

Examining the Role of Students ID Scanning System in Strengthening Libraries Security in Tanzania Higher Learning Institutions

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Abstract

This study examines the role of student ID scanning systems in strengthening library security in higher learning institutions in Tanzania. The study was conducted in response to challenges in many Tanzanian libraries, including manual or traditional access methods, which lead to poor user records, time-consuming processes, vulnerability to unauthorized access, misuse of library resources such as books, novels, and magazines, misunderstandings between users and staff, and reduced service delivery. The study adopted a mixed-methods approach, combining qualitative and quantitative methods to obtain comprehensive data from 140 students. Quantitative data were collected through a survey and analyzed using descriptive statistics, while qualitative data were collected through in-depth interviews and group discussions and analyzed using thematic analysis. The study indicates that a student ID scanning system will improve efficiency, reduce unauthorized entry and material loss, increase accountability, and support orderly operations. It also identifies technical failures and infrastructural limitations. The benefits of this study include library staff, students who use the library, university academic staff, and the government. They will benefit by receiving evidence-based information to support adoption, leading to the development of effective security in library systems in our country's higher learning institutions.

Keywords: ID scanning system, student ID scanning system, Role of student ID scanning system, Library security, Higher learning institution

1. Introduction

The rapid development of information and communication technologies has led to the widespread adoption of automated identification systems across different sectors, including healthcare, agriculture, industry, tourism, and public services (Laudon & Laudon, 2020). Traditionally, identification and record-keeping activities in these sectors relied on manual methods that were often inefficient, time-consuming, and prone to errors, fraud, and unauthorized access (Al-Khouri, 2014; Breeding, 2015). In response to these challenges, ID scanning systems have been introduced to provide accurate, secure identification and fast asset tracking using technologies such as barcodes, radiofrequency identification, and QR codes (Want, 2006; Adeyemi & Adesina, 2019). These systems enable real-time data capture, improved monitoring of activities, and enhanced decision-making by ensuring that only authorized users can access services, facilities, or resources (Adebayo & Akinwale, 2020). Studies further indicate that integrating low-cost, web-based ID scanning technology has improved operational efficiency and accountability across public and private sectors, particularly in developing economies where resource optimization is critical (Law et al., 2018; Patel & Jain, 2019).

The increasing use of digital technologies in the education sector has led to the adoption of student ID scanning systems to improve identification, access control, and the management of academic activities (Laudon & Laudon, 2020). In the past, student identification at institutions relied on manual verification of ID cards (physically) and paper-based records, which were inefficient, prone to impersonation, and made managing the student population challenging (Breeding, 2015; Adebayo & Akinwale, 2020; Shrivastava A et al., 2023). Student ID scanning systems use technologies such as QR codes, barcodes, and RFID to automatically authenticate students and record their activities in real time, thereby enhancing security, accuracy, and operational efficiency (Adeyemi & Adesina, 2019; Want, 2006). These

systems are widely used for library access, attendance monitoring, examination verification, and access to campus facilities, ensuring that only authorized students receive institutional services (Okoye & Mariri, 2021). Furthermore, studies indicate that the use of web-based and low-cost student ID scanning technologies has improved accountability and service delivery in educational institutions, particularly in developing countries where efficient resource management is essential (Law et al., 2018; Patel & Jain, 2019).

The growing demand for secure and efficient management of library resources has led to the adoption of student ID scanning systems as a key component of modern library security frameworks. Traditionally, library access and usage monitoring relied on manual sign-in registers and visual inspection of student identification cards, methods that were often unreliable, time-consuming, and vulnerable to unauthorized access and misuse of library materials (Breeding, 2015; Adebayo & Akinwale, 2020). Student ID scanning systems employ technologies such as QR codes, barcodes, and RFID to automatically verify users and record entry and service usage in real time, thereby enhancing access control and accountability within the library environment (Adeyemi & Adesina, 2019; Want, 2006). These systems enable libraries to restrict access to authorized users, monitor user behavior, and generate accurate usage reports that support effective decision-making and resource management (Okoye & Mariri, 2021). Furthermore, research indicates that integrating web-based, low-cost ID scanning technology improves library security and service delivery, particularly in higher education institutions in developing countries (Law et al., 2018; Patel & Jain, 2019).

Student ID scanning systems enhance identification accuracy, access control, and operational efficiency in educational environments. By automating student verification, these systems reduce reliance on manual checks, minimize impersonation and unauthorized access (Adeyemi & Adesina, 2019; Adebayo & Akinwale, 2020; Ulven & Wangen, 2021). They also enable real-time recording of student activities, allowing institutions to monitor attendance, regulate access to facilities such as libraries and examination halls, and generate reliable data for administrative and security purposes (Want, 2006; Okoye & Mariri, 2021). Additionally, technologies such as QR codes and RFID support faster service delivery and improved accountability by ensuring that institutional services are accessed only by authorized users (Law et al., 2018; Patel & Jain, 2019). Overall, student ID scanning systems play a crucial role in strengthening institutional security, improving resource management, and supporting informed decision-making in modern educational systems (Laudon & Laudon, 2020).

In higher education institutions, student ID scanning systems play a critical role in strengthening library security and improving the management of library resources. By automating student identification using technologies such as QR codes, barcodes, or RFID, these systems ensure that only authorized users gain access to library facilities, thereby reducing unauthorized entry and misuse of library services (Adeyemi & Adesina, 2019; Want, 2006; Ajegbomogun, 2004). Unlike manual verification methods, ID scanning systems provide accurate, real-time authentication, enhancing accountability and minimizing impersonation in the library environment (Adebayo & Akinwale, 2020). Oyewusi and Oyeboade (2009) discussed the importance of access to collections in supporting the university's mission. One reason for encouraging accessibility of library resources to users is to make efforts toward minimizing or avoiding library theft. It is equally important to ensure that security is performed as seamlessly as possible, without interfering with the library's objective of providing a user-friendly environment (McComb, 2004). A user-friendly library environment can be achieved when library security measures are highly prioritized.

Furthermore, student ID scanning systems support effective monitoring and control of library usage by automatically recording entry and exit events and linking them to service access data. This information enables library administrators to track user behavior, identify peak usage periods, and detect security risks such as overcrowding or suspicious activity (Breeding, 2015; Okoye & Mariri, 2021). The availability of reliable usage data also supports informed decision-making in areas such as resource allocation, staffing, and policy development. Additionally, the integration of web-based and cost-effective ID scanning technologies improves operational efficiency and service delivery, particularly in higher learning institutions in developing countries where libraries face challenges related to limited resources and increasing user populations (Law et al., 2018; Patel & Jain, 2019; Oladokun et al., 2024). Overall, student ID scanning systems significantly enhance library security, improve service management, and support sustainable library operations in higher education institutions.

1.1. Research questions

This study answered the following research questions:

- i. How does the student ID scanning system contribute to access control in library security within higher learning institutions in Tanzania?
- ii. How does the student ID scanning system support library management and decision-making in higher learning institutions?
- iii. What challenges affect the effectiveness of student ID scanning systems in strengthening library security in Tanzania?

2. LITERATURE

The existing literature indicates that ID scanning systems play a significant role in enhancing security, efficiency, and accountability across sectors, including education and public services. Studies show that QR code technologies enable accurate, automated identification, reducing impersonation and human error while improving access control (Want, 2006; Adeyemi & Adesina, 2019). Research further demonstrates that ID scanning systems support real-time data collection and monitoring (Breeding, 2015; Adebayo & Akinwale, 2020). The success of ID scanning systems largely depends on user acceptance. The Technology Acceptance Model (TAM), developed by Davis (1989), holds that perceived usefulness and perceived ease of use significantly influence users' willingness to adopt new technologies. Despite these benefits, challenges related to system costs, technical reliability, and data security remain, underscoring the need for continued research and improved system design (Laudon & Laudon, 2020).

2.1. Student ID Scanning System

Student ID scanning systems enhance library security by controlling access and allowing only authorized users to enter the library premises (Kumar & Singh, 2020). Studies show that automated identification technologies, such as QR codes and barcodes, enable reliable student authentication and reduce instances of impersonation and unauthorized access (Want, 2006; Adeyemi & Adesina, 2019). They also help reduce theft and misuse of resources by maintaining accurate digital logs of user activity, thereby improving accountability and enabling quick responses to security incidents (Ahmed, Hassan, & Ali, 2021). However, existing studies also highlight challenges with system reliability and data security, underscoring the need for well-designed, secure implementation frameworks (Laudon & Laudon, 2020).

2.2. Role of Student ID Scanning System

The student ID scanning system provides accurate student identification, enhances security, and improves the efficiency of administrative and academic processes within educational institutions. By automating student verification with technologies such as QR codes and barcodes, the system reduces impersonation and unauthorized access to institutional facilities and services (Want, 2006; Adeyemi & Adesina, 2019). Student ID scanning systems support real-time recording of student activities, including attendance monitoring, library access, and examination authentication, thereby enhancing accountability and enabling data-driven decision-making (Breeding, 2015; Adebayo & Akinwale, 2020). Additionally, these systems facilitate faster service delivery and better resource management, contributing to improved institutional governance and service quality in higher education institutions (Laudon & Laudon, 2020).

2.3. Library Security

Library security encompasses the policies, procedures, and measures designed to safeguard library collections, facilities, staff, and users from theft, vandalism, and unauthorized access (Alemna, 2006). Traditional security methods, such as sign-in books, are often ineffective at preventing unauthorized access, theft, and misuse of library materials (Breeding, 2015). A number of studies (Lorenzen, 1996; Momodu, 2002; Ajegbomogun, 2004; Ugah, 2007; Ifidon, 2000) acknowledge that some individual users of academic libraries exhibit disruptive or criminal behavior within the library environment, which can pose security problems. To address these challenges, student ID scanning systems have been introduced to strengthen access control and user accountability. By verifying users via QR codes and ID scanning, these systems ensure that only authorized students access library facilities and services (Want, 2006; Adebayo & Akinwale, 2020). Furthermore, the use of ID scanning systems supports accurate record-keeping and informed decision-making, thereby enhancing overall library security and service efficiency in higher education institutions (Adeyemi & Adesina, 2019; Laudon & Laudon, 2020).

2.4. Tanzania Higher Learning Institutions

In Tanzanian higher learning institutions, the rapid rise in student enrollment has created significant challenges in managing access to library facilities and safeguarding information resources. Existing studies indicate that many academic libraries in Tanzania still rely on manual or semi-automated security procedures, such as visual inspection of student identity cards and manual attendance records, which are inefficient, error-prone, and vulnerable to unauthorized access (Mwantimwa & Moyo, 2017). Literature on educational security systems highlights that student ID scanning technologies, including QR codes and barcode-based systems, improve access control, enhance accountability, and support effective monitoring of library usage in higher education environments (Breeding, 2015; Laudon & Laudon, 2020). Although empirical studies specifically focused on Tanzania are limited, related research suggests that adopting automated student ID scanning systems can significantly strengthen library security, reduce impersonation, and improve service efficiency in Tanzanian higher learning institutions, where resources are often constrained and security demands are increasing (Adebayo & Akinwale, 2020).

In higher learning institutions, student ID scanning systems play an important role in strengthening library security by enabling accurate identification, controlling access, and monitoring library usage. By replacing manual security methods, these systems reduce unauthorized access, improve accountability, and support efficient management of library resources. However, such solutions require significant expertise, investment, and ongoing maintenance, which may exceed the capabilities of resource-constrained libraries (Javed et al., 2022)

3. METHODOLOGY

3.1. Research Design

A mixed-methods approach was used in this study, combining qualitative and quantitative methods. This approach provides a comprehensive understanding of the role of a student ID scanning system across all higher learning institutions in Tanzania in strengthening library security. In this study, the quantitative method was applied to assess the security of information resources, and the qualitative method was used to explore the role of the student ID scanning system in strengthening library security. These methods were used to generate results that would help solve the previous problem. A structured questionnaire was used with three (3) guiding points to collect data from respondents on security measures (Agree = 3, Disagree = 2, I don't know = 1).

3.2. Study area

The study area of the research is higher learning institution libraries in Tanzania. The area selected is where students find materials such as books, articles, and journals; references; and private study spaces that will help them improve their academic performance. This area needs high security because it contains a large population with different behaviors. The research conducted a comprehensive search of academic databases, including Research Gate, Google Scholar, and Web of Science.

3.3. Sampling and Size

Participants in the study are undergraduate and postgraduate students at higher learning institutions. These participants are selected because they provide accurate and trustworthy information in response to the questions posed. The study selects 140 participants through simple random sampling, including 66 males and 74 females, from a few universities in Tanzania. Each student has an equal chance of being included and of answering the required questions. This method helps ensure a representative sample of students and reduces bias. The researcher adheres to ethical guidelines and principles throughout the review process and will ensure the protection of participants, ethical research conduct, and confidentiality during the processes.

3.4.Data Collection Method

Both quantitative and qualitative approaches were employed in the data analysis and in the collection of data. Descriptive analysis (frequency and percentage) was used to analyze responses to Agree/Disagree/I don't know, and qualitative data were collected through in-depth interviews and focus group discussions (FDGs), where respondents were free to explain their perspectives on specific topics. Open-ended questions allowed students to share detailed experiences, opinions, and challenges related to the student ID scanning system in libraries. The data collection instruments used were a structured questionnaire for the quantitative method and a semi-structured interview guide with focus group discussions for the qualitative method.

3.5.Data Analysis

Johnson & Christensen (2008) define data analysis as the transformation, remodeling, and revision of data to solve an issue. We analyzed the data using quantitative and qualitative methods. Data from closed-ended questions were examined using frequencies, percentages, and means. Data from open-ended surveys, observations, and semi-structured interviews were grouped into themes aligned with the study questions. However, the five Likert scales were reduced to three to facilitate addressing all basic study questions. To do so, the first two scales (strongly agree + agree) were combined. The final two (strongly disagree + disagree) were categorized as disagree. SPSS was used to examine the data. The undecided intermediate scale was retained. Nested interview and observation data supported and strengthened the quantitative findings. Finally, a summary, conclusion, and suggestions were drawn from the data.

3.6.Ethical Considerations

Participation in this study was fully voluntary, and participants retained the right to withdraw their consent at any time, for any reason, without incurring any duties or repercussions. Initially, both the researchers and volunteers participated in the informed consent process. Participants were provided with comprehensive information regarding the study's aim, goals, and objectives. They were explicitly directed to provide their comments with clarity and integrity. Moreover, ethical considerations included securing research approval, safeguarding participant confidentiality, and promoting a respectful and transparent research atmosphere.

4. RESULTS AND DISCUSSION

4.1.The student ID scanning system's contribution to access control in library security within higher learning institutions in Tanzania

Student ID scanning systems enable access control in Tanzanian higher education institutions by allowing only authorized users into libraries, thereby reducing unauthorized access, theft, and misuse of resources (Laudon & Laudon, 2020; Adebayo & Akinwale, 2020). The system maintains digital records of entries and exits, enabling monitoring of library traffic and improving security management (Mwantimwa & Moyo, 2017). However, for both students and staff, the system promotes accountability, fostering awareness that their movements are recorded and encouraging adherence to library rules. In contexts with high student populations and limited staff, ID scanning systems also improve operational efficiency by reducing congestion at entry points (Breeding, 2015).

Table 1 below presents responses from respondents who shared their views on the question, "How does the student ID scanning system contribute to access control in library security within higher learning institutions in Tanzania?" In this study, a qualitative approach was used, and questions were asked through interviews with various respondents, including students of both genders. The interviews were successfully conducted and yielded positive outcomes. The majority of students demonstrated a high level of cooperation.

Table 1:

Respondents' Response on the student ID scanning system's contribution to access control in library security within higher learning institutions in Tanzania

S/N	Comments
Respondent 10.	She states that the ID scanning system ensures that only registered students can enter the library by using a student ID with a QR code. She explains that <i>"before the scanning system (ordinally), anyone could enter the library easily, but now every student must scan their ID, which helps to reduce intruders and improve safety."</i> This response highlights the system's effectiveness in restricting access to authorized users only. This view aligns with studies that indicate that electronic identification systems are effective in preventing unauthorized access and reducing security breaches in academic libraries (Adebayo & Akinwale, 2020; Breeding, 2015)
Respondent 120.	He agrees with the system's role in promoting discipline and compliance with library rules, explaining that <i>"because our ID is scanned before entering, now students behave responsibly since they know their presence and details are recorded."</i> This suggests that the system not only controls access but also encourages responsible behavior among library users. This observation is supported by previous research suggesting that electronic access control systems promote user accountability and discipline by creating traceable logs of user activity (Laudon & Laudon, 2020; Omekwu, Eke, & Odoh, 2019).
Respondent 77.	This respondent, as a leader, observed that the system protects library resources by limiting misuse and that it provides good management of materials, explaining that <i>"when access is controlled, it becomes easier to protect books and facilities from theft and damage as well as provide systematic management of materials and facilities."</i> This highlights the indirect role of access control in safeguarding library materials.
Respondent 98.	She explained that scanning student IDs creates awareness among users that their entry is recorded, which helps the library monitor them. Similar observations have been reported in the literature, noting that digital access logs improve accountability and supervision in academic libraries (Laudon & Laudon, 2020).

Source: Field Data

The views of student respondents indicate that student ID scanning systems are an effective mechanism for strengthening access control in academic libraries at higher learning institutions in Tanzania. Students consistently reported that the system restricts library entry to authorized users only, suggesting that ID scanning reduces unauthorized access and enhances library safety. This finding supports existing studies that identify electronic identification systems as reliable tools for regulating entry and preventing security breaches in academic libraries (Breeding, 2015; Adebayo & Akinwale, 2020).

Furthermore, students emphasized that the system fosters accountability among students and staff because entries are electronically recorded. For staff, this allows them to track student results and determine how to provide services to users. This awareness appears to positively influence student behavior, as respondents noted increased compliance with library rules and more responsible conduct. These observations align with previous research, which indicates that automated access control systems promote discipline and accountability by making user activities traceable (Laudon & Laudon, 2020; Omekwu, Eke, & Odoh, 2019).

In addition, student respondents highlighted the role of ID scanning systems in managing overcrowding and protecting library resources. By controlling user flow, the system helps maintain order during peak hours and reduces the likelihood of theft or damage to library materials. This finding is consistent

with studies conducted in African academic libraries, which report that access control technologies contribute to both security management and effective utilization of library facilities (Mwantimwa & Moyo, 2017).

Qualitative evidence from students demonstrates that student ID scanning systems contribute significantly to access control by restricting unauthorized entry, reducing manual access to the library, enhancing monitoring and control, encouraging responsible behavior, and supporting the protection of library resources and preventing ethical hacking in the library system. These findings align with the existing literature on electronic security systems in academic libraries. These findings are consistent with existing studies that report electronic identification systems as effective tools for improving access control and security in academic libraries (Breeding, 2015; Mwantimwa & Moyo, 2017; Adebayo & Akinwale, 2020; Laudon & Laudon, 2020).

4.2. How does the student ID scanning system support library management and decision-making in higher learning institutions?

Student ID scanning systems provide accurate, real-time records of library usage, including entry and exit times, peak visiting hours, and student visit frequency. This information will enable library management to monitor and control user behavior, identify peak demand periods, and optimize library operations accordingly. For example, administrators can adjust staffing levels, plan opening hours, and manage resource allocation efficiently based on evidence from the scanning system (Laudon & Laudon, 2020; Breeding, 2015).

Through operational planning, these systems are used to track resource utilization in the library by linking student access to borrowing or reading activities. Library managers can also identify frequently used collections, detect misuse, and respond to potential security threats. This operational planning helps reduce human error, such as errors in writing traditional records, and improves work efficiency. According to (Mwantimwa & Moyo, 2017), this systematic approach reduces reliance on manual monitoring, minimizes human error, and provides actionable insights for decision-making.

Table 2:

Responses to the question "How does the student ID scanning system support library management and decision-making in higher learning institutions?"

S/N	Views
Respondent 15	<i>"The ID scanning system helps the library track daily entry and exit, which makes it easier to determine peak usage hours. This data helps the library plan staffing and allocate resources efficiently."</i> According to Singh and Sharma (2020), access control logs provide real-time usage data that improves planning and resource allocation in libraries.
Respondent 71	<i>"Because the system records every student's details who enters, the library can identify patterns of attendance and adjust opening hours based on actual demand."</i> Creswell (2014) explains that information systems provide managers with organizational data necessary for informed decision-making.
Respondent 114	<i>"When the librarian needs to order new books or renew subscriptions, the ID scanning data helps identify the most active departments and areas of study."</i> Kothari (2004) notes that data from automated systems

	can guide resource acquisition decisions by indicating user needs and behavior.
Respondent 120	<i>“We can see patterns of attendance during exams and peak assignment periods, which helps librarians plan workshops or additional services when most students are present.”</i> Ahmed et al. (2021) found that library access data support better planning of outreach activities and academic services during periods of high usage.
Respondent 138	<i>“The scanning system reduces manual record-keeping errors and gives the library reliable statistics to justify budget requests to university management.”</i> According to Velmurugan (2024), automated identification systems improve record accuracy and provide credible evidence for administrative planning and funding proposals.

Source: Field Data

From Table 2 above, respondents highlighted several important ways in which a student ID scanning system supports the management of libraries and decision-making in higher learning institutions, as detailed below.

4.2.1. Tracking of library usage and allocation of resources

Students A and B emphasized that the ID scanning system enables the library to monitor entry and exit patterns, identify peak usage hours, and adjust staffing and opening hours accordingly. This shows that the system will increase operational data, which will help improve service efficiency, make it easier to allocate required resources, and inform decisions about staff working hours. This finding is consistent with Singh and Sharma (2020), who note that access control logs from electronic systems provide managers with actionable information to enhance library operations.

4.2.2. To informed acquisition of resources

Student C highlighted how ID scanning data can guide book acquisitions and subscriptions by identifying the most active departments and student needs. This shows that ID scanning systems contribute not only to security but also to strategic decision-making about library collections, helping students access resources early and making the library more useful. Kothari (2004) supports this, emphasizing that data from automated systems can inform resource acquisition and ensure that library investments align with user demand.

4.2.3. Enhanced monitoring and security

Student ID scanning, as an observation, highlights the need to monitor students who stay beyond closing hours. It underscores the importance of using ID scanning and implementing policies to enhance library security and time intervals. Adebayo and Ogunleye (2016) similarly found that electronic security systems allow librarians to respond quickly to reduce risks associated with unauthorized access or potential misuse of resources.

4.2.4. Planning academic services

Student E noted that attendance patterns, particularly during exams or assignment-heavy periods, help the library schedule workshops and additional support services. This shows that the system supports the

planning of services provided within the library, as well as decision-making, security, and user engagement. Ahmed et al. (2021) found that electronic access data support proactive management of library programs and improve the delivery of academic services during peak demand. Moreover, implementing emerging technologies requires careful planning, resource allocation, and stakeholder buy-in, which can be hindered by budget constraints, organizational inertia, and resistance to change (Haque et al., 2022).

4.2.5. Reliability and administrative support

Student F emphasized reducing manual errors and providing reliable statistics to support budget requests. This shows that ID scanning systems provide credible, auditable data that strengthen the library's administrative and planning capabilities. This will help the library make a good, known budget through the system's automatic attendance, which will help add materials and facilities used within. Velmurugan (2024) reinforces that automated identification systems enhance record accuracy and provide evidence for decision-making at the institutional level.

4.3. Challenges affecting the effectiveness of student ID scanning systems in strengthening library security in Tanzania?

In order to determine the challenges faced by the libraries studied, respondents were asked to identify with some statements that could reveal the challenges occurring in their libraries. To adequately present the findings of the study, percentages for options such as agreed and disagreed were used in presenting the results in the study.

Table 3:

Challenges affecting the effectiveness of the student ID scanning system

S/N	ID scanning system challenges	Agree (Percentage)	Disagree (Percentage)	I don't know (Percentage)	Total (Percentage)
1.	Poor internet connectivity	112 (80%)	28 (20%)	NIL (0%)	140 (100%)
2.	Inadequate maintenance	98 (70%)	38 (27.1%)	4 (2.9%)	140 (100%)
3.	Lack of technical support	124 (88.6%)	16 (11.4%)	NIL (0%)	140 (100%)
4.	Limited staff understanding	85 (60.7%)	55 (39.3%)	NIL (0%)	140 (100%)
5.	Damage to scanning devices	63 (45%)	55 (39.3%)	22 (15.7%)	140 (100%)
6.	Unexperienced students	119 (85%)	21 (15%)	NIL (0%)	140 (100%)

Table 3 shows that among the items categorized as collection ID scanning system challenges in the library, 88.6% of respondents agreed that a lack of technical support in the library is usually high, and 85% indicated that students' lack of experience with library devices is always low. Eighty percent (80%) of respondents reported that poor internet connectivity in the libraries studied was a challenge. Seventy percent (70%) cited inadequate maintenance in the libraries studied, while 60.7% reported limited staff understanding of how to use the system, which is commonly observed. Also, 45% of respondents reported that damage to scanning devices leads to challenges that affect the effectiveness of ID scanning systems observed in the libraries. The presence of uncertainty (15.7% "I don't know") indicates inconsistent exposure to device failures among respondents. Nevertheless, damaged hardware remains a potential risk to system reliability and the continuity of library security operations. The picture drawn from Table 1 shows that the majority of respondents agreed that a lack of technical support, students' lack of experience, poor internet connectivity, and inadequate maintenance are challenges in both libraries in Tanzanian higher learning institutions. This finding is similar to Salaam & Adeyemi, 2020, who reported that student ID scanning systems used in academic library security face several challenges that reduce their effectiveness. Technical problems such as

unstable electricity supply, weak internet connectivity, and frequent system downtime interrupt automated access control, forcing libraries to revert to manual security methods that are less reliable. In addition, inadequate technical support, limited staff training, and poor system maintenance hinder the proper use of scanning technologies, increasing the risk of unauthorized access and poor monitoring of library resources. Financial constraints further limit system upgrades and long-term sustainability in higher learning institutions, particularly in developing countries (Issa, Amusan, & Daura, 2017; Moyo & Mavodza, 2016; Omekwu, Eke, & Odoh, 2019).

The quantitative findings reveal several significant challenges affecting the effectiveness of ID scanning systems for library access control in higher learning institutions in Tanzania. The majority of respondents (80%) agreed that poor internet connectivity is a major challenge. Since most ID scanning systems depend on network connectivity for real-time verification and data recording, unstable internet can halt all work within the library, as users will not be able to log in or out and the library system will stop for a while. This will lead to a rapid loss of services, delay entry processes, and disrupt service delivery. This finding aligns with studies indicating that ICT-based systems in African institutions are often constrained by unreliable internet infrastructure (Mwantimwa & Moyo, 2017).

Additionally, 88.6% of respondents identified a lack of technical support as a major problem, while 70% cited inadequate maintenance. These high percentages suggest that technical sustainability remains a critical issue. The lack of technicians for the equipment used to access these systems is a problem because the equipment requires maintenance, regular system updates, and monitoring to keep the system stable, secure, and to reduce damage to devices such as desktops. Without regular system updates, maintenance, and skilled technical personnel, electronic access systems may malfunction or operate inefficiently. Similar findings have been reported by Adebayo and Akinwale (2020), who argue that technological security systems require continuous institutional support to function effectively.

The findings further show that 60.7% of respondents agreed that limited staff understanding is a challenge, while 85% indicated that some students lack experience using the system. Because students have low awareness of how to scan student IDs, retrieve records of all activities completed in a day, and use the system to generate QR codes for entry and exit, the solution is to provide regular training, especially for new students and employees, to build proficiency and help others continue to get used to new comers. This suggests that user training and digital literacy play an important role in the success of ID scanning technologies. According to Laudon and Laudon (2020), the effectiveness of information systems depends not only on the technology itself but also on users' skills and organizational support structures.

Lastly, the damage to scanning devices indicates that not all universities in Tanzania are experiencing this problem. 45% of respondents agreed that damage to scanning devices is a challenge due to maintenance practices and even the professionals responsible for maintaining the devices. However, 39.3% disagreed, likely because they found skilled professionals who installed the devices well and maintain them. We also see that 15.7% of students do not know, meaning they are newcomers to that area and are uncertain. This mixed response may indicate that device damage occurs occasionally but is not universally experienced across all institutions. However, physical damage to equipment can compromise system reliability and increase operational costs.

Overall, the findings suggest that while ID scanning systems enhance library security, their effectiveness is constrained by infrastructure, technical, and user-related challenges. Addressing internet connectivity issues, improving maintenance and technical support, and providing adequate training for staff and students are essential to maximizing the system's benefits in higher learning institutions in Tanzania.

5. Conclusion and Recommendation

5.1. Conclusion

This research revealed that student ID scanning systems will significantly improve work efficiency, reduce unauthorized entry and material loss, and increase accountability, supporting orderly operations. Quantitative data highlighted challenges, including technical failures such as poor internet connectivity and infrastructure limitations, as well as limited user experience for both students and staff. Qualitative data explained how these factors affect daily activities. The system also supports library management in decision-making by providing accurate records of library usage and resource utilization. Although challenges related to infrastructure and human factors persist, student ID scanning systems remain a critical tool for enhancing security, enabling data-driven administrative decisions, and promoting responsible library use within the library systems of our country's higher learning institutions.

Based on both quantitative and qualitative findings, the study concludes that student ID scanning systems significantly enhance access control in academic libraries at higher learning institutions in Tanzania. Quantitative results showed that the majority of student respondents agreed that the system restricts unauthorized entry, improves user monitoring, and strengthens overall library security. These findings align with previous studies indicating that electronic access control systems improve institutional security by regulating entry and enhancing surveillance efficiency.

Qualitative responses further supported these statistical results. Students explained that ID scanning systems promote accountability and trust because each entry is electronically recorded, thereby encouraging responsible behavior and compliance with library regulations. Innovations are emerging at an exponential rate, making it challenging for libraries to keep pace with the latest developments and select the most suitable solutions for their needs. They also noted that the system helps reduce overcrowding and minimizes theft or misuse of library resources. Both quantitative and qualitative methods were used to confirm that student ID scanning systems are the primary tools for strengthening library security and managing student access. The findings align with research conducted in African academic libraries, which highlights the importance of technological security solutions in safeguarding library resources and maintaining orderly learning environments. Therefore, ID scanning systems are a valuable component of modern library security frameworks in higher learning institutions. By embracing collaboration, investing in staff development, and prioritizing ethical principles, libraries can overcome these challenges and harness the transformative power of emerging technologies to safeguard knowledge and empower communities in the digital age.

5.2. Recommendation

Firstly, it is recommended that higher learning institutions invest in reliable ICT infrastructure in libraries, including a stable power supply, network connectivity, and modern scanning devices, to ensure uninterrupted operation, high performance, and secure, efficient ID scanning systems. Secondly, the study recommends that every institution in Tanzania conduct routine maintenance of the system and the devices used to perform tasks within the library, and that periodic upgrades to the ID scanning system will increase efficiency, speed service delivery, and improve quality while minimizing system failures and enhancing functionality. An up-to-date system enhances accuracy and reduces technical challenges. Thirdly, it is recommended that a written security policy be posted on notice boards in institutional libraries for the user's benefit. A regulatory authority helps users understand the rules for entering the library, borrowing books, and searching for materials within the system. This will help library activities proceed in an orderly, systematic way. Furthermore, it is recommended that library administrators, in partnership with the Ministry of Energy, invest in renewable energy sources, such as solar panels or backup generators. This will help when normal electricity from TANESCO is turned off, allowing activities to continue within the institution. This will help provide a stable power supply for the institution, ensuring uninterrupted operation of the electronic security system during outages. Finally, the study recommends that, through Tertiary Education

Trust Fund (TET Fund) sponsorships, in-house periodic workshops, programs, and certification courses on cyber security, physical security management, and emerging threats could be organized, equipping librarians with the skills needed to protect both physical and digital resources effectively. Library management must ensure that staff participate in mandatory workshops and digital tutorials to improve user orientation. Additionally, these libraries should conduct quarterly reviews to assess progress, using feedback surveys and incident reports to evaluate effectiveness and improve the security of their collections.

REFERENCES

- Shrivastava A, Suji Prasad SJ, Yeruva AR, Mani P, Nagpal P, Chaturvedi A. "IoT Based RFID attendance monitoring system of students using arduino ESP8266 & adafruit.io on defined area". *Cybern. Syst.*, 1–12, 2023.
- Adeyemi, A., & Adesina, A. (2019). Design and implementation of an RFID-based student identification system. *International Journal of Computer Applications*, 178(7), 1–6.
- Adebayo, O. A., & Akinwale, A. T. (2020). Application of smart card technology in academic library security. *Library Philosophy and Practice*, 1–12.
- Al-Khouri, A. M. (2014). Digital identity: Transforming government services. *Innovation Journal*, 19(3), 1–14.
- Breeding, M. (2015). Library security and access control technologies. *Computers in Libraries*, 35(5), 12–17.
- Laudon, K. C., & Laudon, J. P. (2020). *Management information systems: Managing the digital firm* (16th ed.). Pearson Education.
- Law, C., So, S., & Ip, K. (2018). QR code-based mobile access control system. *Journal of Network and Computer Applications*, 107, 1–8. <https://doi.org/10.1016/j.jnca.2018.01.003>
- Okoye, K., & Mariri, T. (2021). Access control systems and campus security in higher education institutions. *International Journal of Information Security Science*, 10(2), 89–101.
- Patel, N., & Jain, R. (2019). An automated student attendance system using QR code technology. *International Journal of Advanced Research in Computer Science*, 10(3), 45–50.
- Want, R. (2006). An introduction to RFID technology. *IEEE Pervasive Computing*, 5(1), 25–33.
- Moyo, M., & Mavodza, J. (2016). *Technology adoption and sustainability challenges in African academic libraries*. African Journal of Library, Archives and Information Science, 26(2), 109–121.
- Issa, A. O., Amusan, B. B., & Daura, U. D. (2017). *Library automation and security management in Nigerian academic libraries*. Journal of Applied Information Science and Technology, 10(1), 45–54.
- Omekwu, C. O., Eke, H. N., & Odoh, J. N. (2019). ICT infrastructure and electronic security systems in university libraries. *International Journal of Library and Information Science*, 11(3), 23–31.
- Salaam, M. O., & Adeyemi, A. B. (2020). Electronic identification systems and access control in academic libraries. *Journal of Information Management*, 12(2), 66–78.
- Oyewusi, F.O. & Oyeboade, S.A. (2009). An empirical study of accessibility and use of library resources by undergraduates in a Nigerian state university of technology. *Library Philosophy and Practice*. <http://unllib.unl.edu/LPP/oyewusi-oyeboade.htm>
- Ajebomogun, F.O. (2004). User assessment of library security: a Nigerian university case study. *Library Management*. 25 (8/9): 386-390.
- McComb, M. (2004). *Library security*. San Francisco: RLS Inc.
- Uga, A. D. (2007). Evaluating the Use of University Libraries in Nigeria: A Case Study of Michael Okpara University of Agriculture, Umudike. *Library Philosophy and Practice an e- journal*. Available at: <http://digitalcommons.unl.edu/libphilprac/>
- Ifidon, S. (2000). *Essentials of management of African university libraries*. Benin: University Press.
- Ulven, J. B., and G. Wangen. 2021. "A Systematic Review of Cybersecurity Risks in Higher Education." *Future Internet* 13 (2): 39. <https://doi.org/10.3390/fi13020039>
- Oladokun, B., E. Oloniruha, D. Mazah, and O. Okechukwu. 2024. "Cybersecurity Risks: A Sine Qua Non for University Libraries in Africa." *Southern African Journal of Security* (2024): 1–14.
- Javed, A. R., F. Shahzad, S. ur Rehman, Y. B. Zikria, I. Razzak, Z. Jalil, and G. Xu. 2022. "Future Smart Cities: Requirements, Emerging Technologies, Applications, Challenges, and Future Aspects." *Cities* 129: 103794. <https://doi.org/10.1016/j.cities.2022.103794>

- Haque, A. B., B. Bhushan, and G. Dhiman. 2022. "Conceptualizing Smart City Applications: Requirements, Architecture, Security Issues, and Emerging Trends." *Expert Systems* 39 (5): e12753. <https://doi.org/10.1111/exsy.12753>
- Javed, A. R., F. Shahzad, S. ur Rehman, Y. B. Zikria, I. Razzak, Z. Jalil, and G. Xu. 2022. "Future Smart Cities: Requirements, Emerging Technologies, Applications, Challenges, and Future Aspects." *Cities* 129: 103794. <https://doi.org/10.1016/j.cities.2022.103794>
- Zewdie, T. G., and A. Girma. 2020. "IoT Security and the Role of AI/ML to Combat Emerging Cyber Threats in Cloud Computing Environment." *Issues in Information Systems* 21 (4) 12-31.