

Digital Transformation in School Libraries Management: Evaluating the Effect of Technology Integration on Student Learning and Library Services

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Abstract

This study explores the effect of digital transformation in school libraries in Ghana, focusing on evaluating how technology integration influences student learning outcomes and library services. The research employs a qualitative approach, using semi-structured interviews, document analysis, and direct observations to gather insights from key stakeholders, including students, librarians, and educators. The findings highlight the significant role of digital tools, such as e-books, online databases, and automated library systems, in improving access to information and enhancing the efficiency of library services. However, the study also identifies challenges related to inadequate infrastructure, digital literacy gaps, and the digital divide between urban and rural schools. The research recommends targeted investments in digital infrastructure, equitable resource allocation, continuous professional development programs, and public-private partnerships to address these challenges and optimize the benefits of digital transformation in Ghanaian school libraries. The study suggests that technology can significantly improve educational outcomes and promote equitable access to learning resources for all students by overcoming these barriers.

Keywords: Digital transformation, School libraries, Student learning outcomes, Technology integration, Digital divide, Library services, Ghana



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INTRODUCTION

Digital transformation has revolutionized educational practices globally, including how libraries support student learning and development. Traditionally seen as repositories of physical resources, school libraries are evolving into dynamic, technology-driven learning hubs. This transformation is underpinned by integrating digital tools, artificial intelligence (AI), and online resources, which have enhanced access to information, streamlined library operations, and fostered student engagement. The COVID-19 pandemic accelerated this shift globally, highlighting the importance of robust digital infrastructures in education systems (HIVO, 2023; Softlink, 2023).

In Africa, however, implementing digital technologies in education faces unique challenges. Limited infrastructure, funding constraints, and digital literacy gaps impede widespread adoption. Despite these obstacles, schools across the continent are leveraging innovative solutions, such as mobile technologies and localized digital content, to bridge these gaps and enhance educational outcomes (UNESCO, 2022).

In Ghana, the adoption of digital technologies in school libraries is gaining momentum, driven by national education policies emphasizing ICT integration. Initiatives like the Ghana Library Authority's digitization efforts aim to improve resource accessibility and promote equitable learning opportunities (Amin & Rahman, 2023). Nevertheless, challenges such as inconsistent internet access, limited funding, and insufficient training for librarians and educators persist. These factors necessitate a nuanced evaluation of how technology integration influences Ghanaian schools' student learning and library services.

However, the potential of digital transformation remains underutilized in many Ghanaian school libraries, often due to systemic challenges. The lack of comprehensive strategies for technology integration has resulted in uneven implementation, with rural schools particularly disadvantaged. These gaps in access and effective utilization hinder the realization of technology's full potential in improving learning outcomes and service delivery. Therefore, this study addresses a critical need to evaluate the effect of digital technologies on school libraries in Ghana, identifying successes and persistent barriers to inform future improvements.

The present research seeks to provide an answer to this question: What are the effects of technology integration on student learning and library services?

It is vital to tackle this problem to put a light on that to help students access more library resources by the means of technological tools in order to improve their scientific knowledge.

This will benefit the Ghanaian society by empowering a lot of people in terms of knowledge and by reducing the illiteracy rate and by promoting digital literacy.

The purpose of this study is to examine the effects of technology integration on student learning and library services in Northern Ghana in order to provide some solutions to students' learning challenges. This will help to promote information literacy and digital literacy skill among library users.

LITERATURE REVIEW

According to Nassè (2018) a literature review is necessary to both educate researchers with the current state of knowledge on the research topic and it helps to identify knowledge gaps and unresolved issues that your research can address.

Theoretical Framework

Technology Acceptance Model (TAM)

The Technology Acceptance Model, developed by Davis (1989), explains how users accept and use technology. The model emphasizes two key factors: perceived usefulness (the degree to which a person believes that using a system enhances performance) and perceived ease of use (how effortless the technology appears to be). In school libraries, TAM is relevant for understanding how students, librarians, and educators interact with digital tools and how their attitudes influence technology adoption. Recent studies confirm TAM's applicability in educational settings, suggesting that user training and awareness campaigns significantly influence technology adoption (Venkatesh & Bala, 2022).

Constructivist Learning Theory

Rooted in the work of Piaget and Vygotsky, the constructivist theory asserts that learners construct knowledge through active engagement and interaction with their environment. Technology in school libraries facilitates constructivist learning by providing interactive, learner-centred resources such as e-books, databases, and AI-driven learning tools. These technologies allow students to explore, collaborate, and create knowledge, aligning with constructivist principles (Amin & Rahman, 2023). In Ghana, integrating digital tools can support inquiry-based learning, especially in contexts with limited traditional resources.

Digital Divide Theory

This theory highlights the gap between individuals with access to digital technologies and those without,

emphasizing how infrastructure, skills, and usage disparities impact societal outcomes (Van Dijk, 2020). In Africa, particularly Ghana, digital divide theory is essential for understanding inequities in technology adoption across rural and urban schools. It provides a framework for analyzing barriers such as internet accessibility, funding, and digital literacy, which directly affect the effectiveness of digital transformation in school libraries (UNESCO, 2022).

Conceptual Review

Effect of Technology Integration on Student Learning Outcomes

Technology integration in school libraries significantly impacts student learning outcomes by enhancing access to diverse resources, fostering independent learning, and promoting critical thinking. Digital tools such as e-books, online databases, and educational apps provide students with broader and faster access to information than traditional resources. This aligns with constructivist learning theories, emphasizing active knowledge construction through engagement with resources and collaboration (Amin & Rahman, 2023).

Research shows that technology integration in libraries can improve students' research skills and academic performance. For example, access to digital literacy programs enables students to develop essential 21st-century skills such as information retrieval, evaluation, and ethical use (UNESCO, 2022). However, the effectiveness of these tools depends on their proper implementation, including teacher and librarian training, as well as student orientation (Venkatesh & Bala, 2022). Although initiatives like the Ghana Library Authority's digitization efforts have made strides in Ghana, disparities between rural and urban schools often limit equitable access to these benefits.

Impact of Digital Transformation on Library Services

Digital transformation reshapes library services by improving operational efficiency and expanding service delivery. Technologies like integrated library systems (ILS), AI-driven search tools, and cloud-based solutions have enhanced cataloguing, resource sharing, and user access. These developments enable libraries to meet the evolving needs of students, who increasingly rely on digital resources for research and learning (Softlink, 2023). However, the transformation also demands a redefinition of librarians' roles. Librarians must adopt new competencies, including technical expertise and digital curation skills, to effectively manage and utilize digital systems. While urban libraries in Ghana benefit from better connectivity and infrastructure, rural libraries face challenges in maintaining these systems due to limited technical support and funding (Van Dijk, 2020).

Barriers to Effective Technology Implementation

Several barriers hinder the successful implementation of technology in school libraries, particularly in developing

regions like Ghana. The digital divide, characterized by disparities in internet access, infrastructure, and digital literacy, remains a critical challenge (Van Dijk, 2020). Rural schools often lack the necessary infrastructure, such as reliable electricity and internet, to support digital systems, leaving students in these areas at a significant disadvantage. Additionally, financial constraints limit the acquisition and maintenance of advanced digital tools, while inadequate training for librarians and educators exacerbates the problem (UNESCO, 2022). Cultural and institutional resistance to change also plays a role, as some stakeholders remain sceptical of technology's benefits or fear its potential to disrupt traditional teaching and library practices (HIVO, 2023).

METHODOLOGY

The methodology for this exploratory case study examines the role of academic libraries in enhancing literacy development in Northern Ghana. The study will employ a qualitative research design to provide an in-depth understanding of the significance and contributions of academic libraries to literacy development within higher education in the region.

Research Design: This study employs an exploratory case study approach to investigate the impact of digital transformation on student learning and library services in school libraries in Ghana. The case study methodology is particularly suitable for understanding contemporary phenomena within real-life contexts, offering a comprehensive analysis of the opportunities and challenges associated with technology integration in school libraries (Yin, 2018). The research focuses on the unique context of school libraries in Ghana, examining how digital tools and services contribute to educational outcomes and service delivery.

This research aims to provide a holistic understanding of how digital transformation affects student learning and library services in Ghanaian schools by utilising a qualitative approach and an exploratory case study design. The findings are expected to inform policies and practical strategies to optimize the role of digital technologies in enhancing library services and supporting student learning. The study adopts multiple qualitative data collection methods, including semi-structured interviews, document analysis, and direct observation to achieve diverse and in-depth data.

Sample and Participants: Key stakeholders, such as librarians (8 respondents), educators (10 respondents), and students (12 respondents) were engaged to gather their perspectives on the effect of digital transformation. Thus, the overall sample size is 30 respondents. Semi-structured interviews allowed participants to share detailed experiences and insights, with interviews audio-recorded and transcribed for accuracy. The saturation was reached at 15 respondents, but the researchers have continued the data collection to gather the maximum information.

Instrument and Procedure: The researchers used an interview guide as an instrument to interview the different participants. The participants were asked to give their consent, and a free time to be interviewed (Nassè et al., 2022). The duration of each semi-structured interview was approximately thirty minutes. The recorded semi-structured interviews were transcribed manually.

Data Analysis: Document analysis involved reviewing policies, digitization strategies, and library usage reports to understand technology integration's objectives, practices, and outcomes. Direct observation of library spaces and operations provided insights into the physical and functional changes brought about by digital transformation, with observations recorded in detailed field notes.

Thematic analysis, as described by Braun and Clarke (2006), was employed to analyse the data. This process includes transcribing interviews verbatim, coding transcripts, documents, and observational notes line by line, and organizing these codes into broader themes. These themes were interpreted in light of the study's objectives, existing literature, and theoretical perspectives, such as the Technology Acceptance Model (TAM) and Digital Divide Theory. This approach ensures that the findings are rooted in participants' lived experiences and informed by relevant theoretical frameworks.

Ethical considerations: For Nassè et al. (2022) respondents' identity and information should be kept confidential in terms of research ethical practices. Thus, the researchers have assured to get respondents' consent and they were informed that their collected data is confidential, and it is used for the purpose of this research only.

RESULTS

This presents the findings of the exploratory case study on the impact of digital transformation in school libraries in Ghana. Qualitative data collected through interviews, document analysis, and direct observations were analyzed to understand the contributions of technology integration to student learning and library services. The analysis highlights key themes that emerged from the data.

Enhanced Access to Learning Resources

Respondents emphasized how digital transformation has broadened access to various learning resources, particularly through e-books and online databases. One Librarian remarked;

"With the widespread introduction and integration of digital resources in academic settings, students now have unprecedented access to a wealth of materials that were previously unavailable or difficult to obtain in traditional print formats. This transformation has significantly enhanced the research process, making it more

convenient and far more comprehensive. Students can now explore a diverse range of topics and gather detailed information with just a few clicks, eliminating many barriers to accessing physical resources. This is particularly beneficial for disciplines like science, technology, engineering, and mathematics, where access to up-to-date research findings and specialized publications is crucial. As a result, digital resources have empowered students to deepen their understanding, broaden their knowledge base, and achieve greater academic success."

A student also remarked as follows:

"I can now access books online through the library portal, which is helpful when preparing for exams. Before, we had to rely on the limited textbooks in the library."

Improved Efficiency of Library Services

Digital tools have streamlined library operations, such as cataloguing, book borrowing, and resource management. A librarian remarked as follows:

"The digital cataloguing system has reduced the time it takes to locate and lend books. Students can search for resources online before even stepping into the library."

A student also has this to say:

"The ability to reserve books online has been a game-changer. It saves time for both students and staff, allowing us to focus on more critical learning activities."

Barriers to Effective Technology Utilization

Respondents highlighted challenges such as poor internet connectivity, lack of funding, and insufficient training.

A librarian interviewed said:

"In rural schools, the internet is often unreliable, making it difficult to access online resources. We also struggle with outdated equipment."

A student complained that:

"We sometimes find it hard to use the computers because they are broken or there isn't enough electricity. It makes it frustrating to rely on digital tools."

Unequal Access and the Digital Divide

There is a significant disparity in the availability and use of digital tools between urban and rural schools. Responding to interview questions, a rural school librarian said:

"Our school doesn't have enough computers for all the students. Compared to urban schools, our digital resources are very limited."

Also, a rural school student had this to say:

"We are lucky to have high-speed internet and modern facilities, but I know some of my friends in rural areas don't have these advantages."

The Role of Training and Support

Adequate training for librarians, educators, and students is crucial for effectively using digital technologies. This is what a librarian said on this theme:

"We received some initial training when the digital tools were introduced, but there hasn't been any follow-up. More training would help us use these tools better."

An educator also said:

"Not all teachers are comfortable with the technology. Workshops and regular support could help bridge this gap."

DISCUSSION

The findings of this exploratory case study illuminate the transformative potential of digital technologies in school libraries while also identifying critical challenges that must be addressed to optimize their benefits. Below is a detailed discussion of each thematic area:

The study highlights the significant role of digital technologies in expanding access to educational resources. Digital tools, such as e-books, databases, and multimedia platforms, have democratized access to knowledge, enabling students to access diverse and up-to-date materials for academic purposes. This aligns with global research, demonstrating that technology integration in libraries fosters independent learning and critical thinking by providing learners with a wide range of resources (Amin & Rahman, 2023). However, disparities in resource availability remain evident, particularly between rural and urban schools in Ghana, underscoring the need for equitable investment in digital infrastructure (UNESCO, 2022).

The findings indicate that technology has enhanced the operational efficiency of library services. Automation of cataloguing and digital lending systems have improved the user experience, making it easier for students and educators to access and utilize resources. This supports existing literature, which emphasizes the role of technology in modernizing library operations and meeting the evolving needs of users (Softlink, 2023). Integrating library services with classroom learning further highlights the potential of school libraries as digital learning hubs. However, sustaining these improvements requires continuous investment in digital tools and training for library staff.

Despite the benefits, the study identifies significant barriers to effective technology utilization, including poor internet connectivity, outdated infrastructure, and inadequate funding. These findings are consistent with research on the digital divide in education, particularly in developing regions where resource constraints often hinder technology adoption (Van Dijk, 2020). In Ghana, these challenges are more pronounced in rural schools, where limited access to electricity and internet

connectivity exacerbates the problem. Addressing these issues requires a targeted approach, including partnerships between government and private entities to invest in infrastructure and provide reliable access to digital resources. The disparity between urban and rural schools regarding technology access underscores the persistent issue of the digital divide. While urban schools benefit from better connectivity and advanced tools, rural schools often struggle to meet basic digital requirements. This inequity limits the effectiveness of technology in enhancing educational outcomes and perpetuates broader social and economic disparities. Strategies to bridge this divide should prioritize equitable resource allocation, including targeted funding and support for under-resourced schools (UNESCO, 2022).

The importance of training librarians, educators, and students emerged as a critical theme. Without sufficient training, the potential of digital tools cannot be fully realized. Librarians and teachers require ongoing professional development to stay abreast of technological advancements, while students need guidance to develop digital literacy skills. This aligns with research emphasizing the need for capacity-building programs to empower stakeholders to utilize technology effectively (Venkatesh & Bala, 2022). Such initiatives should be integrated into national education policies to ensure long-term sustainability.

CONCLUSION

This study has explored the effect of digital transformation on student learning and library services in Ghanaian school libraries. Several key themes were identified through qualitative analysis, highlighting the opportunities and challenges associated with technology integration in these educational spaces. The findings demonstrate that digital tools and resources significantly enhance access to diverse, updated learning materials. Technologies such as e-books, online databases, and multimedia platforms have empowered students and educators by providing resources previously unavailable in traditional library settings. Furthermore, digital cataloguing systems and automation have streamlined library operations, improving efficiency and user experience. These benefits underscore the potential of digital transformation to position school libraries as pivotal hubs of 21st-century learning. Despite these advancements, significant barriers hinder the full realization of digital transformation. Challenges such as poor internet connectivity, limited funding, outdated infrastructure, and inequities between urban and rural schools highlight the persistent digital divide. Rural schools, in particular, face difficulties in accessing and maintaining the necessary resources, thereby limiting the effectiveness of technology integration. Furthermore, inadequate training for librarians, teachers, and students in digital tools remains a critical issue.

Targeted strategies are needed to address these challenges and maximize the benefits of digital transformation. Key recommendations include:

1. **Investing in Infrastructure:** Policymakers must prioritize improving internet connectivity, electricity supply, and digital infrastructure, particularly in rural areas.
2. **Equitable Resource Allocation:** Schools with fewer resources should receive targeted funding to bridge the gap between urban and rural institutions.
3. **Capacity Building:** Regular training programs for librarians, teachers, and students should be integrated into national education plans to enhance digital literacy and effectively use available technologies.
4. **Strengthening Collaboration:** Partnerships between the government, private sector, and international organizations can provide technical support and funding to sustain digital initiatives.

Contribution to Research and Practice

This study contributes to the growing literature on technology integration in education by providing insights specific to the Ghanaian context. It highlights the transformative potential of digital tools while emphasizing the need for systemic interventions to address barriers. The findings offer a foundation for future research and practical strategies to enhance the role of school libraries in supporting student learning and modernizing library services.

Recommendations

The recommendations from this study emphasize the importance of addressing the barriers and leveraging the opportunities presented by digital transformation in school libraries in Ghana. First, investing in digital infrastructure is paramount. Poor internet connectivity and outdated equipment, particularly in rural schools, were significant barriers to technology integration. As many regions in Ghana struggle with these infrastructure issues, targeted investment in reliable internet access, modern computing resources, and renewable energy sources, such as solar power for remote areas, will create a more equitable environment for technology-enhanced learning (UNESCO, 2022; Van Dijk, 2020). Such infrastructure improvements will ensure that all students, regardless of location, can benefit from digital resources.

Equitable resource allocation is another critical recommendation. The study highlighted significant disparities between urban and rural schools, with urban schools often having better access to digital tools and resources. To address this gap, targeted funding models should be implemented to ensure that rural schools receive the necessary resources to integrate technology effectively. This can help bridge the digital divide and provide equal opportunities for all students to access

digital learning tools (Amin & Rahman, 2023). In parallel, continuous professional development programs for librarians, teachers, and students are essential to ensuring effective use of the technology. Without adequate training, even the most advanced digital tools will remain underutilized. Therefore, regular capacity-building initiatives focused on enhancing digital literacy are crucial for maximizing the potential of technology in education (Venkatesh & Bala, 2022).

Furthermore, fostering public-private partnerships can help sustain digital transformation efforts. Collaboration between government bodies, private companies, and international organizations can bring in the technical support, funding, and expertise needed to overcome the challenges identified in the study. Such partnerships have been effective in other regions, providing resources and innovation to support school technology integration (Softlink, 2023). Lastly, it is essential to implement mechanisms for regular monitoring and evaluation of digital initiatives. This will help identify emerging challenges and areas for improvement, ensuring that digital tools continue to meet the evolving needs of students and educators (Van Dijk, 2020).

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Conflict of Interest

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