Informatics-driven optimization of electronic resources in multi-campus academic libraries: Evidence from Tanzania

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ABSTRACT

The rapid expansion of digital technologies has increased the importance of electronic resources in academic libraries for supporting teaching, learning, and research in higher education institutions. However, in multi-campus environments, disparities in infrastructure, system coordination, and user competencies often affect equitable access and effective utilization of these resources. This study examined how informatics principles can be applied to optimize the management and utilization of electronic resources in a multi-campus higher education institution, using the Institute of Accountancy Arusha (IAA) in Tanzania as a case study. The Technology Acceptance Model (TAM), Information Systems Success Model, and Digital Inclusion Theory guided this research. The target population included students, academic staff, librarians, and ICT personnel across the IAA campuses. A mixed-methods research design was employed, involving a questionnaire survey of 349 students selected through stratified random sampling and semi-structured interviews with 94 academic staff, librarians, and IT technicians selected using purposive sampling. Quantitative data were analyzed using descriptive statistics, including frequencies and percentages, while qualitative data were analyzed through thematic analysis. The findings indicate that although electronic resources are available across campuses, disparities in internet connectivity, digital literacy, and technical support affect their effective utilization. The study also found increasing use of artificial intelligence tools among students, often used alongside library databases for academic tasks. The study concludes that informatics-driven optimization requires improved ICT infrastructure, continuous user training, coordinated system management, and institutional policies guiding the responsible integration of emerging technologies in academic library services.

Keywords: Artificial Intelligence, Electronic Resources, Informatics, Library Services, Multi-Campus Systems, Tanzania

I. INTRODUCTION

Digital technologies have fundamentally transformed higher education libraries through the widespread adoption of electronic resources such as e-journals, e-books, online databases, and institutional repositories. These resources are now central to teaching, learning, and research activities, enabling faster access to scholarly information and supporting flexible learning models across geographical boundaries (Tenopir et al., 2023; Mwantimwa et al., 2021; World Bank, 2023). As universities increasingly rely on digital platforms, academic libraries are expected to manage complex information systems that ensure reliable access, effective retrieval, and meaningful use of electronic resources.

From an informatics perspective, the effectiveness of electronic library services depends on the interaction between technology, users, and organizational structures. Informatics emphasizes the systematic management of information systems by integrating digital infrastructure, data management processes, and user-centered service delivery (Alghamdi & Beloff, 2014; DeLone & McLean, 2016; Venkatesh et al., 2012). In academic libraries, this means that the availability of electronic resources alone is insufficient; system quality, user skills, institutional support, and policy alignment collectively determine successful utilization and service performance.

In multi-campus higher education institutions, informatics-driven management of electronic resources is more complex due to variations in infrastructure capacity, staff expertise, service coordination, and policy implementation across campuses. Empirical studies conducted in African universities indicate that despite substantial investments in electronic resources, utilization remains uneven because of unstable internet connectivity, limited digital literacy, and inadequate user support mechanisms (Mushi & Lwoga, 2022; Ndiege & Irura, 2023; Mwantimwa et al., 2021; Kimayani, 2026). These disparities are often more pronounced in satellite campuses, resulting in unequal access to academic information and inconsistent learning experiences within the same institution.

Artificial intelligence (AI) refers to computer-based systems capable of performing tasks that normally require human intelligence, such as information retrieval, content generation, and data analysis. In higher education environments, AI tools such as ChatGPT, Gemini, and Copilot are increasingly used by students to support academic tasks including assignments, literature searches, and research activities. These tools are widely adopted because of their

speed, accessibility, and perceived usefulness (Tenopir et al., 2023; United Nations Environmental, Scientific and Cultural Organization [UNESCO], 2023; Zhai, 2024). While AI tools offer opportunities to support learning and research, they also raise informatics-related concerns regarding academic integrity, reliability of AI-generated content, and declining engagement with authoritative library databases (UNESCO, 2023; Ndiege & Irura, 2023). These developments require academic libraries to rethink how AI technologies can be integrated into existing information systems without undermining scholarly standards

The Institute of Accountancy Arusha (IAA) operates as a multi-campus higher education institution and continues to invest in electronic resources to support academic excellence. However, observable differences in access, utilization, and library service delivery across its campuses suggest persistent informatics challenges related to infrastructure, user capacity, and system coordination. Despite the relevance of these challenges, limited empirical research has examined informatics-driven optimization of electronic resources and library services within Tanzanian multi-campus institutions (Mwantimwa et al., 2021; Mushi & Lwoga, 2022; Ndiege & Irura, 2023). This study therefore investigates how informatics principles can be applied to optimize electronic resource management and library service delivery at the Institute of Accountancy Arusha, with the aim of promoting equitable access, effective utilization, and improved academic outcomes.

1.1 Research Objective

i. Assess the current status of electronic resources and library services across IAA campuses;
ii. Identify informatics-related challenges affecting equitable access to electronic resources in a multi-campus environment;
iii. Examine the influence of artificial intelligence tools on students' use of library electronic resources;
iv. Propose informatics-driven strategies for optimizing electronic resource management and library service delivery

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) explains how users adopt and utilize information technologies based on two key factors, perceived usefulness and perceived ease of use (Venkatesh et al., 2012). In academic libraries, TAM is commonly used to explain the adoption of electronic resources such as online databases, e-journals, and digital repositories. When users perceive electronic resource systems as useful for academic tasks and easy to navigate, their likelihood of using these systems increases. In this study, TAM provides a framework for understanding how students interact with electronic resources and emerging artificial intelligence tools in academic environments. Differences in system accessibility, training opportunities, and user experience across campuses may influence students' perceptions of usefulness and ease of use, thereby affecting their utilization of electronic resources.

2.1.2 Information Systems Success Model

The Information Systems Success Model developed by DeLone and McLean explains how system quality, information quality, and service quality influence the success of information systems and their continued use (DeLone & McLean, 2016). In the context of academic libraries, these elements determine how effectively users can access and utilize electronic resources. System quality refers to the reliability and accessibility of digital platforms, information quality relates to the relevance and credibility of electronic resources, and service quality concerns the support provided by librarians and technical staff. In multi-campus institutions, variations in internet connectivity, system performance, and technical support can affect the overall effectiveness of electronic resource utilization. This model therefore helps explain how informatics infrastructure and service delivery influence the use of electronic resources across campuses.

2.1.3 Digital Inclusion Theory

Digital Inclusion Theory emphasizes equitable access to digital technologies, digital skills, and online information resources. In higher education institutions, disparities in infrastructure, internet connectivity, and digital literacy can lead to unequal access to academic information resources (World Bank, 2023).

In multi-campus environments, students located in satellite campuses may experience limited internet connectivity or fewer technological resources compared to those in main campuses. These disparities can influence the level of access to electronic resources and library services. In this study, Digital Inclusion Theory helps explain differences in electronic resource access and utilization across campuses of the Institute of Accountancy Arusha.

2.2 Empirical Review

2.2.1 Status of Electronic Resources and Library Services in Higher Education

Electronic resources have assumed a central role in teaching, learning, and research in higher education. Academic library services have started to provide e-journals, e-books, online databases, and institutional repositories to support teaching, learning, and research. However, an empirical study carried out among Tanzanian universities revealed that the utilization rate of electronic resources varied. Mwantimwa et al. (2021) observed that academic staff and researchers in Tanzanian universities frequently used electronic resources to perform their scholarly communication. However, the accessibility of the resources varied among the universities. Empirical studies carried out among Tanzanian universities revealed that the preferences of Tanzanian university students to use electronic resources or traditional resources are affected by some factors such as the level of access to the resources, the usefulness of the resources to the students, and the reliability of the resources (Samzugi, 2019).

2.2.2 Informatics-Related Challenges Affecting Electronic Resource Utilization

Empirical studies have shown that infrastructural and user-related challenges affect the utilization and access of electronic resources in higher learning institutions. Research carried out in higher learning institutions in Mwanza City revealed that students experienced difficulties in accessing electronic resources due to poor internet connectivity and lack of awareness and information literacy skills (Mwamasso & Onyango, 2020). Similarly, Kimayani (2026) found that access to digital information resources in Tanzanian universities is significantly influenced by ICT infrastructure limitations and varying levels of digital literacy among users. The challenges were mainly experienced in satellite campuses compared to main campuses due to poor internet connectivity and limited ICT infrastructure. Research carried out in East African universities revealed that infrastructural challenges and poor technical support services negatively impact access and utilization of digital library resources (Ndiege & Irura, 2023).

2.2.3 Influence of Artificial Intelligence Tools on Information-Seeking Behavior

Recent empirical studies indicate that artificial intelligence technologies are increasingly shaping students' information-seeking behavior in higher education environments. AI-powered tools provide rapid responses, automated writing assistance, and simplified information retrieval, making them attractive for academic tasks such as assignments and research activities (Zhai, 2024). However, researchers have also raised concerns regarding the reliability and ethical implications of AI-generated information in academic environments. UNESCO (2023) emphasizes that although AI technologies provide opportunities to support learning and research, their use may raise concerns related to academic integrity and the credibility of information sources. Studies also suggest that students increasingly combine AI tools with traditional academic databases rather than replacing them entirely (Tenopir et al., 2023).

2.2.4 Informatics-Driven Strategies for Improving Electronic Resource Utilization

Several studies emphasize the importance of institutional strategies aimed at improving electronic resource utilization in academic libraries. Training programs that strengthen information literacy and database searching skills have been identified as effective in improving students' ability to locate and evaluate digital information resources (Rafiq et al., 2023). In addition, improvements in ICT infrastructure, reliable internet connectivity, and effective technical support services have been identified as critical factors for enhancing electronic resource utilization in higher education institutions (World Bank, 2023). These strategies are particularly important in multi-campus environments where disparities in infrastructure and user competencies may affect equitable access to digital information resources.

2.3 Research Gap

Although several studies have examined the utilization of electronic resources in higher education institutions, most of these studies focus on single-campus universities and primarily address issues related to user awareness, digital literacy, and access to digital collections. Limited attention has been given to how informatics infrastructure and system coordination influence electronic resource management in multi-campus academic environments. In addition, the growing influence of artificial intelligence tools on students' information-seeking behavior has received limited empirical attention in the context of academic library systems. This study therefore seeks to address these gaps by examining how informatics principles can be applied to optimize electronic resource management and library services in a multi-campus higher education institution.

III. METHODOLOGY

3.1 Research Design

The study employed a mixed-methods design for the study. The design was considered appropriate for the study since it would provide an extensive understanding of the patterns of electronic resource utilization as well as the

perceptions of the users and the experts who are involved in the management of the library or information system (Creswell, 2023; Saunders et al., 2023). The quantitative study was used to assess the access and utilization of the students to the electronic resources, while the qualitative study was used to investigate the experiences of the academic staff, librarians, and ICT experts.

3.2 Study Area

The study was carried out at the Institute of Accountancy Arusha (IAA), a public institution that offers higher learning education up to postgraduate levels in fields like accounting, business, and information technology, among others. The institution operates a multi-campus system with its main campus located in Arusha Municipality. The institution has other campuses located in Dar es Salaam, Dodoma, Songea, and Bukombe. These campuses are all connected to the institution's electronic resources and library services. The multi-campus system of the IAA presents a unique opportunity for a study on the management and usage of electronic resources by the institution. This is because, although the institution has access to electronic resources, different infrastructural facilities may affect the usage of these resources by different campuses. Therefore, the study on the usage of informatics for the optimization of these resources by the institution presents a unique opportunity for a study on the management of these resources by the institution.

3.3 Target Population

The target population for this study was students, academic staff, librarians, and ICT staff from all campuses of the Institute of Accountancy Arusha (IAA). This population was considered relevant for the study since they are the ones actively involved in accessing, managing, and utilizing electronic resources and services from the libraries in the institution. The students formed part of the population since they are the major users of electronic resources for their assignments and research work. Academic staff, librarians, and ICT staff formed part of the population since they are actively involved in teaching, information access, and management of digital information systems. This provided a holistic point of view on the utilization of electronic resources and informatics issues in the institution.

3.4 Sampling and Sample Size

The study used both probability and non-probability sampling methods to select the respondents from the Institute of Accountancy Arusha (IAA). Stratified random sampling was used to select the students for the quantitative study. The students were selected from various campuses to ensure proportional representation of the target population. A total of 349 students took part in the questionnaire study. Purposive sampling was used to select the respondents for the qualitative study. The study selected the respondents based on their professional experience in teaching, library services, and information system management. The respondents for the interview study consisted of 67 academic staff, 11 ICT technicians, and 16 librarians. A total of 94 professional respondents took part in the study. The sampling methods used for the study ensured that it covered general patterns of electronic resource utilization among students and specific perspectives of the professional community on the subject matter.

3.5 Data Collection Tools and Procedure

Data were collected using questionnaires, semi-structured interviews, and document review. Questionnaires were administered to students and academic staff to obtain quantitative data on access, utilization, and perceptions of electronic resources and library services. Semi-structured interviews were conducted with librarians and ICT personnel to collect qualitative information on electronic resource management practices, operational challenges, and improvement strategies. Document review involved examination of library usage statistics, institutional reports, and relevant policy documents to support and validate primary data. The combination of these methods enabled comprehensive data collection and enhanced the reliability of the study findings through triangulation.

3.6 Data Analysis

Quantitative data collected through questionnaires were analyzed using descriptive statistics, including frequencies, percentages, and mean scores, to summarize patterns of electronic resource access, utilization, and service quality across campuses (Saunders et al., 2023). The results were presented in tables and figures to enhance clarity and interpretation. Qualitative data obtained from interviews were analyzed using thematic analysis. Interview responses were transcribed, coded, and organized into themes related to electronic resource management, access challenges, and service improvement strategies (Braun & Clarke, 2022). Document review data were used to support and validate findings from both quantitative and qualitative analyses. The integration of quantitative and qualitative results enabled comprehensive interpretation of the findings and strengthened the alignment between the data and the research objectives (Creswell, 2023).

3.7 Ethical Considerations

Ethical standards were observed throughout the study to ensure the protection of participants and the integrity of the research process. Participation in the study was voluntary, and respondents were informed about the purpose of the research before data collection. Informed consent was obtained from all participants prior to administering questionnaires and conducting interviews. Confidentiality and anonymity of the participants were maintained by ensuring that personal identities were not disclosed in the research report. The collected data were used strictly for academic purposes and handled with appropriate care to prevent unauthorized access. Participants were also assured that they could withdraw from the study at any stage without any negative consequences.

IV. FINDINGS & DISCUSSION

4.1 Respondent Profile

The next subsection presents the profile of respondents who took part in the study. This profile includes the profile of the respondents from the student population based on the study levels and the professional profile of the participants interviewed. This profile is essential in providing a background for interpreting the results on the utilization of electronic resources and services in the library.

Table 1

Distribution of Student Respondents by Campus (n = 349)

Campus	Frequency	Percentage (%)
Arusha	235	67.33
Dar es Salaam	78	22.35
Dodoma	18	5.16
Songea	11	3.15
Bukombe	7	2.01
Total	**349**	**100.00**

The results in Table 1 show that Arusha campus contributed the highest proportion of respondents (67.33%), followed by Dar es Salaam campus (22.35%). Dodoma, Songea, and Bukombe campuses contributed smaller proportions. This distribution ensured representation of all campuses while reflecting their relative population sizes.

Table 2

Student Respondents by Study Level (n = 349)

Study Level	Frequency	Percentage (%)
Bachelor's	276	79.08
Postgraduate	73	20.92
Total	**349**	**100.00**

The results in Table 2 indicate that the majority of respondents were Bachelor's degree students (79.08%), while postgraduate students accounted for 20.92%. This distribution reflects the general enrollment structure of the institution while ensuring representation of postgraduate perspectives.

Table 3

Interview Respondents by Professional Category (n = 94)

Category	Frequency	Percentage (%)
Academic staff	67	71.28
IT technicians	11	11.70
Librarians	16	17.02
Total	**94**	**100.00**

Table 3 shows that academic staff formed the largest proportion of interview respondents (71.28%), followed by librarians (17.02%) and IT technicians (11.70%). This distribution ensured that pedagogical, managerial, and technical perspectives were adequately represented in the qualitative findings

4.2 Status of Electronic Resources

This section focuses on the availability status of the electronic resources and library services within the campuses of the Institute of Accountancy Arusha (IAA). The analysis of the status of the available resources, which are

e-journals, e-books, online databases, and institutional repositories, is carried out with regards to the access and utilization of the resources by the students within the campuses of the concerned institutions. From the findings, the main campuses of the concerned institutions have the basic electronic resources, although the access and utilization status differ from campus to campus. The main campus shows higher access status compared to the satellite campuses. The respondents from the satellite campuses complained of the lack of internet connectivity, which affected the utilization of the available resources.

4.3 Informatics Infrastructure and Access

This subsection analyzes how informatics infrastructure and system-related factors influence access to electronic resources. Particular attention is given to internet connectivity, system accessibility, and the functionality of digital library platforms across campuses.

The results show that more than half of the respondents (about 58%) reported easy access to library electronic resources. However, around 14% experienced difficulties, while a notable proportion remained neutral. This indicates that although electronic resources are generally accessible, access is not equally satisfactory for all students. In terms of academic usage, approximately 57% of students reported using library databases for assignments and research activities. At the same time, nearly one fifth of the respondents indicated that they do not rely on library databases. These findings suggest that while electronic resources play an important role in academic activities, their utilization is not yet consistent among all students.

The study found that more than half of the students could access electronic resources, but consistent utilization of library databases remained moderate. This finding is consistent with studies conducted in African universities, which reported that availability of electronic resources does not always guarantee effective utilization (Mushi & Lwoga, 2022; Ndiege & Irura, 2023). From an informatics perspective, this suggests that system accessibility must be supported by user skills, system design, and institutional support. The Information Systems Success Model explains that system quality, information quality, and service quality jointly influence system use (DeLone & McLean, 2016). In this study, gaps in usage indicate that some of these components are not fully optimized. In line with the Information Systems Success Model, the findings demonstrate that system quality and service quality significantly influence users' continued utilization of electronic resources across campuses.

4.4 Informatics Challenges

This subsection identifies the major informatics-related challenges affecting the effective utilization of electronic resources and library services across campuses. The findings indicate that internet connectivity is the most significant challenge influencing access to electronic resources. More than 73% of respondents reported that unstable internet connectivity limits their ability to access and use electronic resources effectively. This result highlights the strong relationship between ICT infrastructure and academic information access in digital library environments. Similar findings have been reported in Tanzanian and other African higher education institutions, where infrastructural limitations continue to affect digital learning and access to electronic resources (Mwantimwa et al., 2021; World Bank, 2023). These findings are further supported by Kimayani (2026), who reported that infrastructural limitations and user competencies significantly affect access to digital information resources in Tanzanian academic institutions

The study also revealed that limited skills in using library databases affect the effective utilization of electronic resources. Nearly half of the respondents acknowledged difficulties in navigating academic databases, suggesting that digital literacy remains an important factor influencing electronic resource usage. This observation supports the argument that digital literacy is a critical component in informatics-driven information environments (Alghamdi & Beloff, 2024). In addition, moderate levels of satisfaction with library staff support suggest that service delivery mechanisms require further strengthening. Although library and ICT support services exist within the institution, their visibility and consistency across campuses appear to vary. Strengthening user support systems and improving technical assistance could therefore enhance the overall effectiveness of electronic resource utilization across the multi-campus environment.

4.5 Influence of Artificial Intelligence Tools

This subsection explores the growing role of artificial intelligence tools in shaping students' academic information-seeking behavior. The findings indicate that the use of artificial intelligence tools has become common among students. About 44% of respondents agreed or strongly agreed that they use AI tools for assignments, while approximately 36% remained neutral and about 20% disagreed. This suggests that although AI tools are widely adopted, a considerable number of students remain cautious or uncertain about their use. In relation to research activities, nearly 46% of students reported using AI tools, while about 36% were neutral and less than 18% indicated that they do not use them. These results show that AI tools are increasingly integrated into students' academic practices, although traditional academic approaches continue to remain relevant.

The findings indicate that artificial intelligence tools have become increasingly common among students, particularly for assignments and research activities. This confirms that AI technologies have become part of students' academic practices. Similar observations were reported by Tenopir et al. (2023), who noted that students increasingly rely on intelligent digital tools to support learning and research. The growing use of AI tools also aligns with the Technology Acceptance Model, which explains that perceived usefulness and ease of use influence technology adoption (Venkatesh et al., 2012).

However, the presence of a large neutral group suggests that some students are still uncertain about the academic value and ethical implications of AI tools. This supports concerns raised by UNESCO (2023), which emphasize the need for guidance on responsible and ethical use of AI in education. The findings therefore indicate that AI tools are not replacing academic resources, but rather reshaping how students interact with information systems. These findings further support the Technology Acceptance Model (TAM), which emphasizes perceived usefulness and ease of use as critical factors influencing technology adoption. The widespread but cautious use of AI tools reflects varying perceptions of their academic value and system reliability.

4.6 Optimization Strategies

This subsection presents strategies identified by respondents for improving the utilization of electronic resources and enhancing library service delivery within the multi-campus environment. The findings show that most students prefer using both AI tools and library databases in their academic work. About one quarter preferred AI tools only, while less than one fifth preferred library databases only. Very few students reported not using either option. These results demonstrate a shift toward blended information-seeking behavior where students combine modern AI technologies with traditional academic resources. Training and internet connectivity were strongly supported as improvement strategies. More than 90% of respondents agreed that training would enhance their ability to use library databases effectively. Similarly, a large majority supported improved internet connectivity as a key requirement for strengthening electronic resource utilization across campuses.

The preference for combining AI tools and library databases demonstrates a shift toward blended information-seeking behavior. This confirms that students do not view AI and library resources as competing systems, but as complementary tools. Similar findings were reported by Tenopir et al. (2023), who observed that users integrate multiple digital tools to satisfy academic needs. This behavior supports the Diffusion of Innovation theory, which explains how users adopt new technologies while still maintaining traditional systems (Rogers, 2003). In the context of this study, AI tools represent innovation, while library databases represent established academic systems. This blended use of AI tools and library databases reflects the Diffusion of Innovation theory, where new technologies are adopted alongside established systems rather than fully replacing them. Strong support for training and improved internet connectivity highlights the importance of institutional investment in both human and technical capacities. This aligns with UNESCO (2023) and World Bank (2023), which emphasize that digital transformation in education requires both infrastructure development and continuous capacity building. Training improves perceived ease of use, while internet improvement enhances system accessibility. Together, these factors promote effective adoption and sustainable use of electronic resources.

4.7 Summary of Findings

The findings of this study indicate that electronic resources and digital library services are available across the campuses of the Institute of Accountancy Arusha (IAA), including e-journals, e-books, online databases, and institutional repositories. However, their effective utilization varies across campuses due to differences in internet connectivity, ICT infrastructure, and the level of user support available. While the main campus reported relatively better access to electronic resources, respondents from satellite campuses experienced challenges related to unstable internet connectivity and limited technical support.

The study also revealed that informatics infrastructure and system factors significantly influence students' ability to access and utilize electronic resources. Although a majority of students reported having access to library electronic resources, consistent use of academic databases was not universal. Some students indicated limited reliance on library databases for assignments and research, suggesting that accessibility alone does not guarantee effective utilization. In addition, several informatics-related challenges were identified, including unstable internet connectivity, limited skills in using library databases, and varying levels of support from library and ICT staff. These challenges affect students' ability to effectively access and utilize electronic resources across campuses.

The findings further show that artificial intelligence tools are increasingly being used by students to support academic tasks such as assignments and research activities. Many students indicated a preference for combining AI tools with traditional library databases, reflecting emerging blended information-seeking behavior within the academic environment. Finally, respondents strongly supported strategies aimed at improving electronic resource utilization, particularly improved internet connectivity and training on the effective use of library databases. These strategies

highlight the importance of strengthening both technological infrastructure and user capacity in order to optimize electronic resource management and library service delivery within a multi-campus higher education institution. The discussion shows that informatics-driven optimization of electronic resources requires a balanced integration of technology, skills, policy, and institutional collaboration. AI tools are reshaping academic information behavior, but they cannot replace the academic value of library electronic resources. Instead, both systems must be harmonized to support academic excellence in multi-campus higher education environments. This finding is consistent with previous research conducted in Tanzanian universities, which highlighted similar challenges related to access and utilization of digital information resources (Kimayani, 2026).

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study examined informatics-driven optimization of electronic resources and library services in a multi-campus higher education institution, using the Institute of Accountancy Arusha as a case study. The findings provide important insights into how informatics infrastructure, system coordination, user capacity, and emerging digital tools influence access to and utilization of electronic resources in a multi-campus environment.

Regarding the first objective, the study concludes that informatics infrastructure and system factors play a significant role in determining access to electronic resources across campuses. Although electronic resources were available at all campuses, differences in internet reliability, system performance, and technical support resulted in unequal access. These findings demonstrate that effective access to electronic resources in multi-campus institutions depends not only on resource availability but also on the strength and consistency of underlying informatics infrastructure and system management. Regarding the second objective the study concludes that several informatics-related challenges negatively affect the utilization of electronic resources and library services. Key challenges include unstable internet connectivity, limited user skills in navigating library databases, and inconsistent support services across campuses. These challenges reduce effective use of subscribed electronic resources and contribute to uneven academic experiences among students. The findings emphasize the importance of addressing both technical and human factors in informatics-driven environments.

Regarding the third objective the study found that artificial intelligence tools have a noticeable influence on students' use of library electronic resources. Students increasingly combine AI tools with library databases due to convenience, speed, and accessibility. While this blended approach supports academic work, it also raises concerns related to academic integrity, quality of information, and reduced engagement with authoritative library resources. This indicates a need for libraries to guide the responsible and complementary use of AI tools within academic information systems. Regarding the fourth objective, the study concludes that informatics-driven strategies are essential for improving electronic resource management and library service delivery in multi-campus higher education institutions. Effective optimization requires integrated approaches that combine infrastructure improvement, continuous user training, coordinated system management, and clear institutional policies. Harmonizing these elements across campuses can enhance equitable access, improve utilization of electronic resources, and strengthen the overall academic information environment. Overall, the study concludes that informatics-driven optimization provides a practical and sustainable framework for addressing access disparities, utilization challenges, and emerging digital trends in multi-campus higher education institutions. By aligning technology, users, and organizational structures, institutions can enhance the effectiveness of electronic resources and library services and support improved academic outcomes.

5.2 Recommendations

Based on the findings of this study, the following recommendations are proposed to support informatics-driven optimization of electronic resources and library services in multi-campus higher education institutions. First, the management of the Institute of Accountancy Arusha (IAA) should prioritize the improvement and harmonization of digital infrastructure across all campuses. This includes upgrading internet bandwidth, improving network reliability, and ensuring consistent system performance, particularly in satellite campuses. Strengthening infrastructure is essential for reducing disparities in access to electronic resources and supporting effective utilization of digital library services.

Second, the IAA Library Directorate should strengthen capacity-building initiatives by implementing continuous training programs for students and academic staff on the effective use of electronic resources. These programs should focus on database searching skills, evaluation of scholarly information, and responsible integration of artificial intelligence tools with library resources. In addition, the Library Directorate should enhance awareness and outreach activities to improve visibility and use of subscribed electronic databases across all campuses. Third, the Information and Communication Technology (ICT) Departments should enhance system management and technical support services related to electronic resource access. This includes improving authentication mechanisms, ensuring regular system maintenance, and providing timely technical assistance to users. Close collaboration between ICT

departments and library staff is necessary to ensure smooth operation of electronic resource systems and consistent service delivery in a multi-campus environment.

Fourth, institutional policymakers and academic leadership should develop and enforce clear policies and guidelines on the academic and ethical use of artificial intelligence tools in higher education. These policies should promote the complementary use of AI tools and library electronic resources while safeguarding academic integrity and information quality. Harmonized policies across campuses will support responsible technology adoption and consistent informatics practices. Finally, future researchers are encouraged to conduct similar informatics-based studies in other multi-campus higher education institutions to enhance the generalizability of the findings. Further research should also examine the long-term effects of artificial intelligence tools on scholarly information behavior and evaluate the effectiveness of informatics-driven interventions in improving access to and utilization of electronic resources.

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