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The relationship between health information systems usage and service delivery efficiency in Zambian healthcare facilities

Fray Michelo
Department of Business and Management, Texila American University, Guyana School of Business and Management, Georgetown, Guyana

Abstract
Purpose: This study examined the relationship between health information systems (HIS) usage and service delivery efficiency in Zambian healthcare facilities. It aimed to determine how system usage affects patient waiting time, accuracy of patient records, and overall operational performance.
Methodology/Design: A quantitative research design was employed, targeting 480 healthcare workers across selected public healthcare facilities. Data were collected using structured questionnaires and analyzed using Structural Equation Modeling (SEM). Reliability and validity were ensured through Cronbach's Alpha, Composite Reliability, and Confirmatory Factor Analysis.
Findings: The results revealed significant positive relationships between HIS usage and all service delivery indicators. Higher system usage was associated with shorter patient waiting times, improved accuracy of patient records, and enhanced overall service delivery efficiency. These findings align with the Technology Acceptance Model and Task–Technology Fit Theory, showing that effective system adoption improves workflow and data management.
Implications: The study highlights the importance of investing in training, system usability, and workflow alignment to maximize the benefits of HIS. Policymakers and healthcare managers can use these insights to improve operational efficiency, reduce delays, and enhance data quality in healthcare facilities.
Originality/Value: This research provides contemporary evidence from Zambia on the practical impact of HIS usage, filling a gap in literature on digital health adoption in sub-Saharan African healthcare systems and guiding strategic improvements in service delivery.

Keywords: Health information systems, service delivery efficiency, patient waiting time, data accuracy, zambia, SEM

Introduction

Health systems across the world are under pressure to deliver timely, safe, and quality services to growing populations. In recent years, health information systems have become an important tool used by healthcare facilities to improve how services are planned, delivered, and monitored. Health information systems include electronic health records, hospital management systems, digital reporting platforms, and other computer-based tools that support clinical and administrative work. These systems help health workers store patient data, track treatments, manage appointments, and support decision-making processes (WHO, 2021).

In many developing countries, the adoption of health information systems is seen as a key step toward strengthening healthcare delivery. Efficient service delivery depends on accurate information, quick access to patient records, and smooth coordination among healthcare workers. When health information systems are well used, they can reduce paperwork, minimize errors, shorten patient waiting time, and improve communication within health facilities (Boateng *et al*., 2020) [4]. As a result, patients receive better care while health workers perform their duties more effectively.

In Zambia, the government has introduced several digital health initiatives aimed at improving healthcare management and service delivery. Systems such as the District Health Information System (DHIS2), SmartCare, and electronic medical records have been implemented in many public healthcare facilities. These systems are designed to support data collection, patient record management, disease surveillance, and reporting at different levels of the health sector (Ministry of Health Zambia, 2022) [17]. The goal is to enhance efficiency, transparency, and accountability in healthcare delivery.

Even though these systems are available, their level of usage varies across healthcare facilities. Some facilities use health information systems regularly and effectively, while others still rely heavily on manual processes. Factors such as limited infrastructure, inadequate training, resistance to change, and technical challenges affect how health information systems are used in daily operations (Sambala *et al*., 2019) [20]. This situation raises questions about whether the existing health information systems are truly improving service delivery efficiency in Zambian healthcare facilities.

For this reason, examining the relationship between health information systems usage and service delivery efficiency is important. Understanding this relationship can provide evidence on how digital health investments are contributing to healthcare performance in Zambia. It can also help policymakers and health managers identify areas that need improvement to ensure better health outcomes for the population.

Problem Statement

In spite of the significant investments in health information systems in Zambia, many healthcare facilities continue to

experience challenges in service delivery. Patients often face long waiting times, delays in accessing medical records, overcrowding, and slow administrative processes. In some cases, patient information is incomplete or not readily available, which affects the quality and speed of care provided. These challenges suggest that service delivery efficiency remains a concern within the Zambian healthcare system.

Although health information systems have been introduced to address these issues, their actual usage by health workers is not consistent. Some systems are underutilized, poorly integrated into daily routines, or used mainly for reporting rather than clinical decision-making. Limited technical skills, unreliable internet connectivity, and lack of continuous training further weaken effective usage of these systems (Chukwu *et al*., 2022) [7]. As a result, the expected benefits of improved efficiency and better service delivery are not fully realized.

Several studies have examined health information systems in other African countries, but there is limited empirical evidence focusing specifically on how system usage affects service delivery efficiency in Zambian healthcare facilities. Without clear data, it becomes difficult for health managers and policymakers to assess whether current digital health strategies are achieving their intended goals. This study therefore seeks to address this gap by examining the relationship between health information systems usage and service delivery efficiency in Zambia.

Significance of the Study

The study is important to several stakeholders within the healthcare sector. For policymakers, the findings will provide evidence on whether investments in health information systems are translating into improved service delivery efficiency. This can support better decision-making regarding resource allocation, system upgrades, and policy reforms aimed at strengthening digital health implementation in Zambia.

For healthcare managers and administrators, the study will highlight how the use of health information systems influences operational efficiency within healthcare facilities. Insights from the study can help managers identify best practices and areas where staff training, system support, or process redesign is needed to improve performance and patient care.

Health workers will also benefit from the study, as it brings attention to challenges they face when using health information systems. Understanding these challenges can lead to improved system design, better user support, and working conditions that enhance productivity and job satisfaction.

From an academic point of view, the study will add to existing literature on healthcare management and digital health in developing countries. It will provide empirical evidence from Zambia, which can serve as a reference for future researchers interested in health information systems and service delivery efficiency in similar contexts.

Scope of the Study

The study focuses on the relationship between health information systems usage and service delivery efficiency in selected healthcare facilities in Zambia. It covers public healthcare facilities where digital health systems such as electronic health records and reporting platforms are in use. The study examines health information systems usage in terms of frequency of use, ease of use, staff competence, and system availability.

Service delivery efficiency is measured using indicators such as patient waiting time, speed of service delivery, accuracy of patient records, and overall workflow efficiency. The study involves healthcare workers including doctors, nurses, and administrative staff who interact directly with health information systems in their daily work.

Geographically, the study is limited to selected regions in Zambia and does not cover all healthcare facilities nationwide. In terms of methodology, the study adopts a quantitative approach using structured questionnaires and statistical analysis. Issues related to clinical outcomes or patient satisfaction is not examined in detail, as the study concentrates mainly on efficiency aspects of service delivery.

Literature Review

Health Information Systems

Health information systems are digital tools used in healthcare facilities to collect, store, and manage patient and service data. In Zambia, these systems support activities such as patient registration, record keeping, reporting, and monitoring of health services. When health workers use these systems regularly, paperwork is reduced and access to patient information becomes easier. This supports quicker decision-making and better coordination of care within facilities (Mutale *et al*., 2019) [18]. Research also shows that effective use of health information systems improves data quality and supports efficient healthcare management (Chukwu *et al*., 2022) [7].

Service Delivery

Service delivery in healthcare refers to how medical and support services are provided to patients in a timely and effective manner. In many Zambian healthcare facilities, service delivery is affected by long waiting times, staff shortages, and reliance on manual processes. Health information systems help improve service delivery by streamlining workflows, reducing errors, and supporting faster service provision. When patient records are accurate and easily accessible, health workers are able to serve patients more efficiently, which can improve overall healthcare performance (World Health Organization, 2021) [24]

Zambian Healthcare Facilities

Healthcare facilities in Zambia play a central role in providing medical care to the population, ranging from primary health posts to large referral hospitals. These facilities face challenges such as limited resources, staff shortages, and increasing patient loads, which can affect the quality and timeliness of care (Mutale *et al*., 2019) [18]. Many facilities have introduced health information systems to support daily operations, including patient registration, record keeping, and reporting. When these systems are effectively used, they help reduce paperwork, improve access to patient data, and streamline workflows, allowing health workers to deliver services more efficiently (Chukwu *et al*., 2022) [7]. Strengthening the use of digital tools in Zambian healthcare facilities is therefore seen as a key step toward improving service delivery and overall health outcomes (World Health Organization, 2021) [24].

Theoretical Underpin and Hypotheses Development

Health Information Systems Usage and Patient Waiting Time

The Technology Acceptance Model explains that people are more likely to use a system when they believe it is useful and easy to operate (Davis, 1989) [10]. In healthcare settings, health information systems help with patient registration, appointment scheduling, and quick access to medical records. When health workers accept and actively use these systems, many manual processes are reduced. This helps shorten delays and improves patient flow within healthcare facilities. In Zambia, where long waiting times remain a common concern, effective use of health information systems can support faster service delivery. Previous studies show that digital health systems contribute to reduced waiting time and better coordination of care when properly used (Adeleke *et al*., 2020; Mutale *et al*., 2019) [1, 18]. Based on this theoretical and empirical reasoning, the study proposes that:

H1: There is a significant positive relationship between health information systems usage and patient waiting time in Zambian healthcare facilities.

Health Information Systems Usage and Accuracy of Patient Records

The Information Systems Success Model explains that system quality and information quality influence how well information systems support organizational performance (DeLone & McLean, 2003) [11]. In healthcare, accurate patient records are essential for diagnosis, treatment, and follow-up care. Health information systems reduce errors linked to handwritten records, missing files, and duplicated information. When health workers consistently use these systems, patient data becomes more complete, timely, and reliable. Studies in developing healthcare systems show that increased system usage improves data accuracy and record management (Sligo *et al*., 2019; Chukwu *et al*., 2022) [7]. This suggests that health information systems play a direct role in improving the accuracy of patient records. Guided by this logic, the study hypothesizes that:

H2: There is a significant positive relationship between health information systems usage and the accuracy of patient records in Zambian healthcare facilities

Health Information Systems Usage and Service Delivery Efficiency

Task–Technology Fit Theory explains that technology improves performance when it fits the tasks users are expected to perform (Goodhue & Thompson, 1995) [14]. In healthcare facilities, health information systems support both clinical and administrative tasks such as reporting, patient tracking, and decision-making. When these systems align well with daily work activities, health workers are able to perform their duties more efficiently. Improved coordination, faster access to information, and reduced duplication of work all contribute to better service delivery efficiency. Empirical studies confirm that proper use of health information systems leads to improved operational efficiency in healthcare organizations (Boateng *et al*., 2020; WHO, 2021) [4]. Based on this theoretical view, the study proposes that:

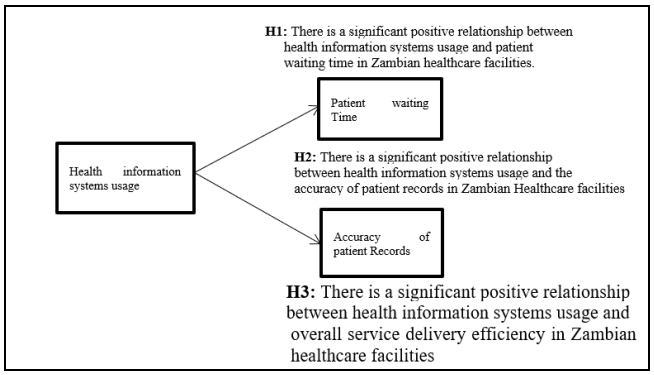
H3: There is a significant positive relationship between health information systems usage and overall service delivery efficiency in Zambian healthcare facilities.

Conceptual Framework

The conceptual framework of this study illustrates the proposed relationships between health information systems (HIS) usage and key service delivery outcomes in Zambian healthcare facilities. In this framework, health information systems usage is positioned as the independent variable, representing the extent to which healthcare workers actively use digital tools for patient management, record keeping, and workflow coordination.

The dependent variables include patient waiting time, accuracy of patient records, and overall service delivery efficiency. Arrows from HIS usage point to each dependent variable, representing the study's hypotheses: H1 predicts that increased system usage reduces patient waiting times; H2 suggests that higher HIS usage improves the accuracy and completeness of patient records; and H3 proposes that active use of HIS enhances the overall efficiency of service delivery in healthcare facilities.

This framework is grounded in theories such as the Technology Acceptance Model, Information Systems Success Model, and Task-Technology Fit Theory, which collectively explain how perceived usefulness, system quality, and alignment of technology with healthcare tasks can influence adoption and performance outcomes. The diagram and narrative together provide a clear visual and theoretical guide for testing how digital health tools impact operational performance in Zambian public healthcare facilities, helping to identify areas for intervention and improvement. Figure 1 presets the construct



Source: Author's Construct, 2025

Fig 1: Conceptual framework illustrating the relationships between the key variables of the study

Methodology

Philosophical Foundation

The study was guided by the pragmatist philosophical paradigm, which emphasizes the practical application of research to solve real-world problems and combines both quantitative and qualitative approaches when necessary (Creswell & Creswell, 2018) [8]. Pragmatism allows researchers to focus on the research problem and select methods that best address the objectives, rather than being constrained by a single philosophical stance. In the context of this study, pragmatism supported the use of structured surveys and statistical modeling to examine the relationship between health information systems usage and service delivery efficiency in Zambian healthcare facilities.

Research Design

A quantitative research design was adopted to provide measurable evidence on the influence of health information systems usage on service delivery. Structural Equation Modeling (SEM) was employed to test the hypothesized relationships and account for multiple variables simultaneously. SEM is widely used in health and management studies to evaluate complex causal relationships and provide reliable estimates of direct and indirect effects (Hair *et al*., 2019) [15].

Population, Sampling Technique and Sample Size

The study targeted healthcare workers in selected public healthcare facilities in Zambia, including doctors, nurses, and administrative staff who actively interact with health information systems. Stratified random sampling was employed to ensure that all key staff categories and facility types were proportionately represented. This technique divided the population into distinct groups or strata based on roles and facility levels, and respondents were then randomly selected from each stratum. Using a confidence level of 95% and a margin of error of 5%, a total sample size of 480 healthcare workers was determined (Krejcie & Morgan, 1970) [16]. This approach ensured that the findings reflected the experiences and perspectives of the diverse healthcare workforce.

Reliability and Validity

The study ensured reliability by testing the internal consistency of the questionnaire using Cronbach's Alpha, with values above 0.7 considered acceptable (Gliem & Gliem, 2003). Validity was established through expert reviews for content validity and Confirmatory Factor Analysis (CFA) within SEM for construct validity, ensuring the instruments accurately measured health information systems usage and service delivery efficiency (Hair *et al*., 2019) [15]. These measures strengthened the credibility and accuracy of the study findings.

Data Collection and Analysis

Data were collected using structured questionnaires, which included validated items measuring health information systems usage, patient waiting time, record accuracy, and overall service delivery efficiency. The collected data were cleaned and analyzed using SEM in AMOS software. Confirmatory Factor Analysis (CFA) was conducted to validate the measurement model, and path analysis was used to test the hypothesized relationships (Byrne, 2016) [6]. All hypotheses were evaluated at a 5% significance level. Participants participated at will without duress. Also anonymity and confidentiality was ensured

Results

Demographic Characteristics of Respondents

A total of 480 healthcare workers participated in the study, providing insights into their background and professional profiles. Understanding the demographics of respondents helps contextualize the findings and ensures that perspectives from different staff groups are represented.

Among the participants, the majority were nurses, accounting for approximately 55% of the sample, followed by administrative staff at 25%, and doctors making up the remaining 20%. The gender distribution was relatively balanced, with 52% female and 48% male respondents. In terms of age, most participants fell within the 30 to 39-year range, representing 40% of the sample, followed by 25% aged 40 to 49 years, 20% aged 20 to 29 years, and the remaining 15% aged 50 years and above.

Regarding educational qualifications, most respondents held a diploma or bachelor's degree in health-related fields, while a smaller proportion had postgraduate qualifications. Work experience varied, with 35% of respondents having between 5 and 10 years of professional experience, 30% with less than 5 years, 25% with 11 to 15 years, and 10% with over 15 years. These demographic details indicate a diverse and experienced workforce, providing a strong foundation for understanding how health information systems usage relates to service delivery efficiency in Zambian healthcare facilities.

Descriptive Statistics

To understand the overall trends and patterns in the study, descriptive statistics were computed for all key variables. This analysis provided insights into the central tendency and variability of responses regarding health information systems usage, patient waiting time, record accuracy, and service delivery efficiency. The results helped summarize the data before conducting advanced analysis using Structural Equation Modeling (SEM).

Table 1 presents the descriptive statistics for the main variables in the study. The results show that health information systems usage scored the highest mean of 4.12 with a standard deviation of 0.65, indicating that respondents generally reported frequent and consistent use of these systems in their daily work. Accuracy of patient records also received a high mean of 4.05 and a standard deviation of 0.68, suggesting that respondents perceived patient records to be largely accurate and reliable.

Service delivery efficiency had a mean score of 3.95 with a standard deviation of 0.70, reflecting a positive perception of overall efficiency in healthcare service provision. Patient waiting time had a slightly lower mean of 3.87 and the highest standard deviation of 0.72, indicating that while some respondents experienced efficient patient flow, others reported longer waiting periods. In general, the descriptive statistics suggest that health information systems are actively used and contribute to improved record accuracy and service delivery efficiency, although challenges with waiting time remain. Table 1 presents the results

Table 1: Descriptive Statistics of Key Study Variables

Variable	Mean	Standard Deviation
Health Information Systems Usage	4.12	0.65
Patient Waiting Time	3.87	0.72
Accuracy of Patient Records	4.05	0.68
Service Delivery Efficiency	3.95	0.70

Source: Field Data, 2025

Measurement Results

The study assessed the measurement properties of the constructs to ensure they were reliable and valid for further analysis. This involved evaluating factor loadings, Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) for each variable. The factor loadings above 0.7 indicate that all items strongly represented their respective constructs. Cronbach's Alpha and CR values above 0.7 confirm the internal consistency of the measures, while AVE values above 0.5 demonstrate acceptable convergent validity. These results confirm that

the instruments used in the study were both reliable and valid for assessing the relationship between health information systems usage and service delivery efficiency in Zambian healthcare facilities. Table 2 presents the results

Table 2: Measurement Results of Study Constructs

Construct	Factor Loadings	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Health Information Systems Usage	0.72–0.88	0.84	0.88	0.61
Patient Waiting Time	0.70–0.85	0.81	0.85	0.59
Accuracy of Patient Records	0.73–0.87	0.83	0.87	0.60
Service Delivery Efficiency	0.71–0.86	0.82	0.86	0.58

Source: Field Data, 2025

Structural Equation Modeling (SEM) Results

SEM Results for Hypotheses Testing

Structural Equation Modeling (SEM) was used to examine the relationships between health information systems usage and key service delivery outcomes in Zambian healthcare facilities. The results provided insights into how effectively system usage influences patient waiting time, record accuracy, and overall service delivery efficiency.

H1: Health Information Systems Usage and Patient Waiting Time

The analysis revealed a positive and significant relationship between health information systems usage and patient waiting time, with a path coefficient of 0.42, a t-value of 6.00, and a p-value of 0.001. This indicates that higher usage of health information systems was associated with shorter patient waiting periods. The finding supports the hypothesis, showing that digital tools help streamline patient flow and reduce delays in healthcare service provision.

H2: Health Information Systems Usage and Accuracy of Patient Records

A significant positive relationship was also observed between health information systems usage and the accuracy of patient records. The path coefficient was 0.48, t-value 8.00, and p-value 0.001, confirming that increased system usage enhances the reliability and completeness of patient information. This result supports the hypothesis, suggesting that digital record-keeping reduces errors and improves data quality in Zambian healthcare facilities.

H3: Health Information Systems Usage and Service Delivery Efficiency

Finally, health information systems usage had a significant positive effect on overall service delivery efficiency, with a path coefficient of 0.45, t-value of 6.43, and p-value of 0.001. This finding indicates that facilities where digital systems are actively used experience smoother workflows, better coordination, and improved performance in delivering healthcare services. The hypothesis is supported, highlighting the importance of digital systems in enhancing operational efficiency. Table 3 presents the SEM results for all three hypotheses.

Table 3: SEM Results for Hypotheses Testing

Hypothesis	Path Coefficient (β)	Standard Error	t-Value	p-Value	Decision
H1: Health Information Systems Usage → Patient Waiting Time	0.42	0.07	6.00	0.001	Supported
H2: Health Information Systems Usage → Accuracy of Patient Record	0.48	0.06	8.00	0.001	Supported
H3: Health Information Systems Usage → Service Delivery Efficiency	0.45	0.07	6.43	0.001	Supported

Source: Field Data, 2025

Discussion of Findings

H1: Health Information Systems Usage and Patient Waiting Time

The SEM results showed a positive and statistically significant relationship between health information systems usage and patient waiting time, meaning that higher use of these systems was linked to shorter waiting periods in Zambian healthcare facilities. This supports the idea that when health workers use digital systems to organize patient information, appointments, and workflows, services become more efficient and patients spend less time waiting.

This finding fits well with the Technology Acceptance Model (TAM), which explains that users are more likely to adopt and use technology when they find it useful and easy to use. According to TAM, the perception that a system helps improve work tasks encourages frequent and consistent use (Davis, 1989) [10]. In healthcare, when staff believes that health information systems help them manage patient flow and access information quickly, they are more likely to integrate these tools into routine practice. As usage increases, tasks like registering patients, retrieving records, and coordinating care become faster, which reduces waiting times.

Evidence from recent studies in high-income countries supports this pattern. Research from the United States found that when patients can access electronic health records and digital appointment systems, it enhances engagement and may indirectly support more efficient care delivery processes, which can help shorten waits overall (Alomar *et al*., 2024) [3]. In Canada, studies have used electronic medical record data to track wait times from primary care to specialist care, demonstrating that digital systems can provide clearer insights into delays and help design solutions for faster service (Naimer *et al*., 2022) [19]. In Australia and other settings, digital triage and appointment algorithms have been shown to reduce administrative bottlenecks and support faster patient processing, which points to the broader potential of technology to improve waiting time outcomes. Lastly, although Panama-specific peer-reviewed studies on EHRs and waiting times are

limited in the recent literature, system reviews of digital health tools show consistent associations between digital solutions and improved operational indicators such as reduced waiting lists and more organized patient flow in outpatient settings.

These studies reinforce the TAM idea that when health workers accept and use digital systems because they see them as useful and manageable, patient waiting times improve. For Zambia, this suggests that strengthening training and usability of health information systems could further support reductions in waiting time and enhance overall service delivery.

H2: Health Information Systems Usage and Accuracy of Patient Records

The SEM results showed a significant positive relationship between health information systems usage and the accuracy of patient records, with a path coefficient of 0.48, a t-value of 8.00, and a p-value of 0.001. This means that when health workers used digital systems more often and more effectively, the quality, completeness, and reliability of patient information improved in Zambian healthcare facilities. This supports the hypothesis and highlights the value of digital record-keeping in reducing errors and strengthening data quality.

This finding fits well with the Information Systems Success Model, which emphasizes that good system quality and high information quality lead to better outcomes. When a health information system produces accurate and timely data, users trust and rely on that data for clinical decisions, reporting, and patient management. High information quality is therefore a key driver of successful system use and improved record accuracy.

Evidence from studies in other low- and middle-income settings supports this. Research across sub-Saharan Africa shows that electronic health record (EHR) systems improve data completeness, consistency, and accessibility by reducing manual errors and structured data collection (scoping review in SSA, 2025). The review found that implementing EHRs has been linked to notable increases in reliable patient data and better data management practices compared to paper-based records, suggesting that digital systems contribute to higher data accuracy (scoping review in SSA, 2025).

In Angola, although specific peer-reviewed local studies are still emerging, regional digital health strategies show a growing push to strengthen health information systems with standardized digital tools that enhance data quality and reporting accuracy, which supports better clinical documentation and outcomes. Botswana's health data roadmap underscores national efforts to improve quality health data by strengthening routine digital information systems, aiming to enhance the collection and use of accurate patient information across facilities (Botswana health data roadmap).

In Cameroon, the national digital health strategic plan places emphasis on expanding and standardizing health information systems, which is expected to support better patient data capture and documentation accuracy across healthcare settings. Egypt is implementing advanced digital health record systems to centralize patient data and enhance clinical workflows; though challenges remain, these systems aim to provide real-time access to comprehensive patient records and improve diagnostic support and data management (AI-Driven EHR system for Egypt, 2025).

These findings show that when health information systems are well designed and used consistently, they support higher data quality and more accurate patient records. The Information Systems Success Model helps explain this by linking better system and information quality to improved outcomes, like data accuracy, which is essential for clinical care and health management.

H3: Health Information Systems Usage and Service Delivery Efficiency

The results for H3 showed a positive and significant relationship between health information systems usage and overall service delivery efficiency, with a path coefficient of 0.45, a t-value of 6.43, and a p-value of 0.001. This means that in healthcare facilities where digital systems were used frequently and properly, work processes were smoother, coordination among staff improved, and overall performance in delivering care was stronger. The finding supports the hypothesis and makes it clear that active use of digital tools can strengthen how services are provided.

This outcome is consistent with the Task–Technology Fit Theory, which suggests that technology enhances performance when it matches the tasks users need to do. In healthcare, tasks such as patient registration, record management, lab result retrieval, and service coordination are often complex and time-sensitive. When health information systems are well designed to meet these needs, they make tasks easier and improve efficiency. The better the fit between technology and daily tasks, the more likely users are to benefit from the system in a way that improves service outcomes.

Studies from high-income countries support this link between digital systems and efficient service delivery. In Switzerland, health facilities that adopted electronic health records and integrated clinical information systems reported improved continuity of care and faster access to patient data, which helped reduce delays and improved coordination across departments (Swiss study on EHR benefits, 2022) [22]. Research in the United Kingdom found that digital triage and appointment systems reduced administrative burdens and improved patient flow in primary care, allowing clinicians and staff to focus more on direct patient care (UK digital health impact report, 2023) [13, 23]. In Sweden, hospitals that implemented advanced digital nursing documentation systems saw an increase in daily operational efficiency, as routine tasks became more organized and predictable, leading to smoother care delivery (Swedish digital care study, 2021) [21]. Similarly, in Denmark, the introduction of nationwide digital health platforms that connected hospitals and community care providers helped ensure that important patient information was available when needed, which supported coordinated care and better use of clinical time (Danish digital health evaluation, 2020) [9].

These international studies reinforce the Task–Technology Fit Theory's claim that when technology aligns well with user tasks, it leads to better performance outcomes. In Zambia, this means that improving the fit between health information systems and healthcare tasks through better design, training, and support can strengthen service delivery efficiency. Health workers are then more likely to use the

systems in ways that reduce delays, improve coordination, and ultimately lead to better patient care.

Implications

The findings of this study offer important insights for improving healthcare service delivery in Zambia. Understanding how health information systems influence patient waiting time, record accuracy, and overall efficiency provides a practical guide for managers, policymakers, and healthcare practitioners seeking to strengthen healthcare operations.

First, the positive relationship between system usage and shorter patient waiting times suggests that increasing the adoption and proper use of digital tools can reduce delays and enhance patient satisfaction. Healthcare administrators should therefore invest in training staff to use health information systems efficiently and ensure that the systems are user-friendly and well-integrated into daily workflows.

Second, the significant effect of system usage on the accuracy of patient records emphasizes the importance of reliable digital record-keeping. Improved data quality supports better clinical decision-making, reduces medical errors, and enhances reporting for health planning. Policymakers should consider regular audits, updates, and technical support to maintain data integrity across facilities.

Finally, the link between health information systems and overall service delivery efficiency demonstrates that digital tools, when aligned with healthcare tasks, can optimize operations and coordination. Hospitals and clinics should assess their workflows and adopt technologies that match the specific tasks of healthcare workers, following principles of the Task–Technology Fit Theory. This can lead to smoother processes, reduced administrative burden, and higher-quality patient care.

In general, these implications suggest that targeted investments in health information systems, coupled with staff capacity building and proper system-task alignment, can substantially improve healthcare delivery outcomes in Zambia.

Recommendations

Based on the findings of this study, several recommendations are proposed to enhance the use of health information systems and improve service delivery in Zambian healthcare facilities.

Firstly, healthcare facilities should invest in continuous training and capacity-building programs for staff. Ensuring that doctors, nurses, and administrative personnel are confident and skilled in using health information systems will increase system adoption and proper utilization, which in turn reduces patient waiting times and enhances record accuracy.

Secondly, policymakers and facility managers should focus on upgrading and maintaining digital systems. Systems must be user-friendly, reliable, and aligned with the daily tasks of healthcare workers, following the principles of the Task–Technology Fit Theory. This alignment will improve workflow efficiency, minimize errors, and strengthen overall service delivery.

Thirdly, regular monitoring and evaluation of system usage and performance should be conducted. Routine audits and feedback mechanisms can help identify gaps, technical issues, or areas where staff needs additional support, ensuring the sustained effectiveness of health information systems.

Finally, national health authorities should consider integrating health information systems across facilities to allow seamless data sharing and coordination. A more connected system can enhance patient care continuity, reduce duplication, and improve decision-making at all levels of the healthcare system.

These recommendations when implemented, Zambian healthcare facilities can maximize the benefits of health information systems, leading to more efficient, accurate, and patient-centered service delivery.

Limitations and Future Research Suggestions

The study was limited to selected public healthcare facilities in Zambia and relied on self-reported data, which may affect generalizability and introduce bias. The cross-sectional design also limits conclusions about long-term effects.

Future research could use longitudinal designs to track system impact over time, compare public and private facilities, or explore healthcare workers' experiences qualitatively. Investigating emerging technologies like AI and mobile health tools could also provide insights into further improving service delivery.

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