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DESIGN OF INTERNAL AUDIT INFORMATION SYSTEMS OF OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT SYSTEMS

PERANCANGAN SISTEM INFORMASI AUDIT INTERNAL SISTEM MANAJEMEN KESELAMATAN DAN KESEHATAN KERJA

Original Research Article
Penelitian

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A B S T R A C T

Background: *The internal audit assessment of the Occupational Safety and Health Management Systems (OSHMS) in the container terminal company currently uses semi-digital forms. The company's existing audit forms used general data processing software (Microsoft Excel), which was ineffective and inefficient in fulfilling the internal audit assessment of OSHMS. It also needed to be adjusted, referring to the guidelines of the Republic of Indonesia Government Regulation Number 50 of 2012. Digitalization through information systems is recommended to improve the effectiveness and efficiency of the internal audit assessment of OSHMS in the company.* ***Purpose:*** *To analyze the requirements for the internal audit information systems of OSHMS in the company.* ***Method:*** *This study used the direct test method to determine the function of features and menus on the information systems interface and usability testing to determine the percentage of system usability for users. Descriptive analysis was used to identify the requirements for the internal audit information systems of OSHMS in the company.* ***Result:*** *Based on the study conducted, there were minor adjustments to the forms of internal audit of OSHMS in accordance with current regulations. The fulfillment of 166 audit criteria for internal audits of OSHMS at the advanced level in the company required 99 documents of audit evidence. The direct test results show that the information systems function is running according to the study objectives. The results of the usability testing obtained a percentage of 83.15%.* ***Conclusion:*** *The internal audit information systems of OSHMS can be implemented and provide benefits for the company.*

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A B S T R A K

Latar belakang: Penilaian audit internal Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3) di perusahaan kepelabuhanan petikemas masih menggunakan formulir semi digital. Formulir audit eksisting milik perusahaan menggunakan perangkat lunak pengolahan data umum yang dinilai kurang efektif dan efisien dalam memenuhi penilaian audit internal SMK3. Selain itu, formulir yang digunakan juga diperlukan penyesuaian terhadap pedoman Peraturan Pemerintah Republik Indonesia Nomor 50 Tahun 2012. Digitalisasi melalui sistem informasi direkomendasikan untuk meningkatkan keefektifan dan keefisienan dalam pelaksanaan penilaian audit internal SMK3 di perusahaan. **Tujuan:** Untuk menganalisis kebutuhan sistem informasi audit internal SMK3 di perusahaan. **Metode:** Penelitian ini menggunakan metode uji coba langsung untuk mengetahui fungsi fitur dan menu pada tampilan sistem informasi dan *usability testing* untuk mengetahui persentase kegunaan sistem informasi bagi pengguna serta analisis deskriptif digunakan untuk mengetahui kebutuhan sistem informasi audit internal SMK3 di perusahaan. **Hasil:** Berdasarkan penelitian yang dilakukan terdapat penyesuaian minor pada formulir audit internal SMK3 dengan peraturan yang berlaku. Pemenuhan 166 kriteria audit internal SMK3 tingkat lanjutan di perusahaan membutuhkan 99 dokumen bukti audit. Hasil pengujian secara langsung menunjukkan fungsi sistem informasi berjalan sesuai tujuan penelitian. Hasil uji kegunaan menggunakan *usability testing* didapatkan persentase sebesar 83.15%. **Kesimpulan:** Sistem informasi audit internal SMK3 dapat diimplementasikan dan memberikan manfaat bagi perusahaan.

Kata kunci:
Sistem informasi, Audit internal, Sistem manajemen, Keselamatan dan kesehatan kerja, Uji kegunaan

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INTRODUCTION

The number of occupational accidents in Indonesia in 2021 was 234.370 cases, which increased by 5.39% from the previous year of 221.740 cases (Violleta and Meirina, 2023). This number can increase if the companies in Indonesia do not have hazard controls, one of them is administrative control. Occupational Safety and Health Management Systems (OSHMS) are one of the administrative controls that can be implemented by companies. Implementing a well-established OSHMS can prevent occupational accidents and diseases (Wang *et al*., 2021). The container terminal company is one of the companies that is required to implement OSHMS. The container terminal company is a company engaged in container terminal services both domestically and internationally. The company also has a high risk of danger that can be controlled through risk management. One of the ways to manage risk is by properly implementing the OSHMS.

The implementation of OSHMS has been required in Republic of Indonesia Government Regulation Number 50 of 2012 about the Implementation of Occupational Safety and Health Management Systems on article 5 clauses 1 and 2, which state that "Every company that employs workers or laborers of at least 100 people or has a high level of potential hazards must implement OSHMS in their company" (Government Regulation, 2012). Up to 1.749 enterprises have implemented OSHMS, according to data from the Republic of Indonesia's Ministry of Labor in 2023 including micro, small, medium, and big businesses, the total number of companies registered with the Ministry of Labor in 2023 was 812.407 (Ministry of Manpower, 2022, 2023. The annual implementation of OSHMS internal audits can be used to manage the system's implementation. Government Regulation Number 50 of 2012 of the Republic of Indonesia regarding the Implementation of Occupational Safety and Health Management Systems is the standard reference used in Indonesia. Government Regulation Number 50 of 2012 of the Republic of Indonesia divides OSHMS implementation into three levels: entrance level (64 criteria), transition level (122 criteria), and advanced level (166 criteria) (Government Regulation, 2012).

Regarding the rules utilized for the OSHMS audit assessment, Minister of Labor of the Republic of Indonesia Regulation Number 26 of 2014 concerning the Implementation of Assessment of the Application of OSHMS (Regulation of The Minister of Manpower, 2014) is relevant. A number of forms are needed for the internal audit of the OSHMS, including the non-conformance report form and the internal audit of OSHMS checklist form. To further assist auditees in meeting audit criteria, a list of objective evidence is also required. Current applicable regulations are reviewed for potential modifications to forms already in use, such as Non-Conformity Report (NCR) forms and checklist forms. The assessment guidelines refer to the Minister of Labor of the Republic of Indonesia Regulation Number 26 of 2014 (Regulation of the Minister of Manpower, 2014), while the checklist forms are modified by Government Regulation Number 50 of 2012 (Government Regulation, 2012).

The company's current audit forms utilized Microsoft Excel, a generic data processing program, which was inefficient and unproductive for completing the internal audit review of the OSHMS because it had to be manually recorded and was unable to provide a comprehensive view. An alternate strategy for raising the efficacy and efficiency of the OSHMS internal audit procedure is digitalization. Existing forms, such as checklist forms and NCR forms, are evaluated for adjustments to the current applicable regulations. The checklist forms are adjusted based on the Republic of Indonesia Government Regulation Number 50 of 2012 (Government Regulation, 2012), and the assessment guidelines refer to the Republic of Indonesia's Minister of Labor Regulation Number 26 of 2014 (Regulation of the Minister of Manpower, 2014). Interpretation of the checklist forms is used to analyze the number and data requirements of audit evidence documents according to the set terms with references from the Department of Labor and Transmigration of East Java Province (Darmawan, 2023). Facilitating the audit process also entails plotting the audit criteria according to the roles and responsibilities of work units or divisions. The non-conformity report forms are modified in accordance with the guidelines for preparing non-conformity reports using the Problem, Location, Objective, and References (PLOR) rules, which include issues with findings, where findings are located, goals or supporting evidence for findings, and references or rules that are violated (Ministry of Research, Technology and Higher Education, Jakarta, 2019).

Utilizing the PHP programming language and MySQL database, information systems based on flexible websites are designed as part of the digitalization process. Since PHP programming is an open source project, modifications and distribution of the source code are permitted (Surahmat and Fuady, 2022). Additionally, the MySQL database can run on a variety of operating systems, supports a wide range of storage engines, and it is open source for the purpose of digitizing the internal audit forms of the OSHMS, a responsive website was selected. This type of website is easy to maintain, can be accessed by several devices of varying sizes, and only requires a single domain (Novianty, 2017). As a result, the OSHMS internal audit can be implemented simply, swiftly, and flexibly by the audit schedule that has been set.

According to earlier research by Ichsan (2019), the information system is capable of managing and accessing relevant OSHMS audit evaluations based on their levels accurately and fraudulently, and it can readily access the data requirements required to assist audits. Additionally, research by Kurniawan (2022) demonstrates that the information system created for

audit checklists and reporting non-conformance reports is workable. In addition, research by Damayanthy (2021) reports that objective evidence is gathered from the firm data archive, and OSHMS assessments are performed utilizing checklist forms based on levels through direct observation. Therefore, it is essential to study related research about "Design of Internal Audit Information Systems of Occupational Safety and Health Management Systems," especially in the container terminal company. This research was conducted to analyze the requirement data for information systems of internal audit of occupational safety and health management systems. This study is expected to be useful for various parties in implementing digitalization in the internal audit process of the occupational safety and health management system.

MATERIAL AND METHOD

This study was experimental research that employed a responsive website as a tool to evaluate the OSHMS internal audit. This study was conducted at a container terminal company that has a high risk of danger that can be controlled through risk management. An effective OSHMS implementation is one method of risk management. The study was conducted from February 1st until August 11th, 2023. The total trial sample consists of 37 users from four system user actors, which are 29 parties from 19 divisions or work units in the company and eight independent parties who are part of the company entities.

The tools and materials used in this research are the existing forms of the company's internal audit of OSHMS in 2022, XAMPP is the abbreviation of the X (cross platform) – Apache – MySQL/MariaDB – PHP (Prasetiyo *et al*., 2023) that included the Hypertext Preprocessor (PHP) language programs (Noviana, 2022) and MySQL database (Rawat *et al*., 2021), and also Visual Studio Code (Ramdhan and Nufriana, 2019). An additional open source, with a multitude of storage possibilities, and compatible with other programming languages, is the MySQL database (Helinda *et al*., 2020). One website may be viewed on many devices with varying screen sizes thanks to responsive websites, which also require only one domain for the entire site and are easy to maintain (Novianty, 2017).

Evaluation of the company's existing internal audit forms of OSHMS

The evaluation of the company's existing forms of internal audit of OSHMS revealed minor changes to some of the forms' components, such as (1) The minor, major, and critical non-conformity checklist categories were added to the checklist forms. In addition, various revisions were made to the audit criteria interpretation requirements to align with current regulation. The results of the checklist recapitulation categories can be obtained as a number and percentage, (2) Create a form for reporting Non-Conformity Reports (NCR) in accordance with PLOR rules. A summary of the number of nonconformities and the state of improvement may be produced, (3) Audit criteria were plotted for 19 work units based on their respective activities and responsibilities, and (4) In line with the Republic of Indonesia's Minister of Labor Regulation Number 26 of 2014, the audit criteria checklist findings are quantitatively integrated into the evaluation logic process in information systems (see Table 1).

Based on Table 1, if one of the same criteria audits from various work units contain more than one of the conformity checklists and no non-conformity category checklist, it falls into the conformity category. A minor category exists when one of the same criteria audits from various work units has more than zero and less than three minor checklists, but no major or critical category checklists. If one of the same criteria audits from various work units contains more than three minor checklists but no major or critical category checklists, it is a major category. If one of the same criteria audits from various work units contains more than one major checklist but no critical category checklist, it is a major category.

Testing the internal audit of OSHMS website

Testing begins with a direct test to find out how the interfaces and features work properly. After the first test is done, the usability test is continued using usability testing (Pratama *et al*., 2021) with the USE questionnaire (Lund, 2001). Testing is carried out using a Likert scale with a range of 1 to 5 to measure respondents agreement with the questions asked (Sukmasetya *et al*., 2020). The measurement results are calculated using the following formula of index value for four aspects of the USE questionnaire (Kurniawan, 2022) and percentage of usability (Riyadi, 2019) can be seen on Equation 1 and Equation 2.

Index value formula

The "F" value is the percentage of respondents answering with each likert scale score, the "5" is the number of Likert scales, the "r" value is the respondents total of each aspect, and the "n" value is the number of questions for each aspect.

Percentage of usability formula

The "A" value represents usefulness, the "B" value represents ease of learning, the "C" value represents ease of use, the "D" value represents satisfaction, the "5" represents the number of likert scales, the "r" value represents the total number of respondents, and the "n" value represents the total number of questions. The usability percentage results are then summarized using the three-box method from a range of 10 to 100 with an interval of 90. This method has three criteria of low (10 - 40%), medium (40.01 - 70%), and high (70.01 - 100%) category (Daga *et al*., 2020).

Table 1. Assessment logic of Occupational Safety and Health Management Systems (OSHMS) criteria audit

Assessment conclusion	Assessment logic				
	Conformity	Minor	Major	Critical	Not applicable
Conformity	>=1	= 0	= 0	= 0	-
Minor	-	>0, <3	= 0	= 0	-
Major	-	>=3	= 0	= 0	-
Major	-		>=1	= 0	-
Critical	0> Conformity >=1	0> Minor >=1	0> Major >=1	>=1	-
Not applicable	If the logic does not match the other assessment logic requirements				

Source: Regulation of the Minister of Manpower (2014) (with processing data)

$$\text{Index value} = \frac{[(\%F_1 \times 1) + (\%F_2 \times 2) + (\%F_3 \times 3) + (\%F_4 \times 4) + (\%F_5 \times 5)]}{5 \text{ x r x n}} \quad \ldots\ldots (1)$$

$$\%\text{Usability} = \frac{A + B + C + D}{5 \text{ x r x n}} \quad \ldots\ldots (2)$$

RESULT

Design and development of internal audit of OSHMS website

The internal audit of the OSHMS information system website is designed and created using a MySQL database and the PHP programming language, which is already available as a package in XAMPP. Programming is carried out in Visual Studio Code using the Laravel framework (Ambriani, 2020; Sari and Wijanarko, 2020). This framework requires composer (Alpina and Witriyono, 2022) and NodeJS (Kurniawan *et al*., 2020) installation. Entity and attribute table designs can be created prior to website design and development to make database design in MySQL more manageable.

A flow map illustrates the flow of information systems for each actor. Figure 1 shows the flow map of the information systems used for the company's internal OSHMS audit. There are four primary actors, who all have various permissions based on their job description. The admins are the website's controllers. The audit criteria assessments team consists of senior and junior auditors of OSHMS. The auditees are assessed by implementing audit criteria.

The Figure 2 shows some of the main features of the website menu that were tested directly. Figure 2 shows an interface for the generate criteria feature depending on the internal audit level, which includes 64 entry-level criteria, 122 transition-level criteria, and 166 advanced-level criteria. In this segment, the auditors were responsible with compiling data on the internal audit of OSHMS criteria by level and work unit. Auditors also fill out checklist forms with information regarding the OSHMS internal audit.

Figure 3 shows the interface of the checklist table after it was generated based on an internal audit of the OSHMS level. The auditees provide evidence for the audit evidence column in this section. Following that, the auditors assess by delivering a conformance or non-conformity checklist based on direct observation and evidence documents specified in the assessment regulations.

Figure 4 shows the interface of the menu edit checklist forms for filling up the checklist table for each row and column. The modify checklist form feature allows auditors and auditees to edit the contents of the checklist table based on their permissions and specified job descriptions. Users can save the forms they fill out to complete the checklist. After the auditors and auditees have completed the forms, admins can obtain the checklist's recap table in Excel format.

Figure 5 shows the final results of the OSHMS assessment's internal audit interface. The assessment results include a summary of the checklist for each work unit and a summary of the checklist for the entire organization, as well as the percentage and level of achievement. The results can be used as a reference before performing an external audit.

Figure 6 shows the interface of the NCR forms for each report. Auditees can only fill out this section with the causes of nonconformities and corrective/preventive actions. Additionally, the auditors complete the description of findings and audit evidence, and other tasks.

Figure 7 shows the interface of the summary of NCR and improvement status. To track the completion of improvements, this part calculates a recapitulation of non-conformity reports and improvement status. The

non-conformity report's summary table is available as an Excel document for admins to download it.

Figure 8 shows the interface of a plotting internal audit of OSHMS criteria by work units. The plotting is based on the job descriptions for each work unit and follows the auditors' instructions. This option makes the audit process easier, particularly for auditees who have met the audit requirements.

Testing the internal audit of the OSHMS website

The initial test was conducted directly to ensure that the appearance and features functioned properly. Data were entered, edited, and deleted for testing purposes. In addition, testing was performed to ensure that the system's features and programming logic worked properly. As a result, actual users of this information system can access it easily and without error.

Figure 9 highlights the results of the information system usability test. The percentages for usefulness, ease of use, ease of learning, and satisfaction were 86.42%, 79.26%, 81.89%, and 86.25%, respectively. They achieved high c in the three-box method for each component of usability testing. Overall, this information system achieved an 83.15% usability score, completing it in the high category according to the three-box method. This indicates that the information system was feasible to be implemented in the company.

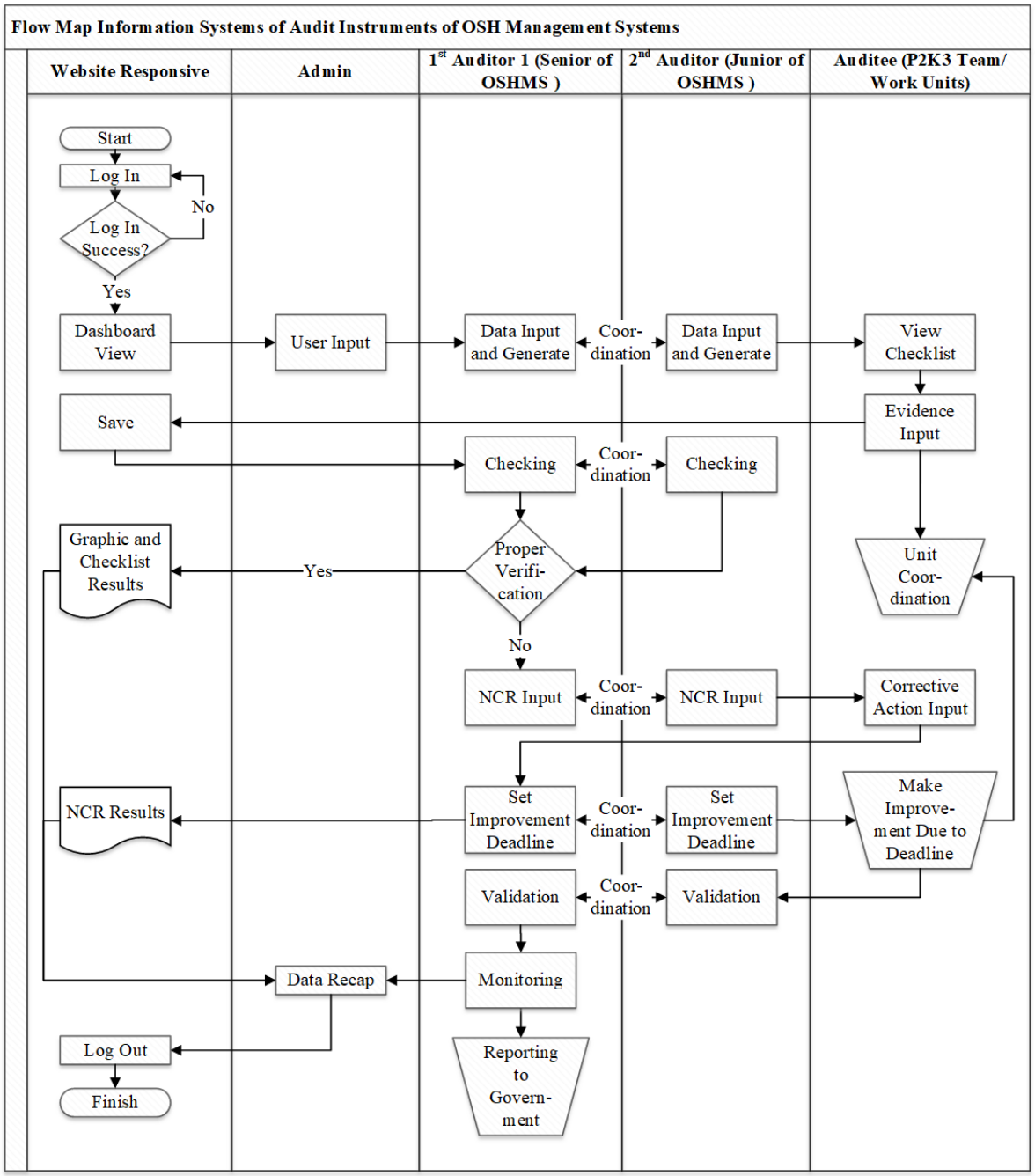

Figure 1. Flow map of information systems

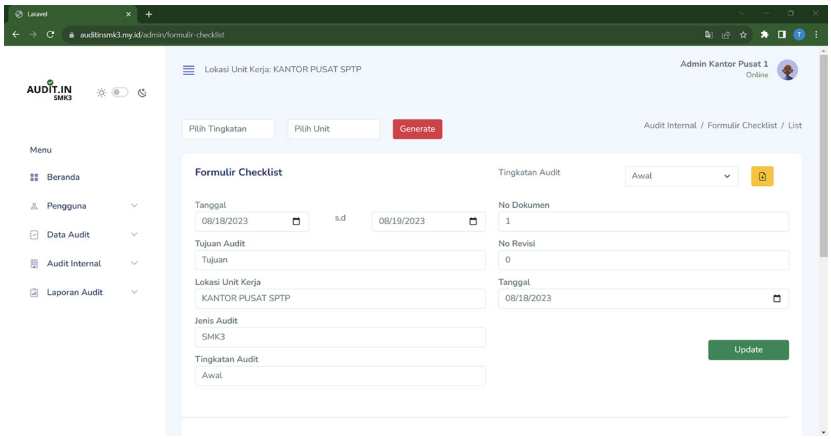

Figure 2. Generate audit criteria levels

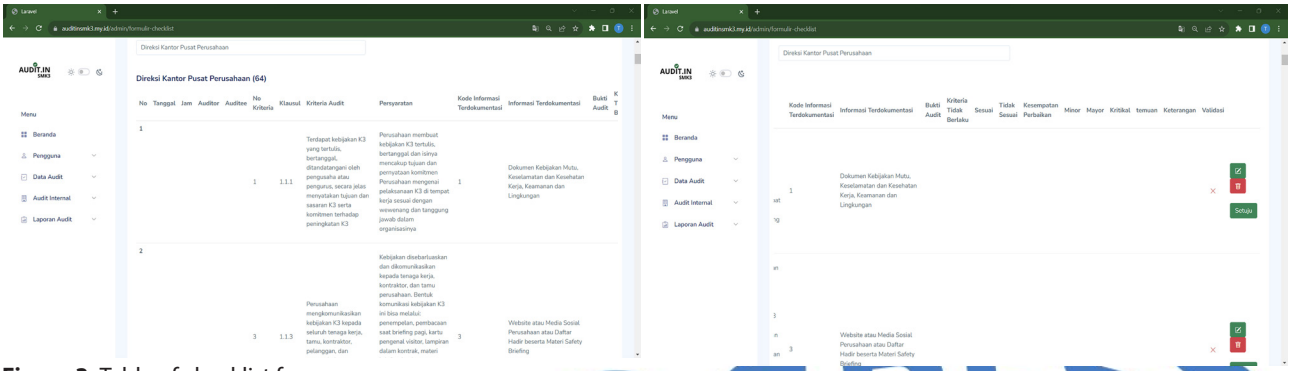

Figure 3. Table of checklist forms

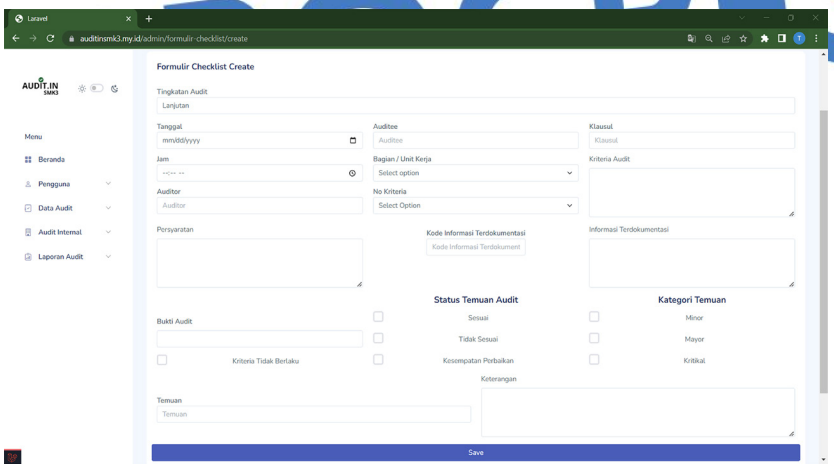

Figure 4. Fulfil checklist forms

Figure 5. Assessment of Occupational Safety and Health Management Systems (OSHMS) results

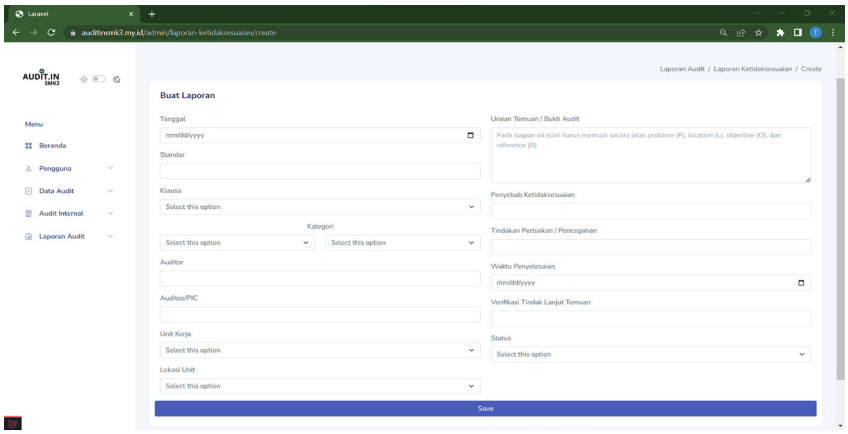

Figure 6. Non-Conformity Report (NCR) forms

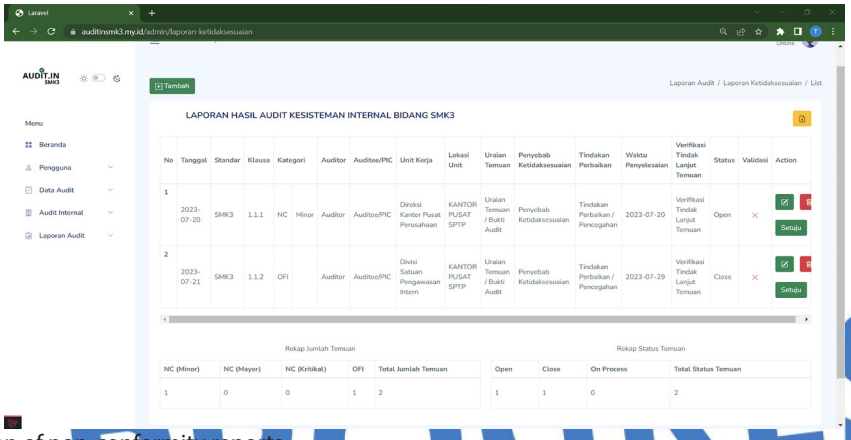

Figure 7. Recapitulation of non-conformity reports

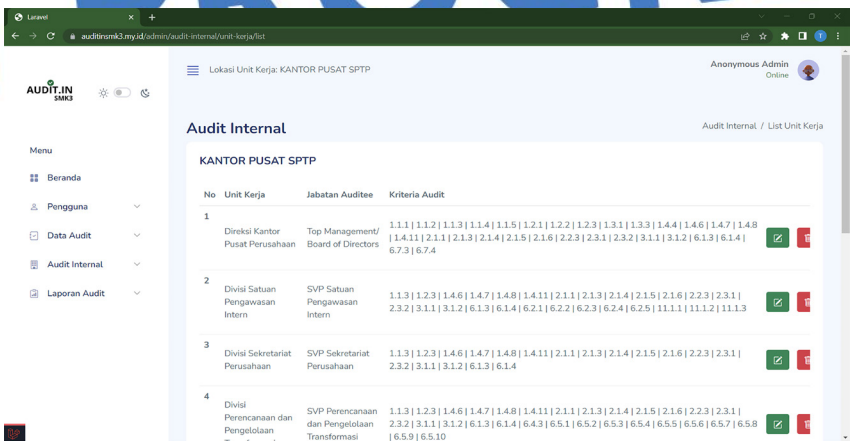

Figure 8. Plotting audit criteria

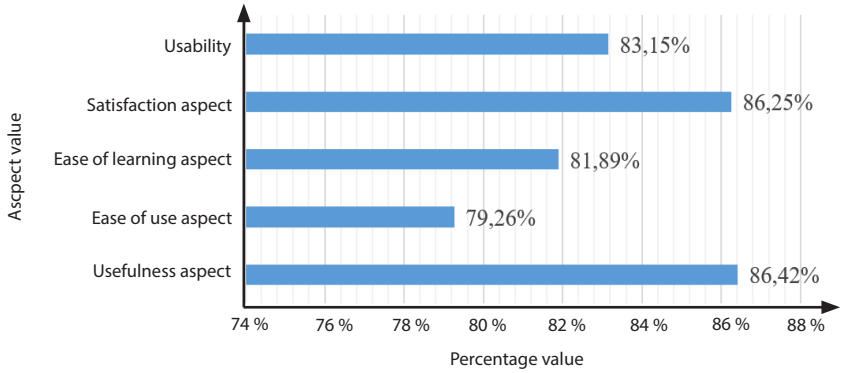

Figure 9. Percentage of usability testing

DISCUSSION

Each company's OSHMS assessment must have various gaps. Although the criteria were the same, there must have been changes in the procedure when collecting evidence and performing the audit. This is due to differences in company policies for creating documents for methods of performing internal audits of the OSHMS, despite the fact that the regulations were the same.

Herzanita *et al*. (2022) developed a BIM-based OHSMS information system that focused on real-project representations of current hazard risk assessments. Hazard risk assessment is part of the OSHMS assessment clause. This research focuses on developing tools for the audit process of overall OSHMS clause assessment at the internal company level. In this study, the same methodology is used to develop a website-based OSHMS information system, namely the waterfall method strategy, which includes communication, planning, modeling, construction, and deployment (Septiawan *et al*., 2022). This is followed up with experimental research to figure out the percentage of usability of the information system that was designed.

The current study combines various factors from previous studies. In the study conducted by Ichsan (2019), 90 documents were required to fulfill the 166 OSHMS criteria. This study required 99 documents to meet the 166 OSHMS criteria. This difference is due to the fact that the company's required evidence was slightly different. The same regulation was implemented that is Republic of Indonesia Government Regulation No. 50 in 2012.

Kurniawan (2022) conducted research that included an extra menu of non-conformity reports. In contrast to Ichsan's (2019) research, which ignored non-conformity reports and focused only on checklists and evidence document requirements, Kurniawan's (2022) research overlooked the list of evidence document requirements. The menu of non-conformity reports was used by the author of this study to improve the audit process. In addition, Kurniawan (2022) followed different regulations, especially ISO 45001:2018, an international regulation. ISO 45001:2018 used more generic clauses, whereas Republic of Indonesia Government Regulation Number 50 of 2012 used more precise auditing criteria.

Developing on previous research, this study complements Ichsan's (2019) study with Kurniawan's (2022) study by adding the non-conformity report option to the menu. These nonconformity reports will be used to create audit reports that will be submitted to the Department of Provincial Labor. The regulations implemented still use regulations that were applied in Indonesia and are currently used by companies. The usability assessment results, which were 83.15%, can be utilized as a baseline for future information system research and development. Information systems may be developed for all Indonesian firms, allowing the government to achieve its goals of digitalizing OSHMS implementation in the digitalization era, which was declared at the National Occupational Health and Safety Month celebration of 2022 (Regulation of the Minister of Manpower, 2022).

CONCLUSION

The company's existing internal audit of OSHMS forms received minor adjustments, with adjustments made in conformity with current regulations. documents required for interpretation included a total of 99 evidence documents to fulfill the company's 166 internal audit requirements for OSHMS. The usability testing results for information systems were 83.15%, indicating that it was feasible for implementation in the company's internal systems.

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