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KICSS2024

Kedah International Conference on Social Sciences:
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e-IPH e-International Publishing House Ltd., United Kingdom

InforMaTIC2024: Information Management and Technology International Conference
Virtual Conference, UiTM Kedah, Malaysia

Organised by: Universiti Teknologi MARA, Kedah, Malaysia

A Conceptual Paper on the Integration of Open-Source Systems and Technological Acceptance in Malaysian School Resource Centers

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Abstract
This paper explores the integration of open-source systems in Malaysian School Resource Centers, focusing on the relationship between technological acceptance and digital equity. Using the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework, the study examines the factors influencing the adoption of open-source solutions. By addressing challenges related to infrastructure, teacher readiness, and resource allocation, the paper aims to provide insights into how open-source systems can bridge the digital divide in Malaysian education, fostering equitable access to technology and enhancing educational outcomes across diverse student populations.

Keywords: Open-Source Technologies; Technology Acceptance Model (TAM); Technology-Organization-Environment (TOE) Framework; School Resource Centre

DOI: https://doi.org/10.21834/e-bpj.v10iSI31.6930

1.0 Introduction

The digital divide in Malaysian education presents a significant challenge that affects both urban and rural areas, leading to disparities in access to educational technologies and resources. Despite Malaysia's progress in economic development, the lack of equitable access to digital tools in schools remains a critical issue. This paper explores the integration of open-source systems in Malaysian School Resource Centers (SRCs) as a potential solution to bridge this digital divide. The objective is to assess how such integration could provide more accessible and adaptable educational resources, thus promoting digital inclusion and educational equity.

2.0 Study Background

The integration of open-source systems, particularly in the context of Integrated Library Management Systems (ILMS), is gaining traction in developing countries where academic libraries are increasingly eager to adopt these solutions. The rapid expansion of the Internet has revolutionized library services worldwide, enhancing accessibility and interconnectivity. However, Malaysian school libraries often

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DOI: https://doi.org/10.21834/e-bpj.v10iSI31.6930

still rely on standalone, non-integrated systems that fail to capitalize on these advancements. This lack of integration hinders the efficiency and reach of these libraries, despite the clear advantages that ILMS could offer, such as improved accessibility, resource visibility, and the potential for greater collaboration among educational institutions. The disparities in access to educational technologies and resources are not limited to rural areas but also affect urban schools, leading to significant inequalities in educational opportunities (Haderlein et al., 2021). The role of school management in fostering and supporting the use of technology in teaching and learning environments is crucial. By integrating libraries into broader Learning Management Systems (LMS), school resource centers (SRCs) could significantly enrich the eLearning environment, promoting a more cohesive and interactive educational experience for students.

This study aims to propose a robust conceptual framework by thoroughly reviewing the various concepts involved in the integration of open-source systems in Malaysian school resource centers (SRCs). It delves into critical aspects such as technological, organizational, and environmental factors, as well as the key constructs of perceived usefulness and perceived ease of use, within the context of the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework. The study seeks to explore how these factors collectively influence the adoption, implementation, and actual use of open-source systems in educational settings. By offering a comprehensive understanding of these dynamics, the study provides valuable insights into overcoming existing challenges, such as resistance to change and inadequate infrastructure, while also highlighting strategies to enhance educational outcomes. This conceptual framework is intended not only to guide future empirical research but also to inform practical implementations, ultimately aiming to foster more inclusive, resource-efficient, and technologically advanced learning environments across Malaysian schools.

3.0 Literature Review

3.1. The Current State of School Resource Centers and Libraries

While the role of School Resource Centers (SRCs) and libraries in supporting student achievement and literacy is well acknowledged (Horban, 2024), current scholarship falls short in exploring the integration of open-source systems within these settings—particularly in the Malaysian context. Most existing studies concentrate on general ICT adoption, thereby neglecting the specific dynamics, challenges, and potential of open-source technologies to bridge the digital divide in education (Joseph, 2024). This oversight reflects a broader research gap in the literature, as highlighted in the limited discourse on open-source system integration in Malaysian SRCs.

Further, although the integration of digital resources is widely regarded as a catalyst for educational improvement, particularly through enhanced access to electronic materials (Horban, 2024), there remains a lack of comprehensive analysis on how such integration may influence educational equity. The absence of research focused on how open-source systems impact resource accessibility across diverse student populations represents a significant limitation. Equity implications—especially for underserved or rural student groups—are seldom addressed in depth, despite recurring evidence of infrastructure and resource disparities (Joseph, 2024; Ullah, 2023).

Moreover, implementation challenges are frequently under-theorized. Although studies acknowledge issues such as outdated infrastructure and limited funding (Ullah, 2023), few have systematically examined the barriers specific to open-source deployment in school environments. Key factors such as teacher digital readiness, administrative involvement, and adaptability among students remain underexplored. As Horban (2024) notes, digital transformation is resource-intensive and demands ongoing support—yet many institutions remain ill-equipped to sustain such initiatives.

This review affirms the urgent need for more targeted research addressing these gaps, particularly studies that examine how open-source integration can both support digital equity and overcome real-world implementation constraints in Malaysian SRCs.

3.2. Understanding Open-Source Systems

Open-source systems serve as cost-effective and flexible alternatives to proprietary solutions in school resource centers (SRCs). Their customizability allows educational institutions to tailor software to local curricula, pedagogical methods, and cultural contexts, thus enhancing their functionality in diverse learning environments (Sánchez et al., 2020). Cost savings from avoiding licensing fees are particularly beneficial for institutions in underserved or rural areas, enabling reallocation of funds to infrastructure, teaching resources, and staff development. In addition, open-source projects often rely on collaborative development, fostering innovation and a strong user community that supports software enhancement, troubleshooting, and knowledge exchange. This model can reduce technical dependency and help fill expertise gaps in schools with limited ICT capacity.

Despite these advantages, there is a lack of empirical research on the effectiveness of open-source systems in the Malaysian educational context. Factors such as infrastructure readiness, technical support availability, and digital literacy remain critical but underexamined dimensions of implementation. Cultural, linguistic, and curricular variations further complicate integration efforts, suggesting the need for localized evaluation frameworks. While open-source systems have shown promise globally, their success cannot be assumed without context-specific validation. In Malaysia, rigorous studies are needed to determine how these systems align with institutional goals and address equity issues in resource distribution. Understanding their scalability and adaptability requires focused inquiry to guide effective implementation strategies and policy development (Wadata et al., 2022).

3.3 Theoretical Overview

3.3.1.TAM-TOE Model

Bryan and Zuva (2021) stated that the integration of the Technology Acceptance Model (TAM) and the Technology, Organization, and Environment (TOE) framework is well-supported by existing literature. TAM, known for its focus on individual attitudes and social behavior

towards technology usage, is complemented by the organizational and environmental focus of the TOE framework. While TAM highlights personal and social influences as major factors in technology adoption, TOE emphasizes organizational governance and external environmental factors. This combination offers a comprehensive approach, accounting for both individual user perceptions and broader organizational and environmental contexts, thus providing a robust model for understanding the dynamics of technology adoption in various settings.

The integration of the Technology Acceptance Model (TAM) with the Technology, Organization, and Environment (TOE) framework in this research offers a comprehensive approach to understanding open data repository adoption. This combined model incorporates TAM's focus on individual behavioral intentions and actual system usage with TOE's emphasis on technological, economic, organizational, and environmental factors. Such an integrated model is instrumental in analyzing how researchers in Malaysian institutions interact with open data repositories, taking into account both personal attitudes and contextual factors influencing their technology adoption behavior.

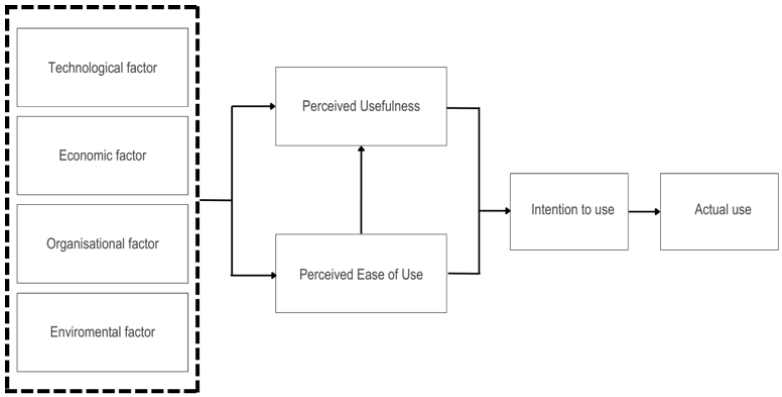

Fig. 1: Integrated TAM-TOE Model
(Source: Qin, X., Shi, Y., Lyu, K., & Mo, Y. (2020))

The integration of open-source systems within Malaysian school resource centers (SRCs) can be effectively analyzed through the combined lens of the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework. This integrated approach allows for a comprehensive understanding of how technological, organizational, and environmental factors influence the acceptance and implementation of open-source solutions in educational settings. For instance, the TAM highlights the importance of perceived ease of use and perceived usefulness, which are critical for educators and administrators when considering the adoption of open-source technologies (Childs et al., 2022). Meanwhile, the TOE framework emphasizes the role of organizational readiness and external pressures, such as policy support and community engagement, which are particularly relevant in the context of Malaysian schools (Hjelm, 2023). By leveraging open-source systems, SRCs can customize educational resources to better meet local needs, thereby enhancing interactivity and engagement among students. However, successful integration requires addressing potential barriers, such as inadequate training and infrastructure, which can hinder the effective use of these technologies. Thus, employing the TAM-TOE framework provides valuable insights into the multifaceted challenges and opportunities associated with adopting open-source systems in Malaysian SRCs, ultimately fostering a more effective learning environment.

3.4.0 Discussion of the Concepts Involved

3.4.1. Technological Factor

The technological factor within the Technology Acceptance Model (TAM) and Technology-Organization-Environment (TOE) framework is crucial for understanding the integration of open-source systems in Malaysian school resource centers (SRCs). The TAM emphasizes perceived ease of use and perceived usefulness as key determinants of technology acceptance, which are essential for educators and administrators when evaluating open-source solutions Uula (2023). In Malaysian SRCs, these perceptions significantly influence the willingness to adopt open-source systems, as they offer customizable and interactive resources that enhance learning experiences. The TOE framework adds to this by considering organizational readiness and environmental factors, such as policy support and community engagement, important for successful implementation (Hong et al., 2021). By addressing both technological perceptions and the organizational context, the TAM-TOE framework provides a comprehensive understanding of the challenges and opportunities associated with adopting open-source systems in Malaysian SRCs.

3.4.2. Organizational Factor

The organizational factor in the Technology Acceptance Model (TAM) and Technology-Organization-Environment (TOE) framework is crucial for integrating open-source systems in Malaysian school resource centers (SRCs). This factor includes elements such as organizational culture, management support, and staff readiness to adopt new technologies (Giovannella, 2022). In Malaysian SRCs, strong organizational support and a culture of innovation are essential for implementing open-source systems, as these require a shift in traditional practices and the willingness to embrace new methodologies. Supportive policies and training programs can enhance the perceived usefulness and ease of use of these technologies, increasing their acceptance among educators (Wang et al., 2017). By leveraging these organizational factors, Malaysian SRCs can foster an environment conducive to integrating open-source systems, leading to improved educational outcomes.

3.4.3. Environment Factor

This factor includes external elements such as government policies, funding availability, and community support, which can either facilitate or hinder the adoption of new technologies (Brasier & Wan, 2010). In Malaysian SRCs, supportive government initiatives and policies that promote technology integration can enhance the perceived usefulness and ease of use of open-source systems (Wang et al., 2022). Community engagement and collaboration can also provide resources and training, fostering an environment conducive to technology adoption (Nurkholis & Anggraini, 2020). As open-source systems require a shift in traditional practices, a supportive external environment is crucial for overcoming resistance to change and ensuring successful implementation. By leveraging these environmental factors, Malaysian SRCs can create a favorable context for integrating open-source systems, leading to improved educational outcomes (Schretzlmaier et al., 2023).

3.4.4. Perceived Usefulness

Research indicates that perceived usefulness is a critical determinant in technology acceptance, especially in educational settings where educators' intentions to use technology depend on their perceptions of its effectiveness and relevance (Ling et al., 2020; Mahomed et al., 2018). For example, perceived usefulness directly correlates with email usage among academicians, suggesting similar dynamics may apply to adopting open-source systems in schools (Mahomed et al., 2018). Additionally, integrating system quality and information quality into the UTAUT model enhances understanding of open-source technology acceptance, crucial for Malaysian schools (Zainab et al., 2019). Findings also indicate that technology acceptance, including open-source systems, depends on perceived ease of use and usefulness (Ling et al., 2020). The relationship between perceived usefulness and organizational context, as outlined in the TOE framework, highlights the need for Malaysian SRCs to foster an environment that enhances the perceived benefits of open-source systems, facilitating their integration (Zainab et al., 2019; Mahomed et al., 2018).

3.4.5. Perceived Ease of Use

Research shows that if users perceive a technology as easy to use, they are more likely to engage with it, enhancing its integration into educational practices (Granić & Marangunić, 2019). A high perception of ease of use correlates positively with the intention to adopt new technologies, including open-source systems (Effendy et al., 2021). Additionally, perceived ease of use significantly impacts technology acceptance, highlighting the need for user-friendly open-source systems in Malaysian schools (Granić & Marangunić, 2019). The TOE framework suggests that organizational readiness, including training and support, can enhance perceived ease of use, fostering a favorable environment for integrating open-source systems in school resource centers. Addressing perceived ease of use is essential for the successful implementation of open-source technologies, as it directly influences user acceptance and the effectiveness of these systems in enhancing educational outcomes (Effendy et al., 2021; Granić & Marangunić, 2019).

3.4.6. Actual Use of OS-ILS SRC

The actual use of open-source integrated library systems (OS-ILS) in Malaysian school resource centers is influenced by the constructs of the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework. Research indicates that usage of OS-ILS depends on perceived benefits and ease of use. For example, many librarians recognize the potential of open-source ILS, but adoption is limited due to concerns about usability and support (Singh, 2014). Usability testing is crucial for ensuring these systems meet specific library needs, enhancing satisfaction and promoting use (Khatun & Ahmed, 2018). Despite the advantages of cost-effectiveness and customization, many libraries hesitate to fully integrate open-source ILS due to concerns about technical support and system reliability.The TOE framework highlights that organizational readiness, including staff training and support, is pivotal for facilitating the use of OS-ILS in school resource centers (Macan et al., 2013). Addressing factors like usability, organizational support, and perceived benefits is essential for integrating open-source systems in Malaysian educational institutions (Singh, 2014; Khatun & Ahmed, 2018).

4.0 Methodology

This conceptual paper adopts a theory-driven approach to develop a framework explaining the integration of open-source systems in Malaysian School Resource Centers (SRCs). The methodology involves an integrative review of literature on educational technology, library systems, and open-source adoption. The proposed framework is guided by the Technology Acceptance Model (TAM) and Technology-Organization-Environment (TOE) framework. TAM addresses user perceptions such as perceived usefulness and ease of use, while TOE examines technological, organizational, and environmental influences. By synthesizing insights from past studies, this paper aims to provide a structured foundation for future empirical research and practical implementation in Malaysian SRCs. The insights gathered from this methodological approach serve as the foundation for the development of the proposed conceptual model presented in the following section.

5.0 Conceptual Model Development

The findings of this paper is a proposal of a framework examining the integration of Open-Source Integrated Library Systems (OS-ILS) and their acceptance within Malaysian School Resource Centers (SRCs). As illustrated in Figure 2, the framework adopts a hybrid theoretical model, combining the Technology Acceptance Model (TAM) with the Technology-Organization-Environment (TOE) framework. This integrated model serves to address both individual perceptions and contextual enablers influencing the adoption of open-source systems in the school library environment.

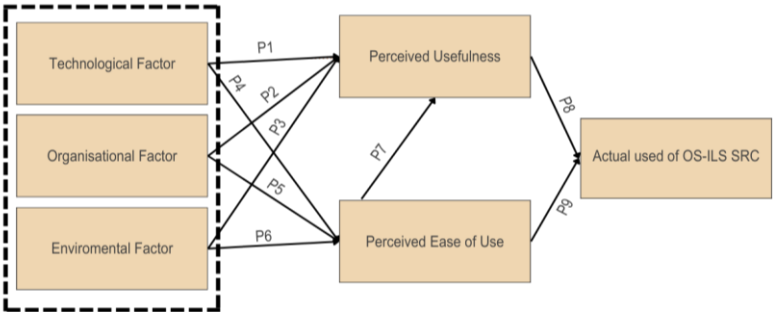

Fig. 2: SRC Integrated Library System Adoption Research Framework

While TAM has been widely applied across various technology adoption studies, its combination with the TOE framework remains underutilized within library and educational contexts. This study seeks to fill this gap by contextualizing the TAM-TOE integration for the specific case of OS-ILS implementation in Malaysian SRCs.

5.1 Model Components

The conceptual framework integrates both environmental-contextual dimensions and user-driven constructs to examine the adoption and operational use of Open-Source Integrated Library Systems (OS-ILS) within School Resource Centres (SRCs). The external dimensions are adapted from the Technology-Organization-Environment (TOE) framework and encompass three core aspects. The technological dimension involves attributes such as system stability, interoperability, and functional adequacy—key elements that contribute to user assurance and system effectiveness. The organizational dimension addresses institutional backing, staff digital literacy, and organizational adaptability toward technological innovations. The environmental dimension considers the availability of digital infrastructure, the presence of supportive policies, and the influence of external actors or peer networks on institutional technology adoption.

The internal dimensions, grounded in the Technology Acceptance Model (TAM), focus on user attitudes and behavioral intentions. Perceived Ease of Use (PEU) pertains to individuals' assessment of the system's usability and accessibility, while Perceived Usefulness (PU) captures the belief that OS-ILS enhances the quality and productivity of library functions. Actual Use reflects the measurable engagement and sustained application of OS-ILS in daily school library operations. Collectively, these user-centric and context-sensitive variables form an integrated analytical model that supports a comprehensive investigation into the behavioral, technical, and institutional factors influencing OS-ILS adoption in Malaysian SRCs.

5.2 Prepositions of Research Frameworks

The propositions for the research framework are combinations of two different models as follow:
Proposition 1: There is a significant relationship between Technological Factor and Perceived Usefulness (PU)
Proposition 2: There is a significant relationship between Organisational and Perceived Usefulness (PU)
Proposition 3: There is a significant relationship between Environmental Factor and Perceived Usefulness (PU)
Proposition 4: There is a significant relationship between Technological Factor and Perceived Ease of Use (PEU)
Proposition 5: There is a significant relationship between Organisational and Perceived Ease of Use (PEU)
Proposition 6: There is a significant relationship between Environmental Factor and Perceived Ease of Use (PEU)
Proposition 7: There is a significant relationship between Perceived Ease of Use (PEU) and Perceived Usefulness (PU)
Proposition 8: There is a significant relationship between Perceived Usefulness (PU) and Actual used of OS-ILS SRC
Proposition 9: There is a significant relationship between Perceived Ease of Use (PEU) and Actual used of OS-ILS

The integration of the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework offers a holistic and multidimensional understanding of OS-ILS adoption in Malaysian School Resource Centers (SRCs). TAM emphasizes individual-level perceptions such as perceived usefulness and ease of use, while TOE enriches the analysis by incorporating broader organizational and environmental dimensions that influence system implementation and sustainability. In SRCs, where technological readiness, institutional capacity, and policy support vary significantly, this integrated framework serves as a robust foundation for analyzing adoption dynamics.

Technological factors—particularly system compatibility and complexity—are central in shaping users' perceptions of OS-ILS functionality and relevance. When the system aligns with school needs and performs reliably, adoption is more likely; conversely, technical barriers can impede its use, especially in under-resourced settings. Organizational support, especially from school leadership, is equally crucial. As noted by Hjelm (2023), institutional readiness, provision of training, and access to supporting resources significantly impact system success. Environmental factors, notably peer influence, also warrant attention. Schretzlmaier et al. (2023) highlight how peer recommendations and testimonials can foster positive perceptions and accelerate adoption. By applying this integrated approach, the paper not only contributes to the theoretical advancement of adoption models in library and information systems but also delivers practical insights for digital transformation efforts in Malaysian educational institutions.

6.0 Conclusion

The conceptual exploration of integrating open-source systems within Malaysian School Resource Centers (SRCs) underscores the significant potential of such technologies to bridge the digital divide and enhance educational equity. This paper has laid a theoretical foundation by examining the intersection of the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework, offering insights into the factors influencing the adoption of open-source solutions in the educational context. While this paper is conceptual, it provides a crucial step toward understanding the complexities and potential of open-source systems in Malaysian SRCs. One notable limitation of this paper is the limited exploration of open-source system integration in Malaysian School Resource Centres (SRCs). While open-source solutions are gaining global recognition, their adoption within the Malaysian school library context remains under-researched.

Future empirical studies should be conducted to assess how these systems are being implemented, used, and perceived across various SRC environments in Malaysia. This will provide more granular insights and validate the conceptual framework proposed in this paper. Additionally, this paper recognizes the absence of a localized framework for open-source integration in Malaysian SRCs. Many existing studies rely on international models that may not align with Malaysia's unique socio-cultural and educational context. Future research should focus on developing and testing localized conceptual or implementation frameworks that reflect the specific needs, resources, and constraints of Malaysian schools. Such frameworks will enhance relevance and practical applicability.

Acknowledgements

I would like to express my gratitude to the organizing committee of the Information Management and Technology International Conference 2024 (InforMaTIC2024) for the opportunity to present my research. Special thanks to my mentors and colleagues for their guidance and support. I also acknowledge the financial support from Institut Pengajian Siswazah (IPSis), Universiti Teknologi MARA. This paper was refined with AI assistance in language editing.

Paper Contribution to Related Field of Study

This conceptual paper significantly contributes to the field of educational technology and digital equity by proposing a novel framework for integrating open-source systems in Malaysian School Resource Centers (SRCs). By leveraging the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework, this study provides a comprehensive understanding of the factors influencing the adoption of open-source technologies in educational settings. The research addresses critical gaps in the literature by focusing on the specific challenges and opportunities within the Malaysian context, offering a localized approach that considers the unique socio-cultural and infrastructural conditions of Malaysian schools. Additionally, this paper contributes to the ongoing discourse on bridging the digital divide in education, particularly in developing countries. It highlights the potential of open-source systems to enhance resource accessibility and educational equity, providing actionable insights for policymakers, educators, and technology implementers. The study's findings are expected to serve as a valuable reference for future empirical research and practical implementations, promoting sustainable and inclusive educational reforms in Malaysia and potentially other similar contexts.

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