

## Determinants of Health Information System Usability for Quality Service Delivery: A Case Study of Muhimbili National Hospital (MNH), Tanzania

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### ABSTRACT

*This study examines the determinants of Health Information Systems (HIS) usability, using a case study of Muhimbili National Hospital (MNH). In this study, we focus on human, organizational, and technological factors. The Human, Organization, and Technology-Fit (HOT-Fit) model guided this research. We utilize a mixed-methods research approach with a descriptive survey design and a sample of 109 respondents selected from the 1500 population at Muhimbili National Hospital through simple random and purposive sampling. Semi-structured interviews were used to gather qualitative data in order to delve further into the experiences and perspectives of MNH staff members, while structured questionnaires were used to collect quantitative data in order to evaluate various aspects of Health Information Systems (HIS) usability. The analysis of quantitative data was conducted by using descriptive statistics and multiple linear regression analysis, while qualitative data were analyzed through thematic analysis. The findings showed that human factors, such as education and training, significantly enhance HIS usability. Organizational factors, such as organizational structure, policies, and top management support, have a significant and positive impact on HIS usability. Technological factors, such as infrastructure reliability and system capabilities, also have a significant and positive impact on HIS usability. The study also revealed the interdependence of these factors, underscoring the significance of staff engagement and effective management practices. It is recommended that enhancing training with practical applications, strengthening organizational support, investing in robust infrastructure, implementing user feedback mechanisms, and promoting interdisciplinary collaboration could optimize HIS usability.*

**Keywords:** Health Information System, Human Factors, Organizational Factors, Technological Factors, Usability

### I. INTRODUCTION

Global technological development has become one of the most important strategic aspects in the growth of organizations (Serrat, 2021). Medical centers used the conventional paper-based system to document and share patient medical data among their departments before the advent of electronic technology (Ibrahim, 2013). Much as the paper-based system served its purpose, it required no training but was vulnerable to several limitations, such as delayed access to information due to the need for thorough searching when records were not properly categorized (Muhanga & Haule, 2021). This called for information and communication technology experts to devise means of storing medical-related information systematically (Garavand et al., 2016). As a result, a variety of health information systems (HIS) mushroomed all over the world to ensure quality service delivery (Auyo et al., 2023). Therefore, with technological advancement, a shift to electronic medical records management systems was inevitable (Serrat, 2021). A few decades ago, Garavand et al. (2016) introduced health information systems to enhance the availability of patient health information. Nowadays, the use of HIS in hospitals has increased by 40 percent globally (Adejumo 2017). Hospitals use these systems to capture, process, store, retrieve, share, and present data for improved decision-making (Auyo et al., 2023). As a result, medical institutions worldwide can share medical data more efficiently through integrated HIS, facilitating quicker access to critical information and improving patients' health outcomes.

Good health among individuals in a community influences a high-quality population, which in turn triggers the country's economic development (Muhanga & Haule, 2021). This notion also aligns with the Sustainable Development Goals agenda, which emphasizes positive health as an integral segment for development and a thriving community (Ibrahim, 2013). Healthcare information systems, in most cases, catalyze the effectiveness and efficiency of health service delivery, which is crucial for good health (Muhanga & Haule, 2021). The availability and effective use of HIS provide the means to deliver health services (Odiwuor et al., 2015). HIS aims to provide high-quality services, timely and accurate information, and clinical data sharing to help patients receive the best care possible

(Garavand et al., 2016). HIS reduces costs, reduces medication errors, and improves care quality (Auyo et al., 2023). Furthermore, it is associated with increased legibility and improved healthcare quality (Lubua & Pretorius, 2018).

Lubua & Pretorius (2018) reported that HIS significantly enhances service delivery in healthcare sectors. Reports also suggest that it influences the quality of services provided to the public. Due to its substantial impact on service delivery, HIS adoption and use rapidly expanded in developed and developing nations, including Tanzania (Mboro, 2017). There are several public and private healthcare centers and hospitals that have fully implemented HIS. Although these systems differ from one hospital to the next, the major intention is to improve service quality.

Different countries around the world have recorded the use of HIS. Kohn (2014) reports that due to its endless benefits, both developed and developing countries, including Tanzania, have adopted and rapidly expanded the use of HIS in most of their hospitals. In Tanzania, Muhimbili National Hospital (MNH) is a prominent healthcare institution, serving as a national referral hospital, research center, and university teaching hospital. With a 1,500-bed capacity and 2,000 outpatient visits daily, MNH employs 2,800 individuals and plays a crucial role in the country's healthcare system. The hospital relies on the integrated Hospital Management Information System (HMIS), developed between 2004 and 2006, to manage various functions, including patient registration, human resource administration, payroll, finance, supplies, laboratory, and pharmacy (Mbizi, 2021). Researchers have documented the system's pivotal role in optimizing healthcare processes and enhancing patient outcomes (Mbizi, 2021). Even though HIS plays a big part at MNH, it's still unclear how useful it is. Prior studies have mostly concentrated on the operational and technical advantages of HIS (Akor et al., 2016). Nevertheless, there is a clear knowledge gap about the individual elements that impact its applicability, especially when considering large public hospitals like MNH in Tanzania.

By investigating the variables that affect the usability of health information systems (HIS) at MNH, this study seeks to close this gap. Through examining the impact of human, organizational, and technological factors on HIS usability, this research aims to provide valuable insights for optimizing HIS performance and raising service standards at MNH. Given the critical role that efficient HIS plays in the healthcare industry, this study will provide important new information to solve.

## 1.1 Statement of the problem

Medical facilities must establish and use health information systems (HIS) efficiently to improve service delivery and healthcare outcomes (Auyo et al., 2023). Usability, which measures how effectively systems can be utilized by medical professionals, office workers, and patients in an efficient, productive, and satisfying manner, significantly impacts these outcomes (Croll, 2009). At Muhimbili National Hospital (MNH), various issues affect HIS usability, including inadequate infrastructure, insufficient ICT knowledge, governance problems, disregard for eHealth standards, and interoperability issues (Garavand et al., 2016). These problems result in less effective use of HIS, negatively impacting medical treatment delivery and harming the hospital's reputation.

Despite substantial efforts by Tanzanian state agencies, including MNH, to automate services and integrate information and communication technologies (ICTs) into healthcare, issues with HIS usability persist (Muhanga & Haule, 2021). For example, only about 60% of the medical staff at MNH consistently use HIS for patient care, and many have concerns about its reliability and ease of use (Mbizi, 2021).

These problems lead to inefficient workflows and system failures that hinder healthcare practitioners and affect patients, as timely and accurate health information is crucial for patient treatment. These deficiencies prompted an investigation into the factors influencing the usability of health information systems for quality service delivery, focusing primarily on organizational, technological, and human factors.

## 1.2 Research Objectives

- i. To examine the influence of Human factors on the usability of HISs at MNH.
- ii. To examine the influence of Organization factors on the usability of HISs at MNH.
- iii. To examine the influence of Technology factors on the usability of HISs at MNH.

## II LITERATURE REVIEW

### 2.1 Theoretical Review

#### 2.1.1 The Human, Organization, and Technology-fit (HOT-Fit) Model

Erlirianto et al. (2015) introduced the Human, Organization, and Technology-Fit (HOT-Fit) model, which provides a framework for assessing how well human, organizational, and technological factors align to improve the usability and effectiveness of Health Information Systems (HIS). Human factors include aspects such as user training, competency, acceptance, and satisfaction. Erlirianto et al. (2015) assert that effective training enhances user skills and

system usability, and that higher levels of user satisfaction are associated with improved system usability. System integration success depends on organizational elements, including resources, support, and alignment of practices with the HIS. Hyppönen et al. (2019) and Mbizi (2021) corroborate this view by emphasizing the importance of procedural alignment and adequate organizational support.

Technological factors include system functionality, integration, technical issues, and infrastructure. This study assessed how organizational, technological, and human factors influence Muhimbili National Hospital's HIS usability and its effect on service delivery using the HOT-Fit model. It examined organizational variables such as support and procedural alignment, technological factors through system performance and security analysis, and human factors through user training and satisfaction. The study aims to identify the key elements that influence HIS usability and to provide insights into how these elements impact the quality of services provided.

## 2.2 Empirical Review

The review of literature on the determinants of health information systems usability for quality service delivery at MNH exposed a number of factors which influence the utilization of HIS in-healthcare settings.

### 2.2.1 The Influence of Human Factors on the Usability of HISs

A study by Halim (2019) explored the role of perceived usefulness and ease of use in HIS usability. This study surveyed a sample of 150 healthcare professionals across various settings, and the findings revealed that higher perceptions of usefulness and ease of use were strongly associated with better HIS usability. The research emphasizes the importance of making HISs both valuable and user-friendly to enhance usability. Supporting this, Price et al. (2016) investigated how positive perceptions among healthcare professionals influence HIS adoption and integration. Their study involved a sample of 200 healthcare professionals and employed a mixed-method approach, including surveys and interviews. The results indicated that positive perceptions significantly facilitated HIS adoption and integration, leading to improved efficiency and patient care outcomes. The study recommends focusing on enhancing the perceived value of HISs through user-centered design.

Awowale (2017) assessed user satisfaction and acceptance in HIS implementation using quantitative surveys with a sample size of 300 users across different healthcare facilities. The study found that high levels of user satisfaction and acceptance are crucial for successful HIS implementation. It underscores the importance of incorporating user-centered design principles to enhance usability and effectively meet user needs.

### 2.2.2 The Influence of Organization Factors on the Usability of HISs

Using a sample of 20 healthcare institutions, Kuhuba et al. (2014) identified organizational culture, leadership support, and resource availability as key determinants influencing HIS usability and implementation success. The findings indicated that institutions with supportive leadership and a culture favoring technological adoption were better positioned to integrate HIS into clinical workflows, thereby enhancing data management and improving patient care quality. This research emphasizes the importance of fostering a supportive organizational environment for successful HIS integration.

Moreover, Khatun and Sima (2015) examined public-private procurement practices for medical commodities in a study involving a sample of 15 public and private procurement offices. The research reported that organizational challenges, such as bureaucratic procurement processes and inconsistent guidelines, adversely affect HIS usability and overall efficiency in managing medical supplies. The study suggests that streamlined and consistent procurement practices are necessary to support effective HIS implementation.

### 2.2.3 The Influence of Technology Factors on the Usability of HISs

Khatun and Sima (2015) emphasize the importance of system design and functionality in enhancing HIS usability. Their research, which involved a sample of 30 healthcare organizations, highlighted that user-friendly interfaces and robust technical support systems are essential for improving HIS adoption and usability among healthcare professionals. The study underscores the need for well-designed HIS systems that support user needs and provide reliable technical assistance to ensure effective usage.

Kavuta (2023) explored the impact of regulatory compliance on pharmaceutical procurement, involving a sample of 25 procurement offices. The study focused on aligning procurement practices with health regulatory standards to ensure the quality and reliability of medical supplies. The findings suggest that adherence to regulatory standards is crucial for maintaining high-quality medical supplies, thereby supporting the overall usability of HIS through effective procurement practices.

Afzal (2017) critiqued regulatory compliance theory, arguing that qualified and competent staff are critical for ensuring effective adherence to policies and procedures. With a sample of 20 healthcare organizations, the study

emphasizes the importance of skilled personnel in managing regulatory compliance and optimizing HIS usability. It suggests that competent staff is vital for the successful implementation and operation of HIS systems. Similarly, Asemahagn (2017) highlights the importance of human factors, including staff training and competency, in achieving regulatory compliance and optimizing HIS usability. With a sample of 40 healthcare institutions, their study findings indicate that comprehensive staff training and ongoing professional development are key to ensuring effective HIS usage and adherence to regulatory requirements.

In general, the reviewed literature underscores the multifaceted nature of HIS usability and implementation processes. By elucidating the factors that influence usability, these studies provide valuable insights for policymakers, healthcare administrators, and researchers seeking to promote the effective use of HIS to enhance service delivery and healthcare outcomes. However, most of the findings are from studies conducted in different countries, which cannot be generalized to the Tanzanian context. Furthermore, even those conducted in Tanzania, such as Chikanda (2016), focused primarily on procurement aspects rather than the specific usage of HIS at Muhimbili National Hospital (MNH) and similar healthcare institutions. For this reason, we conducted this study to bridge the existing gap in the literature.

### III METHODOLOGY

#### 3.1 Research Design

A descriptive survey design was employed in the study, utilizing both quantitative and qualitative techniques within a mixed-methods approach. Multiple regression analysis was incorporated to examine the relationships between variables. Semi-structured interviews were conducted to gather qualitative data, providing deeper insights into the experiences and perspectives of MNH staff members, while structured questionnaires were used to collect quantitative data, evaluating various aspects of Health Information Systems (HIS) usability. This combined approach enhanced the overall understanding of HIS usability by integrating individual human experiences with broader statistical patterns, offering a comprehensive analysis (Kothari, 2004).

#### 3.2 Population of the Study

In this study, the target group comprised 1,500 MNH staff members, including registrars, residents, specialists, nurses, and other personnel. A diverse sample was selected to ensure that the findings would be applicable to similar healthcare institutions.

#### 3.3 Sample Size

A sample size of 109 out of 1,500 employees was calculated using Yamane's formula, with a 95% confidence level and a 5% margin of error. The sample included employees from various departments, representing a cross-section of the entire population.

#### 3.4 Sampling Technique

Systematic random sampling was employed to select participants, involving the selection of every 2nd staff member from a list to ensure a representative sample. This method was chosen to minimize bias and achieve balanced representation.

#### 3.5 Data and Data Collection Methods

Data was collected using two main methods: questionnaires and interviews. The questionnaire consisted of both open-ended questions and five-point Likert scale questions to assess the impact of human, technological, and organizational factors on the usability of the HIS. Different questions were designed to represent each independent variable. For human variables, a question like, "I am aware of the HIS implemented at MNH," was used. Regarding organizational factors, a question such as, "Are there clear guidelines or policies in place regarding the use of the health information system?" was included. For technology, a question like, "The usability of the health information system enhances service quality at MNH," was asked. A total of 109 questionnaires were distributed, and all 109 were returned, providing a 100% response rate.

Additionally, semi-structured interviews were conducted with 30 HIS users, including doctors, nurses, and administrative staff. The interviews aimed to gather in-depth insights into their experiences and challenges with HIS. These interviews were recorded verbatim for further analysis and were guided by an interview guide. The interviews, lasting approximately 15–20 minutes, were conducted either face-to-face or by telephone, following prior arrangements with the participants. The qualitative data collected through interviews complemented the quantitative data from the questionnaires.

### 3.6 Validity and Reliability of Data

To ensure the data was reliable and valid, a pilot study involving 20 respondents was conducted to refine the research instruments. This pilot study was carried out with respondents from the same hospital who were not involved in the main research. It helped the researcher identify and address weaknesses in the tools. Triangulation was employed to cross-verify data from different sources. Member checking was used to allow participants to review their interview transcripts for accuracy. An audit trail documented the research process, and exploratory factor analysis (EFA) and Cronbach's alpha were used to test data validity and reliability.

### 3.7 Data Analysis

Quantitative data were analysed using Microsoft Excel and IBM SPSS version 23. Descriptive statistics (e.g., mean, standard deviation) and regression analysis were performed to examine the impact of human, organizational, and technological factors on HIS usability. This analysis followed a thorough process of data cleaning, grouping, and coding. Qualitative data from interviews were analysed using thematic analysis with NVivo software to identify patterns and themes.

## IV FINDINGS & DISCUSSION

### 4.1 Demographic Characteristics

The study conducted at Muhimbili National Hospital in Dar es Salaam included 109 participants with various demographic characteristics. Descriptive statistics, including percentage and frequency, were utilized to present the respondents' demographic features, including gender, age, education level, and area of specialization, as shown in Table 1. The sample reflects a diverse professional background, offering insights into the usage of healthcare information systems.

**Table 1**

*Demographic Characteristics*

Characteristic	Category	Frequency	Percent (%)
<b>Gender</b>	Male	62	56.9
	Female	47	43.1
<b>Age(years)</b>	18-25	4	3.7
	26-35	22	20.2
	36-45	56	51.4
	46-50	20	18.3
	Above 51	7	6.4
<b>Education Level</b>	Certificate	10	9.2
	Diploma	17	15.6
	Bachelor's Degree	60	55.0
	Master's Degree	22	20.2
<b>Area of Specialization</b>	Registrar	12	11.0
	Resident	11	10.1
	Specialist	7	6.4
	Nurse	18	16.5
	Health Attendant	7	6.4
	Accountant	17	15.6
	Social Worker	3	2.8
	Medical Records	7	6.4
	ICT Personnel	13	11.9
	Pharmacist	11	10.1
	Health Lab Scientist	3	2.8

As shown in Table 1, the majority of respondents were male (56.9%). The demographics reveal that most of the respondents were aged between 36 and 45 years (51.4%), and a significant portion held a bachelor's degree (55.0%). Regarding their areas of specialization, nurses constituted the largest group (16.5%), followed by accountants (15.6%) and ICT personnel (11.9%). The remaining respondents were distributed among various other roles, including registrars, residents, and specialists.

### 4.2 Influence of Human Factors on the Usability of HISs at MNH

The first objective of the study sought to identify the influence of human factors on the usability of HISs at MNH. The human factors considered include awareness of Health Information Systems (HIS) implemented, frequency

and adequacy of training on HIS, influence of user perceptions and experiences on HIS effectiveness, HIS adoption and satisfaction in providing quality service, ease of use of HIS, level of HIS acceptance, and trust in HIS services. Descriptive analysis of these factors is displayed in Table 2, where SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree.

**Table 2**

*Descriptive Statistics of the Items Forming Human Factors*

Human Factor	SA (%)	A (%)	N (%)	D (%)	SD (%)
Users' awareness on Health Information Systems (HIS) Implemented	27.5	41.3	18.3	3.7	9.2
Frequency and Adequacy of Training on HIS	22.9	36.7	22.9	3.7	13.8
Influence of User Perceptions and Experiences on HIS Effectiveness	18.3	45.9	22.9	5.5	7.3
HIS Adoption to Satisfaction in Providing Quality Service	32.1	36.7	18.3	5.5	7.3
Ease of Use of HIS	25.7	41.3	22.9	4.6	5.5
Level of HIS acceptance	27.5	45.9	18.3	3.7	4.6
Trust in HIS Services	18.3	41.3	27.5	5.5	7.3

#### 4.2.1 User Awareness on Health Information Systems (HIS) implemented at MNH

Findings presented in Table 2 indicate that a majority of the respondents (68.8%) are aware of the HIS implemented at MNH, with 27.5% strongly agreeing and 41.3% agreeing. This suggests that communication about the HIS within the institution is fairly effective. However, a notable portion (27.5%) of the respondents were either neutral or unaware of the HIS, highlighting a gap in awareness that could impact the usability of the system. If users are not fully informed about the HIS, it may hinder their ability to effectively use the system, thereby reducing its overall effectiveness and the quality of care provided. Therefore, improving communication and awareness campaigns is crucial to enhancing both user engagement and the usability of the HIS. Furthermore, this result supports the HOT-Fit model's assertion that user competency and training are essential human factors (Erlirianto et al., 2015). To improve user involvement and the HIS's usability, communication and awareness initiatives must be improved.

#### 4.2.2 Frequency and Adequacy of Training on HIS

Findings presented in Table 2 indicate that 59.6% of individuals, with 22.9% strongly agreeing and 36.7% agreeing, responded that they got sufficient training on the HIS. Regarding the suitability of the training they receive, a noteworthy 36.7% of respondents were either neutral or disagreed. It appears that there is a need for more regular and in-depth training sessions, as this exposes a weakness in the current training programs. To improve the HIS's usability and optimize its advantages inside the organization, it is imperative to make sure that all users have the tools they need to use it efficiently. This is proportional with the conclusions drawn by (Erlirianto et al., 2015) who stress the importance of efficient training in enhancing user proficiency and system usefulness. During the interview, a key informant said, *"The system's user-friendly interface, coupled with adequate training and support, has alleviated concerns and motivated users to embrace the change."* (Interview: P2, May, 2024)

Similarly, another key informant said:

*Adequate training plays a crucial role in facilitating the usability of the health information system. It empowers users with the necessary skills and knowledge to navigate the system effectively, ensuring proficiency in tasks such as data entry, retrieval, and interpretation. Training sessions also serve to address any apprehensions or uncertainties users may have, instilling confidence and promoting a positive attitude towards the system. Moreover, continuous training and refresher courses enable users to stay updated on system updates and enhancements, enhancing their overall competency and usability.* (Interview: P3, May, 2024).

#### 4.2.3 Influence of User Perceptions and Experiences on HIS effectiveness

The findings in Table 2 show that, the majority of respondents (64.2%) believe that user experiences and perceptions have a significant influence on the HIS's efficacy. This emphasizes how important it is to prioritize satisfying user experiences in order to improve the usability and efficacy of the system. Enhancing user involvement and responding to criticism with continuous improvements may increase the impact of the HIS on MNH's health service quality. This result validates the HOT-Fit model's claim that increased system usability is correlated with higher user satisfaction (Kohn, 2014).

#### 4.2.4 HIS Adoption to Satisfaction in Providing Quality Service

According to findings presented in Table 2, 68.8% of respondents believe that usability of HIS positively improves their satisfaction with offering high-quality services. This suggests that HIS is essential for raising customer happiness and service quality. To enhance its usability, the HIS must be made sure to be easy to use and to efficiently satisfy the needs of healthcare professionals. Empirical results like those of Mboro (2017), which connect higher judgments of simplicity and utility with HIS usability, support this.

#### 4.2.5 Ease of use of HIS

The majority of respondents (67%) indicate that the HIS is straightforward to use, which is crucial to its efficient usage. Nonetheless, over 28.4% of respondents expressed no opinion or disagreement, indicating that usability problems require to be addressed. The HIS might be made more approachable and user-friendly with continued system improvements and user training. According to Lubua and Pretorius (2018) the HOT-Fit model validates the requirement for arrangement between system complexity and user needs. One participant in the interviews clarified that:

*“Users are more likely to adopt a solution that fits their workflow requirements and is simple to use. On the other hand, people may become resistant to adoption if complicated processes or interfaces are involved. Therefore, to maximize acceptance and utilization of the health information system at MNH, it is imperative to ensure high standards of usability and swiftly fix any issues related to these aspects. (Interview, May 20, 2024, P4)”*

#### 4.2.6 Level of HIS Acceptance

Findings in Table 2 demonstrate that 73.4% of respondents believe that healthcare professionals' willingness to engage with the Health Information System (HIS) at Muhimbili National Hospital (MNH) is strongly linked to the system's acceptance. Theoretical insights from the HOT-Fit model, and empirical studies such as Lubua and Pretorius (2018) and Price et al. (2016), underscore that user acceptance is pivotal to system usability. Promoting favourable attitudes toward HIS through strategies like comprehensive training, ongoing support, and clear communication of benefits can significantly increase user engagement and efficient system utilization. These strategies address user needs and foster a sense of competency and satisfaction, enhancing overall system acceptance and, ultimately, its effective use in healthcare settings.

#### 4.2.7 Trust in HIS Services

The findings further depicted in Table 2 reveal that while 59.6% of respondents trust the Health Information System (HIS) services at Muhimbili National Hospital (MNH), a significant 34.8% remain neutral or distrustful. This suggests that trust is a critical factor for increasing user engagement and ensuring system effectiveness. According to the HOT-Fit model and empirical studies like those by Price et al. (2016), trust in HIS is closely related to its usability; users are more likely to engage with a system that is perceived as reliable, secure, and user-friendly. Enhancing trust can be achieved by addressing concerns related to system performance, ensuring robust security measures, and maintaining ease of use. Consistent and transparent communication regarding the HIS's benefits and security features can further build user confidence. When users trust the HIS, they are more likely to engage with it fully, leading to more efficient system usability and improved healthcare outcomes.

### 4.3 Influence of Organizational Factors on the Usability of HISs at MNH

The second objective of the study sought to identify the influence of organizational factors on the usability of HISs at MNH. The organizational factors considered include supportive organizational culture and process change, clear guidelines and policies, management support, implementation of training and education programs, opportunities for education sponsorship programs, organizational challenges, and limited investment in IT infrastructure. Descriptive analysis of these factors is displayed in Table 3, whereby SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree.

**Table 3***Descriptive Analysis of the Items Forming Organizational Factors*

<b>Organizational Factors</b>	<b>SA (%)</b>	<b>A (%)</b>	<b>N (%)</b>	<b>SD (%)</b>	<b>D (%)</b>
Supportive Organizational Culture and Process Change	31.2	36.7	18.3%	6.4%	7.3%
Clear Guidelines and Policies	27.5	34.8	21.1	8.3	8.3
Management support	24.8	35.8	23.9	7.3	8.3
Implementation of Training and Education Programs	26.6	33.0	24.8	7.3	8.3
Opportunities for Education Sponsorship Programs.	25.7	31.2	25.7	7.3	10.1
Organizational Challenges	26.6	32.1	23.9	8.3	9.2
Limited investment in IT infrastructure	13	55	29	4	8
Resistance to change	11	60	20	8	10
High implementation costs	5	70	15	6	13

#### 4.3.1 Supportive Organizational Culture and Process Change

Table 3 demonstrates that a sizable portion of respondents (67.9%) think that MNH's organizational culture and process modifications favorably enhance new technology's usability, indicating a conducive atmosphere for implementing technological advancements. This encouraging atmosphere encourages user acceptance and participation, which is essential for enhancing the use of new technology. There is yet opportunity for development, despite the fact that 13.7% of respondents disagreed and 18.3% of neutral replies were given. Improving communication and fostering an inclusive culture are critical to raising support and acceptance for new technology. By doing this, MNH can ensure that all users feel supported and are more likely to use new tools and processes efficiently. It can also further improve the usability of its technological systems. In line with the HOT-Fit model's emphasis on organizational support, improving communication and cultivating an inclusive culture are crucial to boosting support and acceptance for new technologies (Kuhuba et al., 2014).

#### 4.3.2 Clear guidelines and Policies

Further findings in Table 3 indicate that most respondents (62.3%) think there are explicit rules or guidelines for using the Health Information System (HIS), indicating that they have a favorable opinion of the organization's design and execution of its policies. Establishing unambiguous standards is essential to ensuring that the HIS provides an organized and user-friendly approach. The existing neutrality and remarkable level of disagreement and neutrality (37.7%) indicate that a large number of staff members may find the current standards inadequate or ambiguous. This emphasizes the necessity for increased policy enforcement and communication in order to guarantee that all staff members are aware of and abide by the rules. Enhancing these elements might make the HIS easier to use, which would encourage more regular usage and increase its overall efficacy.

#### 4.3.3 Management Support

Moreover, findings indicate that the majority of respondents (60.6%) believe that hospital administration supports them when they utilize the Health Information System (HIS). This indicates that HIS assistance by the management is typically sufficient. Through ensuring that users have the tools and assistance they need to utilize the system efficiently, this support is essential for enhancing the usability of the HIS. Better managerial support is clearly needed, as evidenced by the 15.6% of respondents who disagree and the 23.9% of respondents who are neutral. By addressing these problems and offering more resources and reliable support, it may be possible to improve system usability and the user experience overall. Enhancing managerial assistance is essential to guarantee that all employees feel adequately supported, which will improve system performance overall and enable more efficient use of the HIS. In line with the HOT-Fit model's emphasis on management support, it is imperative to strengthen managerial support in order to guarantee that all employees feel appropriately supported (Halim, 2019).

During an interview, one participant said: *...leadership support and commitment to technology integration have played a pivotal role in fostering a culture of acceptance and encouraging users to adopt and usage of the system"*

#### 4.3.4 Implementation of Training and Education Programs

Findings in Table 3 portray that 59.6% of respondents are aware that the company frequently provides education and training opportunities with the goal of raising service quality. Nonetheless, it appears that these programs might not be sufficiently thorough or beneficial for everyone, as indicated by the 15.6% of opposing and 24.8% of neutral comments. This suggests that in order to guarantee that every employee benefits equally, training activities need to be more inclusive and focused. Improved training initiatives are essential for increasing user confidence and competence, which improves the Health Information System's (HIS) usability. Enhancing the

effectiveness and accessibility of training can help the business make sure that all employees are better equipped to utilize the HIS, which will improve overall service quality and system usability.

#### 4.3.5 Opportunities for Education Sponsorship Programs

Table 3's data reveals that while 56.9% of respondents are aware of opportunities for education sponsorship programs intended to help them develop in their careers, a noteworthy 43.1% are either neutral or disagree. This shows that in order to properly assist staff career progression, sponsorship programs need to be more visible and easily available. The company can improve professional growth and job satisfaction by raising awareness of and access to these opportunities, which will benefit the Health Information System's (HIS) use. Employee engagement and motivation to use the HIS efficiently increases when they feel encouraged to advance in their careers. This enhances the overall effectiveness and usability of the system. Additionally, the reviewed literature highlights the significance of human factors such as training and satisfaction (Hyppönen et al., 2019).

#### 4.3.6 Organizational Challenges

The results of the review of the literature, which emphasizes the significance of organizational support and resources for HIS usability, are consistent with the finding from Table 3 show that 58.7% of respondents see organizational issues like risk aversion, inadequate IT investment, and resistance to change as barriers to using Health Information Systems (HIS) effectively (Erlirianto et al., 2015). With 41.4% of respondents expressing neutrality or disagreement, the disparity in opinions points to different experiences and perceptions inside the business, maybe as a result of different responsibilities or degrees of engagement (Kavuta et al., 2023). Furthermore, in order to improve HIS usability, it is imperative to overcome these obstacles through strategic planning, increased IT investment, and creating a culture that supports change, as suggested by research to improve system efficacy and usability (Khatun & Sima, 2015).

#### 4.3.7 Limited Investment in IT Infrastructure

Findings indicate that 68% of respondents consider a major issue to be inadequate investment in IT infrastructure, highlights a crucial obstacle to the efficient use of Health Information Systems (HIS). This research emphasizes how more money needs to be spent on IT infrastructure in order to enhance HIS efficacy and usability.

The evaluated literature, which includes research by Halim (2019), indicates that inadequate investment in IT infrastructure can seriously obstruct system integration and functionality. Additionally, Kimaro and Twaakyondo (2017) stress that sufficient resources and assistance are necessary to maximize HIS effectiveness. Healthcare organizations can improve system usability, user experience, and overall service delivery efficiency by addressing these infrastructural inadequacies. This will help them with the literature's suggestions for better resource allocation to enable success. An informant elaborated on this topic by saying:

*The usability of the health information system has faced significant challenges due to resource constraints and inadequate support mechanisms." Insufficient financial resources for technical assistance, infrastructure improvements, and training have made it more difficult for us to successfully meet user needs.*

#### 4.3.8 Resistance to Change

Findings in Table 3 further indicate that 70% of respondents saw resistance to change as a major obstacle implies that the efficient use of Health Information Systems (HIS) is severely hampered by unwillingness to switch from traditional methods to digital systems. This is consistent with previous research (Awowale, 2017), who notes that resistance to change is a common obstacle to the adoption of HIS, particularly in big healthcare settings. Chikanda (2016), point out that addressing this resistance is essential to improving system adoption and usability, emphasizing the requirement for user acceptance for successful HIS implementation. Encouraging a culture that welcomes change via focused instruction, clear communication, and strong support can lessen opposition and enhance HIS usability and integration, resulting in easier transitions. During the interview, an informant added:

*One of the main problems we've observed with the MNH health information system's usability is some user groups' aversion to change. Some staff members are reluctant to switch from conventional paper-based processes to digital systems, even after receiving extensive training and support.*

#### 4.3.9 High Implementation Costs

The data presented in Table 3 reveals that a significant obstacle to successfully implementing new technologies, such as Health Information Systems (HIS), is financial obstacles, as indicated by 70% of respondents citing high implementation costs as a major issue. This result is consistent with the literature, which emphasizes that

sufficient funding is necessary for the use and successful deployment of HIS (Erlirianto et al., 2015). Ensuring that budgetary restrictions do not compromise the efficacy of the system can improve HIS usability by tackling these cost issues through strategic planning and focused investment. Healthcare companies can enhance HIS usability and functionality through effective resource allocation, which will ultimately result in improved healthcare service delivery.

#### 4.4 Influence of Technology Factors on the Usability of HISs at MNH

Evaluating the effects of technological aspects on MNH's Health Information Systems (HIS) usability was the third study objective. The technical aspects that are looked at are infrastructure accessibility, technological problems, and the function of HIS in enhancing service quality. The study also took into account system complexity, expertise and training requirements, and integration with external systems, technological constraints, and security issues that could erode user confidence. Table 4 presents a descriptive analysis of these characteristics, where SA stands for "strongly agree," A for "agree," N for "neutral," D for "disagree," and SD for "strongly disagree."

**Table 4**

*Descriptive Analysis of the Items Forming Technology Factors*

Technology factors	SA (%)	A (%)	N (%)	SD (%)	D (%)
Technical Issues	22.9	36.7	18.3	11.0	11.0
Infrastructure Availability	27.5	32.1	18.3	9.2	12.8
Usability of HIS Enhancement of Service Quality	25.7	34.9	16.5	7.3	15.6
Technological Limitations	20.2	33.0	22.9	9.2	14.7
Integration with External Systems	18.3	27.5	22.9	11.0	20.2
Knowledge and Training	16.5	29.4	27.5	9.2	17.4
Complexity of the system	10.0	70.0	10.0	10.0	4.0
Security concerns affect user trust	5.0	68.0	16.0	8.0	12.0

##### 4.4.1 Technical Issues

A major determinant to system usability and workflow productivity is highlighted by Table 4. Findings demonstrate that 59.7% of participants encounter technical issues including computer malfunctions and network outages when using the Health Information System (HIS). This result is consistent with those of Afzal (2017), which highlights the influence of technological aspects on HIS effectiveness. According to Afzal (2017), system stability is essential for user acceptability and efficient HIS use, recurrent technical problems interfere with day-to-day operations and lower user satisfaction. Improving system usability is crucial to maintaining the HIS's dependability and efficacy for all users, which will eventually promote improved healthcare outcomes. These issues must be addressed through regular maintenance and increased technical assistance. The key informant clarifies such technical matters by stating:

*One specific challenge faced by users during the usability of the health information system was the unfamiliarity with the new interface and functionalities. Despite training sessions, some staff members struggled to navigate the system efficiently, leading to frustration and decreased productivity. Additionally, data entry errors and inconsistencies emerged as common issues, highlighting the need for ongoing training and quality assurance measures.*

##### 4.4.2 Infrastructure Availability

The findings in Table 4 also indicate that 59.6% of respondents recognize high infrastructure availability supporting HIS usability. This positive response suggests that the current infrastructure is perceived to be generally sufficient to support the system, echoing the importance of technological factors, such as system functionality and integration, highlighted in the HOT-Fit model (Erlirianto et al., 2015). However, the 31.1% of respondents who remain neutral or disagree suggest perceived gaps in infrastructure adequacy, which could be due to insufficient or unevenly distributed IT resources. This finding is consistent with Adejumo (2017) who emphasised the need for robust technological infrastructure to ensure optimal HIS usability. To address these gaps, targeted investments in infrastructure are necessary, ensuring that IT resources are adequately distributed and accessible throughout MNH, thereby enhancing HIS usability and consistent service delivery. One respondent highlighted these challenges by stating:

*The shortage of computers has been a major challenge, leading to inadequate adaptation and usability of the Health Information System. Additionally, the lack of ICT staff for support has resulted in the inability to effectively use ICT systems, especially when users face system issues and lack timely ICT support, ultimately leading to the failure to provide quality services to clients*

#### 4.4.3 HIS Usability for Enhancement of Service Quality

The findings displayed in Table 4 reveal that majority of respondents (60.6%) believe that using the Health Information System (HIS) enhances service quality at MNH. This positive perception highlights the system's potential to improve patient care, operational efficiency, and clinical outcomes. However, the 23.1% neutral responses indicate a need for clearer communication or evidence of these benefits to fully realize the system's usability impact. Enhancing the visibility and understanding of HIS benefits among stakeholders could further optimize its usability and effectiveness in healthcare service delivery, aligning with the literature by Akor et al. (2016) which emphasized the role of perceived usefulness and ease of use in improving system usability.

#### 4.4.4 Technological Limitations

The findings in Table 4, where 53.2% of respondents identify technological limitations such as system functionality issues and slow response times as barriers to effective HIS use, underscore the significant impact of technological factors on usability at MNH. These challenges align with the HOT-Fit model's emphasis on the importance of technological components, including system performance and infrastructure (Erlirianto et al., 2015), in ensuring system usability. The identified limitations can lead to workflow disruptions and reduced user satisfaction, reflecting findings by Chikanda (2016) that highlight the need for robust and responsive technological systems to maintain usability in healthcare settings. To address these barriers, it is crucial to invest in continuous system upgrades and improvements, adapting the HIS to evolving healthcare needs and technological advancements. Doing so will enhance user experience, optimize system performance, and ultimately support better service delivery. Cementing these, an informant said:

*Yes, there have been instances where users encountered technical issues or limitations with the health information system during the usability process. These issues ranged from system crashes and slow performance to compatibility issues with existing hardware or software. While our IT team has been proactive in addressing these challenges, such disruptions have occasionally impacted users' confidence in the system and hindered smooth usability.*

#### 4.4.5 Integration with External Systems

The findings in Table 4, showing that 31.2% of respondents perceive limited integration of the HIS at MNH with other hospital systems or external databases, and 22.9% remaining neutral, highlight a critical gap in the system's interoperability and data exchange capabilities. This is consistent with the HOT-Fit model's focus on technological factors, emphasizing that effective integration is crucial for the seamless flow of information across different platforms (Erlirianto et al., 2015). Limited integration can hinder comprehensive patient care and health information management by creating silos of data that are difficult to access and use effectively, which is consistent with Afzal's (2017) argument that interoperability is vital for enhancing HIS usability. Addressing these integration challenges by improving the system's compatibility with external databases and internal hospital systems could enhance data accessibility and streamline workflows, thereby increasing HIS usability and supporting more effective healthcare delivery at MNH

#### 4.4.6 Knowledge and Training

The findings presented in Table 4 that 45.9% of respondents possess sufficient knowledge of how to use the HIS. However, the 27.0% who feel neutral or disagree indicate ongoing challenges in user education and training. Addressing these challenges through regular, tailored training programs could significantly boost user confidence and proficiency in HIS utilization, ultimately enhancing the system's usability and ensuring that healthcare professionals maximize its benefits. This aligns with Adejumo (2017), who emphasizes that technological infrastructure, including system functionality and usability, is critical for supporting effective training and user engagement. Interview sessions provide detailed facts about training. An informant was quoted saying: “...ongoing training and support initiatives should be prioritized to ensure that users feel confident and competent in utilizing the system. Additionally, establishing clear communication channels and feedback mechanisms will allow users to voice their concerns and suggestions, fostering a sense of ownership and engagement.”

#### 4.4.7 Complexity of the system

The finding presented in Table 4 reveal that 80% of respondents perceive the complexity of the Health Information Systems (HIS) at Muhimbili National Hospital (MNH) as a determinant to usability, suggesting that simplifying the system could enhance user effectiveness and patient care. According to the HOT-Fit model, technological factors, such as system functionality and integration, play a critical role in determining system usability. Findings are consistent with those of Hyppönen et al. (2019) who emphasized that system simplicity enhances usability by improving perceived ease of use and user-centred design. Thus, these findings suggest that addressing

technological complexities is crucial for enhancing HIS usability at MNH, complementing the human and organizational elements also assessed in this study. In the interview session, a nurse on the same was quoted saying: “...the complexity of the systems has been a challenge in using them, and the high cost of maintaining the system and ICT infrastructure has been an issue preventing the optimal adaptation and use of the systems to provide quality services”

#### 4.4.8 Security Concerns Affect User Trust

The findings indicate that 73% of respondents recognize a significant link between security concerns and user trust in the Health Information System (HIS) at Muhimbili National Hospital (MNH). According to the HOT-Fit model, technological elements, including security infrastructure, are crucial for system adoption and effectiveness. The findings are in line with those of earlier scholars. Hyppönen et al. (2019) support this by highlighting that secure systems foster user confidence, which is essential for successful implementation and integration of HIS. Therefore, robust security measures not only protect sensitive data but also enhance user trust, directly contributing to improved system usability and encouraging broader system use within healthcare settings.

#### 4.5 Multiple Regression Analysis

**Table 5**

*Factors for Usability of HIS*

Variable	Coefficient	Standard Error	t-value	p-value
Constant	0.23	0.08	2.85	0.005
Human factors	0.42	0.12	3.50	<0.001
Organizational factors	0.31	0.09	3.45	<0.001
Technological factors	0.28	0.10	2.80	0.007

Important factors impacting system efficacy were found in the regression study of Muhimbili National Hospital's Health Information System (HIS) usability, as shown in Table 5. The study's findings regarding human factors revealed a coefficient of 0.42 and a p-value of 0.001 ( $p < 0.05$ ), which strongly suggest that human factors—particularly healthcare workers' greater awareness—improve HIS usefulness.

The regression analysis of the Health Information System (HIS) usability at Muhimbili National Hospital revealed significant parameters influencing system efficacy, as Table 5 illustrates. The study's results on human factors showed a p-value of 0.001 ( $p < 0.05$ ) and a coefficient of 0.42, which strongly suggest that human factors—especially the increased awareness of healthcare workers—improve the effectiveness of HIS.

To sum up, the research has provided insightful information about the variables influencing Muhimbili National Hospital's (MNH) Health Information Systems' (HIS) usability. Through a detailed examination of organizational, technological, and human factors, the study pinpoints important areas where focused interventions might boost healthcare service delivery and increase HIS usability. The primary conclusions highlight how important it is to maximize HIS performance in hospital settings by taking into account awareness, training, organizational support, technology infrastructure, and system capabilities.

It is clear from looking ahead that making investments in specialized training programs, strengthening organizational support, and modernizing technology infrastructure are critical actions. By taking these steps, healthcare providers will be able to use the HIS more successfully and foster an environment that is conducive to continuous innovation and improvement.

Through the integration of user feedback and the promotion of interdisciplinary collaboration, MNH may enhance its HIS to more effectively align with clinical workflows and fulfill patient care requirements. Furthermore, it has been observed that technological variables are essential for guaranteeing the system's acceptance and usage. Despite the system's many advantages for healthcare workers, patients, and the government as a whole, it has been demonstrated that power outages and other related issues, if not resolved in a timely manner, will prevent the system from operating to its full capacity.

## V. CONCLUSIONS & RECOMMENDATIONS

### 5.1 Conclusions

To sum up, the research has provided insightful information about the variables influencing Muhimbili National Hospital's (MNH) Health Information Systems' (HIS) usability. Through a detailed examination of organizational, technological, and human factors, the study pinpoints important areas where focused interventions might boost healthcare service delivery and increase HIS usability. The primary conclusions highlight how important

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## 5.2 Recommendations

Based on the findings of this study the following recommendations are proposed to enhance system effectiveness and healthcare service delivery:

The study recommends MNH to develop tailored training programs that go beyond basic system functionalities to include hands-on and scenario-based learning. Moreover, it should emphasize on the practical benefits of the HIS in improving clinical workflows, patient care outcomes, and administrative efficiency. Continuous training ensures that healthcare professionals are not only proficient but also confident in utilizing the system effectively in their daily routines.

The researcher suggests that MNH obtain commitment from middle and senior management in order to create an atmosphere that is conducive to the adoption and use of the Health Information System (HIS). According to the report, MNH should set aside enough money for system improvements, maintenance, and training. Upon the establishment of the requisite equipment, it is imperative to institute policies and laws that delineate the functions, advantages, and inducements for continuous utilization of these systems.

The report also suggests that MNH make investments in modernizing and upholding a strong IT infrastructure in order to guarantee dependable and secure HIS operations. Investing in hardware, software, and network infrastructure is necessary to ensure system performance, data integrity, and smooth communication. System capabilities and user experience can be enhanced by frequent upgrades and the integration of cutting-edge technology like cloud computing and mobile solutions.

The report advises MNH to put systematic procedures in place for getting input from medical professionals regarding their HIS encounters. It is important to use this input to pinpoint areas that require improvement, usability problems, and user challenges. In addition, it is crucial to include users in the design and improvement phases to guarantee that system upgrades take into account practical issues and complement clinical procedures.

Lastly, MNH is urged to foster cooperation between administrators, IT specialists, and healthcare practitioners in order to jointly create HIS features that satisfy operational and clinical requirements. Putting together multidisciplinary teams to streamline processes, incorporate new features, and fix bugs in the system will help guarantee that the HIS meets the objectives of healthcare delivery and boosts productivity and effectiveness all around.

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