of page loading speed and system response. Performed using the GTMetrix tool.

1. Reliability

Reliability Testing is essential to ensure that IoT-based inventory systems consistently perform their intended functions under defined conditions. This can be achieved by applying load testing methodologies and observing the behavior of the system during unexpected loads or failures. to test the reliability of the system using Gatling, ensuring that the system can maintain its performance and availability during peak usage times and possible disruptions, thus providing a smooth loaning experience for users in an academic environment.

2. Security

The security of an IoT-based inventory and lending system is critical, as it involves managing sensitive user data, including personal identification and lending records. To evaluate security, penetration testing and vulnerability scanning tools using Qualys Web Application Scanner will be used to identify potential threats and weaknesses in the system, ensuring that sensitive data is protected from unauthorized access and irregularities.

3. Facilities

Usability testing is done by opening the website on desktop and mobile based. This test analyzes how well the system can adapt to various platforms and devices, thus ensuring a consistent user experience regardless of the mode of access used, be it through a desktop or a different mobile device [14].

Testing was conducted using the PageSpeed Insights tool, with the aim of assessing the extent to which the system can function effectively in different contexts, thereby increasing flexibility and accessibility for users in an Internet of Things-based lending and inventory system [8].

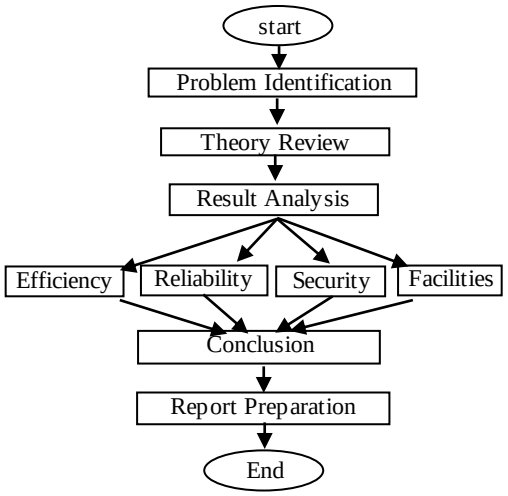

Figure 1. Research Flow

This system quality test is also based on the value of the answers to the ISO / IEC 25010 Standard questionnaire distributed to respondents. To measure the quality of the system using the equation (1) and equations (2) [15].

$$Y=p/Qx100 \quad (1)$$
$$Q=RxSx5 \quad (2)$$

Description:
Y = Rated variables.
p = Total Score.
Q = Maximum Score.

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R = total responden.
S = Total Questions.
5 = Highest score on the questionnaire.

The results of the calculation of each variable are then interpreted with the score criteria table. The score interpretation is presented in Table 2.

Table 1. Score Interpretation Criteria

Score	Description
0-20	not very good
21-40	Not good
41-60	good enough
60-80	Good
81-100	very good

RESULTS AND DISCUSSION

The system is equipped with hardware components and software components. The hardware components are assembled and inserted into a box while the software components are in the form of a website interface. Both hardware and software components are created in a form and interface that makes it easy for users to manage inventory and borrowing of goods.

Figure 2. Hardware Interface Design Results

The results of this Internet of Things-based system software design [16] The system built has the ability to provide real-time information regarding the availability of items in inventory, and also the ability to automatically record the borrowing process through sensor detection. In addition, this system also implements a method that focuses on user needs to maximize usability value, so that users can feel the ease of borrowing transactions and more efficient inventory management [17].

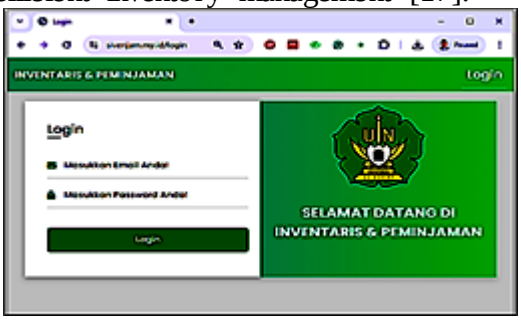

Figure 3. Login Page

On the item loan page, users can see a list of available items and can borrow items according to their needs. The data displayed on the item borrowing page is the data from the RFID scan on the hardware. There are two RFIDs that need to be scanned when borrowing goods, namely the user's RFID and the RFID label attached to the item.

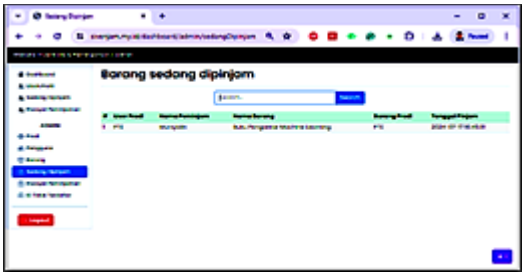

Figure 4. Borrowing Page

The results of efficiency testing towards the optimal value of 86 from a maximum score of 150. these findings mean that the system has been able to carry out the activity process efficiently and has good responsive ness. The efficiency and good responsiveness obtained by this system is based on the

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implementation of a system that uses the latest technology, as stated by Julianto Simatupang and Muhammad in their research, that the creation of a web-based final project information system can facilitate and accelerate the submission of student final assignments [18].

Table 2. Quality test Value

Variabel	Question Value	Quality	
		Maks Score	Value
Efficiency	22	150	86
	22		
	21		
	18		
	24		
	22		
Reliability	19	150	83
	24		
	21		
	19		
	21		
	21		
Security	22	125	90
	23		
	24		
	21		
	23		
Facilities	25	75	100
	25		
	25		

Based on the Reliability Variable Quality test, it gets a score of 83 out of a maximum score of 150. these findings mean that the inventory and lending system has a good level of reliability. This result is in line with research [19] which explains that the reliability variable is an important indicator in assessing the quality of information systems. This finding is in accordance with the results of research [20] which states that the reliability variable has a positive effect on information system user satisfaction.

Quality testing is also carried out using the Gatling Tool. With the tests obtained the results of the error ratio value of 100%, with a total of 900 reques, as many virtual users with a response time of 10 seconds. this shows that the system can maintain its performance well even under peak load conditions. The test results show that the reliability of the system is also high, with the ability to recover from interruptions without data loss, which is obtained from load testing using Gatling.

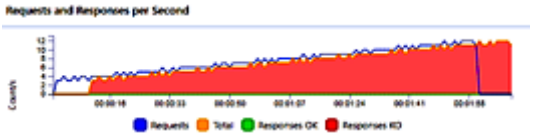

Figure 5. Gatling Test Results

Based on the Security Variable Quality test, it gets a score of 90 out of a maximum score of 125. These results indicate that the inventory and lending system has a good level of security. Security features such as authentication, authorization, and data encryption provided will provide a sense of security for users in using the system.

The security features integrated in this system make data more protected from security threats such as data breaches. systems built using the laravel framework have a high level of security, so users can feel comfortable and safe in using the system. these findings are in line with research [21] which states that the security variable is an important aspect in assessing the quality of information systems.

In the security aspect, the system has been resistant to attacks and is able to protect user data based on the results of vulnerability scanning using the Qualys Web Application Scanner security testing tool, the sivenjam.my.id website did not

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find any significant security holes. this shows that the system has good security. this test resulted in a Certificate score of 100, Protocol Support 100, Key Exchange score 90, and Cipher Strength score 90. these results mean that the system security configuration is good and can protect user data effectively and the results of this test are in accordance with the ISO 25010 security standard.

Figure 6. Security Testing Results

Based on the Portability Variable Quality test, it gets a score of 100 from a maximum score of 75. These results indicate that the inventory and lending system has a very good level of portability. This system can be accessed through various devices such as desktops, laptops, and mobile devices. The responsive design of the system makes the appearance of the system consistent and can adapt well to various device screen sizes. This finding is in line with previous research which reveals that the ability of the system to be accessed through various devices is one of the important components in assessing the quality of an information system[22].

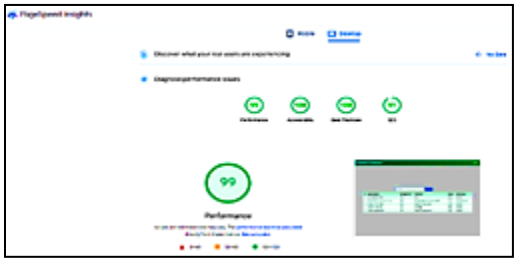

Figure 7. Test Results of the Desktop Version

Furthermore, in terms of portability, the system can run well on various devices and platforms. The results of portability testing conducted on various devices such as desktop, and mobile, show that the system can adapt well and provide a consistent usage experience.

Testing on the desktop version has a performance value of 99, Accessibility of 100, Best Practices score of 93, SEO score of 91. while for the mobile version has a Performance score of 86, Accessibility score of 100, Best Practices score of 100, SEO score of 91. the results of this test indicate that the system can run well and is suitable on various types of devices [23].

Figure 8. Mobile Version Test Results

Overall, the evaluation results show that the inventory and lending system is of very good quality in various aspects.

CONCLUSION

The IoT-based Inventory and Lending System developed can help the process of managing inventory items properly. This system utilizes IoT technology in monitoring and automating the process of identifying, borrowing, and returning goods. This system can record every transaction of borrowing and returning goods, as well as provide information on the status and history of borrowing goods that can be accessed through a website interface.

BIBLIOGRAPHY

[1] K. Nistrina, "Penerapan Augmented Reality Dalam Media Pembelajaran," *Jurnal Sistem Informasi, J-SIKA*, vol. 03, no. 01, Jun. 2021.

[2] R. D. Nasution, F. H. Saragih, and P. S. M. A. Sembiring, "Pendampingan Sistem Pembelajaran Online Berbasis Aplikasi Google Meet Bagi Guru-Guru Smp It Daarul Istiqlal Dan Smp It Rahmat Marindal I, Kecamatan Patumbak, Kabupaten Deli Serdang," *Jurnal Pengabdian Kepada Masyarakat*, vol. 26, no. 4, p. 188, 2020, doi: 10.24114/jpkm.v26i4.20365.

[3] D. U. Hidayah and P. Subarkah, "Media Pembelajaran Tentang Klasifikasi Binatang Berbasis Video Animasi 3 Dimensi di SMP Negeri 2 Wangon," *MATRIK : Jurnal Manajemen, Teknik Informatika dan Rekayasa Komputer*, vol. 19, no. 1, pp. 45–52, Nov. 2019, doi: 10.30812/matrik.v19i1.492.

[4] M. A. Rizkiawan, H. Ramza, and E. S. Alim, "Information System For Recording Assets And Loaning Goods Using Agile Development Methods At Bpti Uhamka," *Journal of Scientech Research and Development*, vol. 5, no. 2, 2023, [Online]. Available: https://idm.or.id/JSCR/in

[5] W. Kuandee, P. Nilsook, and P. Wannapiroon, "Asset supply chain management system-based IoT technology for higher education institutions," *International journal of online and biomedical engineering*, vol. 15, no. 3, pp. 4–20, 2019, doi: 10.3991/ijoe.v15i03.8533.

[6] B. Baharuddin, J. W. Sitopu, M. S. Safarudin, Muh. W. S. Adam, and Muh. Safar, "Mengenal Internet of Things (IoT): Penerapan Konsep dan Manfaatnya dalam Kehidupan Sehari-hari," *Journal Of Human And Education (JAHE)*, vol. 4, no. 4, pp. 827–835, Jul. 2024, doi: 10.31004/JH.V4I4.1348.

[7] T. Wang and P. Zhao, "Research and Application of Internet of Things in Intelligent Library," *Proceedings of the First International Conference on Information Sciences, Machinery, Materials and Energy*, vol. 126, no. Icismme, pp. 684–687, 2015, doi: 10.2991/icismme-15.2015.141.

[8] S. Megawati, "Pengembangan Sistem Teknologi Internet of Things Yang Perlu Dikembangkan Negara Indonesia," *Journal of Information Engineering and Educational Technology*, vol. 5, no. 1, pp. 19–26, 2021, doi: 10.26740/jieet.v5n1.p19-26.

[9] B. D. Andikasari, S. Fadli, and W. Murniati, "Analisa Website Desa Darmaji Menggunakan ISO/IEC 25010 (Studi Kasus : Website Desa Darmaji)," *INNOVATIVE: Journal Of Social Science Research*, vol. 4, no. 2, 2024.

[10] M. Asim and M. Arif, "Internet of things adoption and use in academic libraries: A review and directions for future research," *J Inf Sci*, 2023, doi: 10.1177/01655515231188338.

[11] Y. Zhu, Y. Jin, L. Tao, G. Gong, and Zhou Yao, "Analysis and Adoption of the Internet of Things in Life Cycle Management of Electric Energy Meters," *Academic Journal of Business & Management*, vol. 4, no. 11, 2022, doi: 10.25236/ajbm.2022.041119.

[12] P. Gannamraju, S. Yarramsetti, and L. S. Kumar, "Radio frequency

identification and internet of things-based smart library management system," *International Journal of Networking and Virtual Organisations*, vol. 24, no. 4, pp. 329–346, 2021, doi: 10.1504/IJNVO.2021.116430.

[13] L. Yang and C. H. Shen, "The Shadow Banking Behaviour In Internet Of Things: Evidence From Economy Operation Mode In China," *Technological and Economic Development of Economy*, vol. 30, no. 2, pp. 402–422, Apr. 2024, doi: 10.3846/tede.2022.16461.

[14] A. Rakhman, "Analisa Sistem Keamanan Rumah Berbasis Internet of Things," *Politeknik Harapan Bersama Tegal*, vol. 12, no. 2, 2023, doi: 10.30591/smartcomp.v12i2.4521.

[15] B. I. Rumabar and E. Maria, "Evaluasi Kualitas Shopeepay Menggunakan ISO/IEC 25010," *Jurnal Sistem Informasi Bisnis*, vol. 14, no. 1, pp. 54–61, 2024, doi: 10.21456/vol14iss1pp54-61.

[16] S. Muddin, A. C. Darti A, R. Arlanjatdin, and A. Ramang, "Perancangan Aplikasi Penjualan Barang Elektronik Berbasis Android," *Jurnal Teknologi dan Komputer (JTEK)*, vol. 1, no. 01, pp. 1–8, 2021, doi: 10.56923/jtek.v1i01.46.

[17] A. Hermanto *et al.*, "Peningkatan Usability Point of Sales (PoS) Berbasis Human Centered Design (HCD)," *JOINS (Journal of Information System)*, vol. 7, no. 1, pp. 1–13, 2022, doi: 10.33633/joins.v7i1.5528.

[18] J. Simatupang and M. Muhammad, "Rancang Bangun Aplikasi Pengelolaan Tugas Akhir dengan Menerapkan Prinsip-Prinsip Teknologi Mobile," *JOISIE (Journal Of Information Systems And Informatics Engineering)*, vol. 2, no. 2, p. 39, 2018, doi: 10.35145/joisie.v2i2.16.

[19] H. Harisno and D. Herby, "The Analysis of Factors Affecting the Buying Interest of E-Commerce Customers," *CommIT (Communication and Information Technology) Journal*, vol. 12, no. 1, p. 13, 2018, doi: 10.21512/commit.v12i1.2089.

[20] H. Wijaya, "Evaluasi Action & Result Control Dalam Implementasi Sistem Manajemen Lima Jari-Jari Pada Usaha Kecil & Menengah (Ukm) Griya Karya Tiara Kusuma Di Surabaya," *Calyptra: Jurnal Ilmiah Mahasiswa Universitas Surabaya*, vol. 2, no. 2, pp. 1–20, 2013.

[21] S. Nurul, Shynta Anggrainy, and Siska Aprelyani, "Faktor-Faktor Yang Mempengaruhi Keamanan Sistem Informasi: Keamanan Informasi, Teknologi Informasi Dan Network (Literature Review Sim)," *Jurnal Ekonomi Manajemen Sistem Informasi*, vol. 3, no. 5, pp. 564–573, 2022, doi: 10.31933/jemsi.v3i5.992.

[22] S. Ahdan, A. R. Putri, and A. Sucipto, "Aplikasi M-Learning Sebagai Media Pembelajaran Conversation Pada Homey English," *Sistemasi*, vol. 9, no. 3, p. 493, 2020, doi: 10.32520/stmsi.v9i3.884.

[23] A. Mulyana and M. N. Arifin, "Smart Socket untuk Smart Home berbasis Message Queuing Telemetry Transport (MQTT)," *Komputika : Jurnal Sistem Komputer*, vol. 8, no. 2, pp. 111–117, 2019, doi: 10.34010/komputika.v8i2.1684.