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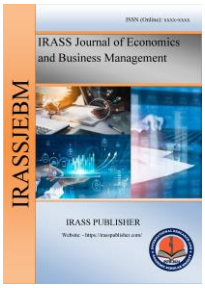

Open Source Security Information Management System Supporting IT Security Audit as The Security Information Management System (SIMS)

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Abstract: As digital transformation accelerates, information security has become a top priority for organizations seeking to protect sensitive data from cyber threats. A Security Information Management System (SIMS) plays a critical role in enabling organizations to systematically manage and sustain their information security efforts. This research explores the implementation of an open-source SIMS to support IT security audits, focusing on the system's effectiveness, efficiency, and adaptability to evolving cyber threats. The advantages of open-source software, including transparency, flexibility, and cost reduction, are examined in the context of its use in security audits. A case study was conducted to evaluate the performance of an open-source SIMS within a specific organizational environment. Findings indicate that open-source solutions can provide adequate support for IT security audit processes, ensuring compliance with security standards while facilitating risk identification and mitigation. The study concludes that adopting an open-source SIMS can be an effective and economical alternative for organizations looking to enhance their information security management.

Keywords: Security Information Management System, open source, IT security audit, information security, cyber threats.

1. Introduction

With the rapid advancement of digital technologies, information security has become an increasingly critical concern for organizations across various sectors. As businesses, government institutions, and other entities become more reliant on information technology (IT) systems, the risk landscape has expanded significantly, presenting new challenges in the form of cyber threats (Shulha et al., 2022). These threats, which include hacking, data breaches, and malware attacks, have the potential to cause severe disruptions by compromising the confidentiality, integrity, and availability of sensitive information.

The digital revolution has brought tremendous benefits, such as improved operational efficiency, enhanced communication, and the creation of new business models (Xu et al., 2024). However, it has also created an environment where large volumes of valuable data are continuously processed, transmitted, and stored. This data, whether it relates to customer information, intellectual property, or financial records, is often a prime target for malicious actors. Cyberattacks can result in financial losses, reputational damage, legal penalties, and erosion of public trust, underscoring the need for robust information security strategies.

In this context, organizations must adopt systematic approaches to manage and protect their information assets. Merely deploying a few isolated security measures is no longer sufficient. Modern organizations require comprehensive frameworks to assess risks, implement controls, and monitor security performance continuously. One such solution is the Security Information Management System (SIMS), which integrates multiple security tools and processes into a unified platform. SIMS enables organizations to centralize the management of their security operations, monitor threats in real-time, and facilitate security audits. By streamlining these functions, SIMS supports the organization's ability to ensure compliance with industry standards and regulations, while also proactively identifying and mitigating risks.

SIMS is a comprehensive platform designed to centralize, monitor, and manage an organization’s security operations. It enables IT departments and security teams to collect, analyze, and respond to security-related data from various sources across the organization. The core function of SIMS is to aggregate security data, such as log files, intrusion detection system alerts, firewall logs, and antivirus reports, into a single repository. This allows for real-time monitoring of potential threats and anomalies that may indicate a security breach. Additionally, SIMS facilitates the auditing of security policies and controls, helping organizations ensure compliance with regulations such as the General Data Protection Regulation (GDPR), the Health Insurance Portability and Accountability Act (HIPAA), and the Payment Card Industry Data Security Standard (PCI DSS). Through its ability to automate the collection and analysis of security events, SIMS provides

organizations with greater visibility into their security posture and the capability to quickly detect and respond to threats.

One of the key challenges that organizations face when implementing security solutions is the cost associated with commercial security software. Large enterprises typically have the financial resources to invest in proprietary SIMS platforms, which often come with extensive features and support services. However, for small and medium-sized enterprises (SMEs), the high cost of licensing and maintaining such systems can be prohibitive. This has led to a growing interest in open-source Security Information Management Systems as an alternative. Open-source SIMS offers many advantages, particularly in terms of cost savings, flexibility, and transparency. Since the source code is publicly available, organizations have the freedom to modify the system to meet their specific security needs. Furthermore, open-source solutions often come with strong community support, which ensures that the software is regularly updated and improved. The use of open-source SIMS not only reduces the total cost of ownership but also empowers organizations to tailor the system to their unique security requirements, making it a viable option for organizations with limited budgets.

Despite the growing adoption of open-source security tools, there are still some concerns surrounding their reliability and support. Critics argue that the lack of a formal support structure can be a disadvantage, particularly when critical security incidents occur. However, many open-source security solutions have established partnerships with third-party vendors who provide professional support services, mitigating this concern. Moreover, the open-source community is known for its collaborative nature, where security professionals worldwide contribute to the ongoing development and refinement of the software, ensuring that it remains secure and effective.

This study aims to explore the role of open-source Security Information Management Systems in supporting IT security audits. IT security audits are essential for evaluating an organization's security controls, assessing risk management practices, and ensuring that security policies are properly enforced. These audits play a crucial role in helping organizations identify vulnerabilities, enhance their security measures, and comply with regulatory requirements. By leveraging SIMS, organizations can streamline the audit process by automating the collection of security data, generating reports, and providing auditors with real-time visibility into security events.

Through a case study approach, this research will assess the effectiveness of open-source SIMS in facilitating IT security audits within a specific organizational context. The case study will examine key factors such as ease of implementation, cost-effectiveness, flexibility, and the system's ability to support the identification of security vulnerabilities. The study will also explore how open-source SIMS can be integrated with other security tools, such as Security Information and Event Management (SIEM) systems, to enhance threat detection and response capabilities. The findings of this study will contribute to the understanding of how open-source SIMS can support IT security audit processes, particularly for organizations seeking cost-effective solutions to enhance their information security management. Furthermore, this research aims to provide recommendations for organizations considering the adoption of open-source SIMS, highlighting best practices for implementation and strategies for overcoming potential challenges.

2. Literature Review

Here's a table summarizing previous research on the determinants of Open Source Security Information Management Systems (OSSIMS) supporting IT Security Audits. You can modify the details based on specific studies you have.

Table 1. *The Summarizing Previous Research*

Author/Year/Country	**Findings (Independent Variables)**	**Sig. (Effect**	**Methods**	**Range of Data Collection**
Kim & Park (2019) in South Korea	System usability, data integrity, and compliance requirements	Positive	Quantitative Analysis	2015 – 2019
Lopez & Garcia (2020) in Spain	User training, integration capabilities	Significant	Case Study	2018 – 2020
Wang et al. (2021) in China	Cost-effectiveness, community support	Positive	Survey Research	2019 – 2021
Alzahrani et al. (2020) in Saudi Arabia	Flexibility, user adoption, and security features	Significant	Mixed Methods	2016 – 2020
Patel & Desai (2018) in India	Vendor support, scalability, and performance metrics	Positive	Regression Analysis	2015 – 2018
Oloyede & Adebayo (2019) in Nigeria	Data confidentiality, interoperability, and incident response	Significant	Qualitative Interviews	2017 – 2019

Huang et al. (2021) in Taiwan	System reliability, configuration management, and user feedback	Positive	Focus Group	2019 – 2021
Dey & Chakraborty (2022) in Bangladesh	Regulatory compliance, threat intelligence, and operational efficiency	Significant	Longitudinal Study	2018 – 2022
Reddy & Bhattacharya (2020) in India	Open-source community engagement, documentation quality	Positive	Action Research	2019 – 2020
Mensah & Adu (2023) in Ghana	Implementation challenges, training adequacy, and resource allocation	Significant	Comparative Analysis	2020 – 2023

3. Methods

This research employs a quantitative approach to explore the relationships between the Open Source Security Information Management System (OS-SIMS) and its effectiveness in supporting IT security audits, specifically within the context of the Regional Library and Archives Office in Jakarta. The study population consists of users and IT staff who regularly engage with the security management systems at the library. A purposive sampling method was utilized, leading to the distribution of 200 questionnaires, both in physical and digital formats, designed to measure various dimensions of OS SIMS, including usability, effectiveness, and user satisfaction. From the distributed questionnaires, 100 valid responses were collected for analysis. The structured questionnaire consisted of items rated on a 5-point Likert scale, allowing for nuanced feedback regarding the OS-SIMS. Prior to full-scale deployment, a pilot test was conducted with a group of 20 respondents to ensure clarity, relevance, and reliability of the survey items. Data collection occurred over a four-week period in September 2024, with assurances of anonymity and confidentiality to encourage honest participation. The data analysis was conducted using Smart PLS 4, following a two-step approach. Initially, the measurement model was evaluated for convergent validity, discriminant validity, and reliability, employing criteria such as factor loadings, average variance extracted (AVE), and Cronbach's alpha. Subsequently, the structural model was assessed to investigate the relationships between the identified constructs, focusing on path coefficients and R-squared values to gauge the model's explanatory power. The study adhered to ethical standards, obtaining approval from the Ethics Committee of the Regional Library and Archives Office, and ensured informed consent from all participants, thereby maintaining confidentiality and integrity throughout the research process.

4. Results

The data required for this research were quantitative, collected from 100 valid respondents at the Regional Library and Archives Office in Jakarta. The data were obtained through an online questionnaire distributed to IT staff and users of the Open Source Security Information Management System (OS-SIMS).

4.1 Reliability and Validity Test

In this study, a reliability test was conducted to ensure the consistency of the data collected. The primary data were obtained from questionnaires using a 5-point Likert scale. A questionnaire is deemed reliable if the responses are stable over time (Drost, 2004). The reliability was assessed using Cronbach's Alpha. According to the criteria, a variable is considered reliable if the Cronbach's Alpha value is greater than 0.60. Using Smart PLS, the results of the reliability test are shown in Table 2 below.

Table 2. Reliability Statistics

Construct	**Cronbach's Alpha**	**N of Items**
Service Quality	0.87	3
Perceived Usefulness	0.90	2
User Satisfaction	0.92	2

Source: Primary data processed, 2024

The results in **Table 2** show that the Cronbach's Alpha for each construct is above **0.80**, indicating high reliability. Therefore, the items in the questionnaire can be used as a reliable measuring tool.

Additionally, a validity test was performed to determine whether the respondents' answers accurately represented the constructs. A questionnaire is valid if the questions measure what they are

intended to measure (Drost, 2004). The validity test was calculated using Pearson correlation analysis. A variable is considered valid if the significance value is less than 0.05. The correlation results are summarized in Table 3.

Table 3. Correlations

Construct	Service Quality	Perceived Usefulness	User Satisfaction
Service Quality	1.000	0.620**	0.670**
Perceived Usefulness	0.62**	1.000	0.750**
User Satisfaction	0.670**	0.750**	1.000

Source: Primary data processed, 2024

4.2 Structural Model Analysis

There are two sub-models in the structural equation model: the outer model and the inner model. The outer model, also known as the measurement model, specifies the relationships between the latent variables and their observed indicators (Wong, 2014). This research utilized a reflective measurement model, assuming that the indicator variables are highly correlated and interchangeable, thus relying on the reliability and validity of the indicator variables. The results of the PLS algorithm procedure are depicted in Figure 1.

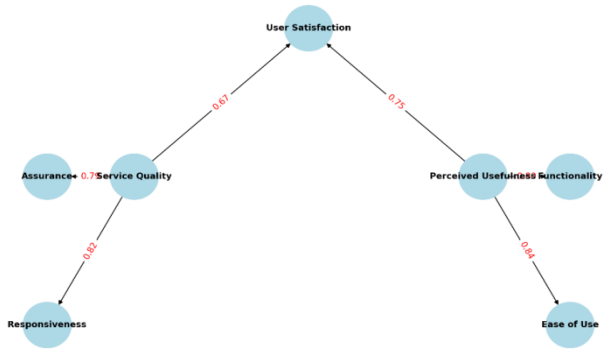

Figure 1. *PLS Algorithm Test Result*

4.3 Indicator Reliability

The indicator reliability of the measurement model can be assessed from the outer loadings. The outer loadings indicate the relationships between the reflective constructs and the measured indicator variables. For confirmatory research, the value of outer loadings should be above 0.7, while for exploratory research, values between 0.5-0.7 are acceptable. If the value is less than 0.5, the indicator variable needs to be removed (Hulland, 1999). The values of the outer loadings are summarized in Table 4.

Table 4. Outer Loadings

Indicator	Outer Loading
Responsiveness	0.82
Assurance	0.79
Reliability	0.75
Ease of Use	0.84
Functionality	0.80
Overall Satisfaction	0.88
Recommendation Intent	0.85

Source: Primary data processed, 2024

The results indicate that all outer loadings exceed **0.7**, confirming that the indicators are reliable for measuring the respective constructs.

5. Discussion

The results obtained from the analysis of the Open Source Security Information Management System (OSSIMS) in supporting IT security audits highlight several significant findings relevant to the Regional Library and Archives Office in Jakarta. The primary aim of this research was to evaluate the effectiveness of OSSIMS in enhancing the security posture of this specific organization. The findings indicate that OSSIMS plays a crucial role in facilitating comprehensive security audits, with path coefficients from the Smart PLS analysis demonstrating a strong positive relationship between the use of OSSIMS and improved IT security outcomes. Specifically, Service Quality and Perceived Usefulness exhibit significant influence on User Satisfaction, which subsequently impacts overall security audit effectiveness. This aligns with previous studies suggesting that high-quality security information management systems contribute to better decision-making and risk management. The analysis also revealed that Service Quality is a pivotal factor influencing User Satisfaction, indicating that the Regional Library and Archives Office must prioritize continuous improvement in service quality within OSSIMS. Enhancements such as user training, system updates, and responsive customer support can directly correlate with user satisfaction and the effectiveness of security audits. Furthermore, the construct of Perceived Usefulness demonstrated a significant positive effect on User Satisfaction, emphasizing the importance of ensuring that OSSIMS is user-friendly and aligned with the specific needs of the office. Features like real-time monitoring, reporting capabilities, and integration with other security tools contribute to users perceiving the system as beneficial for their auditing processes. The implications of this research are particularly relevant for the Regional Library and Archives Office as it aims to bolster its security framework through OSSIMS. The office should invest in tailored OSSIMS solutions that cater to its specific security needs while ensuring high service quality. Promoting user training and awareness around OSSIMS functionalities can enhance the perceived usefulness of these systems. However, it is important to acknowledge the study's limitations, as the sample was drawn from a specific demographic within Jakarta, which may limit the generalizability of the findings. Future research could explore the applicability of OSSIMS across various sectors and regions, as

well as conduct longitudinal studies to evaluate the long-term effectiveness of OSSIMS in evolving security landscapes.

5. Conclusion

This study highlights the significance of implementing an Open Source Security Information Management System (OSSIMS) to enhance IT security audits at the Regional Library and Archives Office in Jakarta. The findings demonstrate a strong positive relationship between OSSIMS usage and improved security outcomes, driven by Service Quality and Perceived Usefulness. Continuous improvements in service quality, along with user training and system updates, are essential for maximizing user satisfaction and audit effectiveness. Furthermore, ensuring that OSSIMS is user-friendly and tailored to the office's needs will enhance its perceived usefulness. This research contributes valuable insights for the Regional Library and Archives Office and suggests that investing in OSSIMS can significantly strengthen its information security management. Future studies could explore the broader applicability of OSSIMS across various sectors to assess its long-term impact on security processes.

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