International Research Journal Of Medicine and Health Sciences

*Vol 6, Issue 2, pp 1-19, Aug 5, 2024, © International Research Journal Publishers, ISSN 2710-2742 (online) www.irjp.org*

# FACTORS INFLUENCING IMPLEMENTATION OF HEALTH MANAGEMENT INFORMATION SYSTEM IN PUBLIC HEALTH FACILITIES IN PUNT LAND STATE, SOMALIA

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Accepted, Aug 2nd, 2024

**Abstract:** The adoption and utilization of Health Management Information System in Somalia is very low. It is characterized by a myriad of challenges such as low rate of government investment in the systems, low level of technical capacity in handling information (collecting, analysis, dissemination), and lack of or poorly drafted HMIS strategies. The study sought to interrogate the factors influencing implementation of Health Management Information System in Public Health Facilities at in Punt Land State, Somalia. The study also sought to establish the effect of technological factors, organizational factors, environmental factors and human factors on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia. The study adopted a descriptive research design. The target population was 834 pharmacists, registered nurses and hospital administrators in public health facilities in Puntland state. Stratified simple random sampling was used in the selection of 270 staff working in Puntland state. Data was collected by use of a semi structured questionnaire. Data was analyzed by use of descriptive and inferential statistics with the help of SPSS version 24.0. The results indicated that technological factors, organizational factors and human factors have positive and significant effect on the implementation of HMIS in public health facilities in Punt Land State, whereas environmental factors had a negative effect on the implementation of HMIS in public health facilities in Punt Land State, Somalia. The study also found that human factors have a positive and significant effect on the implementation of HMIS in public health facilities in Punt Land State, Somalia. The study recommends that the management of the health facilities should ensure a well-established infrastructure system. Further, the management of health facilities should ensure continuous improvement of WAN infrastructure. Also, the study recommends that Punt Land State should increase the allocation of financial resources to the implementation of Health Management Information System. Further, the local government of Punt Land State should ensure an improvement in the adoption and implementation of HMIS. This will play a key role in ensuring a reduction in information mismanagement.

**Keywords:** *Technological Factors, Human Factors, Environmental Factors, Health Facilities*

## INTRODUCTION

Health Management Information Systems (HMIS) are integral components of healthcare delivery, forming one of the six essential building blocks for health system strengthening. These systems are designed to collect, store, process, and disseminate health information to support decision-making in healthcare facilities and organizations. They cover a wide range

of functions, from patient registration, diagnosis, treatment, and medical records to pharmacy management, personnel databases, billing, and payroll (Aror & Ikbal, 2023). Modern HMIS are crucial in today's healthcare environment due to the increasing complexity and the need for timely, accurate information. They enable healthcare providers to streamline operations, enhance the quality of care, and improve efficiency by integrating various health functions and departments. This integration helps in eradicating disjointed information and modernizing health processes, thus ensuring better healthcare delivery (MDPI, 2023).

The World Health Organization (WHO) highlights that effective HMIS facilitate the generation, compilation, analysis, synthesis, and communication of data. This process supports informed decision-making, policy formulation, and program management, ultimately contributing to improved health outcomes (Measure Evaluation, 2023). Moreover, the adoption and use of information systems in healthcare are critical for addressing complexities and challenges in the sector. Information systems play a vital role in developing, documenting, and communicating solutions among stakeholders, thus enhancing the overall functionality and responsiveness of healthcare services (Gebre & Bygstad, 2019). The use of modern information technology offers tremendous opportunities in health care delivery as it reduces clinical errors and enhances efficiency that leads to quality delivery (Kuyo, Muiruri& Njuguna,2018).Therefore, successful implementation of HMIS is deemed appropriate to minimize complexities in healthcare sector (Batra & Pall, 2015).

Hospitals have gradually embraced the need for HMIS. The overall advantage of using Health Management Information Systems far outweighs the limitations. Systems help streamline functions carried out at the hospital thereby greatly improving efficiency and effectiveness in health delivery (Kithinji, 2018). Having quality information leads to informed decision making with an aim of improving the healthcare systems, regardless, most public health facilities face setbacks related to quality information. In most cases, data lays idol in reports and is not used for improving the neither policies nor strategic planning activities of the hospitals (Kalayou et al. 2020). The main reason behind these challenges lies in the complexity of the HMIS with less response to the informational needs of the facilities. Therefore, decision makers have a hard time accessing the information they require for decision making purposes (Lee & Xia, 2016).

Globally, India has introduced a HMIS geared towards ensuring efficient delivery of quality healthcare across all the provinces especially the rural setups. The introduction of the systems was large scale with collaborations between the stakeholders involved such as the government policy makers, users and the health practitioners (Srivastava, 2016). In Africa, Zambian government in collaboration with the European Union (EU) has set about an HMIS project that also includes Smart Care programme that provides the frontline healthcare personnel with information form medical records in a timely manner to enable them make key decisions that ultimately improves delivery of healthcare (Mutale *et al*., 2013).

In the local context of Somaliland, a UNICEF (2015) report indicated that the healthcare system faces a myriad of issues ranging from low rate of government investment in the systems, low level of technical capacity in handling information (collecting, analysis, dissemination), lack of or poorly drafted HMIS strategies and inadequacy of personnel. Therefore, the MoH, policy makers, donors and other stakeholders in the country have inadequate access to information which can guide development of policies for improvement of the priorities, health status and assessment of the status of public health facilities (Askar*et al*., 2017).

According to Somaliland HMIS (2016) report, Somaliland lacks a wide-ranging HMIS. What exist are simple disease surveillance systems and an HMIS set at the ministry level in the year 1995, however their operational status is wanting since data collection is done in simple excel sheets. Therefore, HMIS basic HMIS has very limited scope in terms of data sources and

coverage, though it has helped to provide information about vaccination and epidemic outbreaks, implying that were a proper system to be enacted, the results would lead to outstanding healthcare delivery. Efforts are being made to expand the system with help from bodies such as Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and UNICEF, though, challenges still exist.

**Objectives of the Study**

The study aims to interrogate the factors influencing implementation of Health Management Information System in Public Health Facilities at in Punt Land State, Somalia.

The study guided by the following specific objectives;

i. To establish the effect of technological factors on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia.
ii. To find out the effect of organizational factors on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia.
iii. To determine the effect of environmental factors on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia.
iv. To examine the effect of human factors on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia.

**Literature Review**

**Technological Factors and Health Management Information System Implementation**

Technology refers to the features of an innovation including relative advantage, compatibility, complexity and security concern (Gibb & Kraemar, 2004). Technological concept is viewed in the lens of perceived benefits and costs, new processes, methods and production systems an organization aspires to maintain or enhance operational efficiency, service delivery and respond to changes in the external environment (Lin., 2014). HMIS implies for firms to adopt sophisticated new technology innovations, they must ensure that they possess limited IT/IS/IM platform that enable real-time interaction among stakeholders. HMIS is because IT/IS/IM infrastructure can integrate information requirements into the planning of IM strategies including sharing of skills and know-how on how to develop, integrate and operate technology innovations (Zhu *et al*., 2003).

Additionally, Lin (2014) states that the effectiveness of adoption of innovation depends upon financial investment, stakeholders' effort in learning new technologies and investment on time. This implies that organization's insufficient investment on time, finance, skills and knowledge among employees and key stakeholders are inhibitors of IS adoption (Walker & Jones, 2012). Researchers that is Al-Tit (2016) and Kim, Seok and Kim (2020) asserted that firms with top management commitment, investment on employee training on skills and knowledge and financial resources to procure IS infrastructure are likely to adopt innovation faster than financially constrained organizations. Three technology factors that is relative advantage of IS, compatibility of IS with the organizational culture, complexity as well as security are important factors in IS implementation. Relative advantage entails the social status of motivation aspects of innovation adoption and the costs incurred in adopting, implementing and maintaining innovation (Rogers, 2003).

Organizations that are driven by change are likely to adopt technology innovations whereas; organizations that are resistant to change are least likely or may adopt technology innovations at later stage (Batra& Pall, 2015). Hence, organizations should carefully consider adopting an appropriate innovation because of perceived ability of innovation to minimize operation costs, improve communication with customers, vendors and employees' and gain relative operational advantage (Sagiroglu & Ozturan, 2006).

**Organizational Factors and Health Management Information System Implementation**

Based on the TOE model, organizational factors refer to the characteristics of an organization ranging from its age, size, scope and structure (Tonartzky & Fleischer, 1990). Firm size has been found to affect a firm's success in IS adoption (Ahmadi *et al.,* 2018)). Moreover, firm size, in previous literature has been identified as an important factor (Low *et al*., 2011) since it represents both the organization and technical aspects of innovation adoption, whereby organization's size has been found to positively influence adoption of innovation and organizations' readiness to adopt innovation.

A study by Hameed *et al.* (2012) to determine the effect of 10 factors on adoption of HMIS indicated that organizational readiness was more important in adoption of HMIS compared to size of the organization, resources availability and the expertise of the staff in IT. On the other hand, centralization was not an important factor. Wang *et al*. (2005) while focusing on USA based facilities argued that adoption of HMIS depended on the market, financial as well as organizational factors. Adoption of HMIS was easy in private hospitals that aimed to maximize profits compared to public hospitals.

In Malaysia, Ahmadi et al. (2018) argued that adoption of HMIS varied with the hospital size, pressure from competitors and employees' knowledge and technical knowhow. The adoption of HMIS varied with hospital size whereby the big hospitals had implemented more than the smaller counter parts. In Kenya, Kuyo *et al.* (2018) argued that among public health facilities in Uasin Gishu, organizational hierarchy, staff performance, management support, adequacy of computers, staff skills and organizational culture were important factors.

**Human Factors and Health Management Information System Implementation**

Staff should possess some knowledge and skills about technology innovation in order to adopt new technology innovation. HMIS in turn serves as an IS capability that will enable adoption of new technology innovation (Khalifa, 2014). Scholars Lian, *et al*. (2014) verified HMIS by providing that if IS staff possesses sufficient knowledge and adequate skills to adopt technological innovation; organizations will have more confidence in the adoption of technology innovation. Employees are considered as the most valuable asset of an organization and are playing a critical role for organizations to improve performance. THMIS is because some human resources possess proficient technical knowhow and experience that cannot be replicated. Organizations can capitalize on such tacit knowledge and experience to gain competitive advantage since tacit knowledge is difficult to be copied by rivals (Khalifa & Alswailem, 2015).

Rumambi *et al*. (2017) conducted a study in Indonesia to find out the critical factors for adoption of HMIS through the Hot-Fit model approach. Through Structural Equation Modelling (SEM), it realized that the hospital with more IT units and staff had shown advanced stages of implementation compared to those that had not. Farzandipur (2016) argued that the availability of IS infrastructure, skills, know-how, and access to experts such as IT developers positively affects the adoption of technology innovations. Moreover, adoption of innovation requires significant investments in employee training and supportive software and hardware, yet many organizations are concerned with expenditure instead of benefits of adoption (Alipour, 2017).

In India, Batra and Pall (2015) indicated that the health facilities in Jalandhar, the rate of adoption of HMIS was low and was mainly for clinical functions. However, investment in resources, employee training, IT skills and capacity enhanced the adoption rate. In Saudi Arabia, Khalifa (2014), through a qualitative approach indicated that low awareness, training and technical challenges contributed towards the low adoption rate of HMIS in public health facilities. In New York, Abramson *et al*. (2012) established that among the state health facilities, adoption of HMIS was more advanced compared to the private facilities because of resource and technical capacity availability.

**Environmental Factors and Health Management Information System Implementation**

Environmental refer to the surrounding society in which an organization operates in based on the TOE model (Tonartzky & Fleischer, 1990). Organization adoption of technology innovation is heavily affected by external factors that are beyond firm's control, such as government policies, competitors and vendors' coercive pressure (Vest, 2010). The surrounding society presents both opportunities and weaknesses in adoption of HMIS. These external factors include mimetic/competitive pressure; government policies and vendors support (Callen, Braithwaite & Westbrook, 2008).

Competitive pressure is the pressure associated with the loss of an advantage in the market (Rogers, 2003). Competitive and mimetic pressure in public healthcare arises from fierce competition from the private sector. The healthcare public sector is actively searching for sustainable competitive advantage in the form of employee knowledge management, improved patient care and reduced operation costs (Stansfield *et al*. 2018). Organizations are therefore forced to adopt technology innovation in order to remain competitive in their industry and achieve organizational goals. Adoption of IS in a highly competitive industry is deemed to have the potential to improve organizational performance by improving and coordination of activities within an organization (Nguyen, Bellucci & Nguyen, 2014). In Puntland, the healthcare sector is under pressure from the state in to adopt IS in order to provide affordable, acceptable and highest possible quality of health and universal access to healthcare by all citizens.

Government policies can also indirectly and/or directly stimulate information generation and sharing resulting from diffusion of technology (Bozak, 2013). Many governments are shifting towards the adoption of technology infrastructure that enables reliable, accurate and real-time information sharing and communication (Cresswell & Sheikh, 2013). The government can exert pressure on organizations to conform to its demand and expectations though its policies and laws and to abide with international regulations (DiMaggio & Powell, 1983). Supporting HMIS Cresswell and Sheikh (2013) also found out that coercive pressure from the government could strongly influence implementation of HIIS.

Vendor support is also a significant factor in HMIS adoption. Vendors tend to invest in large organizations because they perceive an easy recovery of costs compared to investing in small organizations that they deem to be uncertain in terms of cost recover (Gangwar, Date& Ramaswamy, 2015).Prior literature supports the role of vendor support in enhancing IS adoption (Ahmadi *et al.,* 2015). Vendors can negatively or positively influence organizations to adopt technology innovation. Perceived benefits and costs significantly affect vendor's support on adoption of technology innovation by organizations (Oliveira& Martins, 2010).

**Theoretical Framework**

To understand the determining factors for successful implementation of Health Management Information System in public health facilities, HMIS study derives its theoretical backing from the Diffusion of Innovations theory (DOI), Technology-Organization-Environment (TOE) Framework and the HOT-Fit framework. THMIS are renowned theories that have attempted to explain technology adoption in any organization and the determining factors hence suitable for HMIS study.

**Diffusion of Innovations theory (DOI)**

Rogers' Diffusion of Innovations (DOI) theory, introduced in 1962, explores how and why technology and new ideas spread through cultures at both organizational and individual levels. The theory includes four main components: innovation, communication channels, time, and the social system. Innovation, as defined by Rogers (2003), refers to any new idea or technology. The rate of adoption is influenced by features such as compatibility, relative advantage, observability, trialability, and complexity. Innovations with higher trialability,

relative advantage, compatibility, and observability tend to be adopted more quickly, while those with greater complexity face slower adoption rates (Rogers, 2003).

Effective communication is crucial for successful innovation diffusion within organizations. System members must be aware of and have access to communication channels that facilitate the spread of innovations. Interpersonal communication is particularly influential, as it helps shape participants' attitudes toward innovations (Rogers, 2003). Time also plays a significant role in the adoption process, which involves the decision-making process, adopter categories (innovators, early adopters, early majority, late majority, and laggards), and the overall rate of adoption. Adoption follows an S-curve, where initial adoption is slow, accelerates as more members join, and then slows down again (Rogers, 1995).

The social system, consisting of individuals or groups with common goals, significantly impacts innovation diffusion. Organizational features such as formalization, slack resources, and centralization affect how innovations are adopted. High formalization can create barriers to innovation, while greater organizational slack and less centralization foster a more innovative environment (Rogers, 1995). Additionally, complexity and firm size influence adoption; organizations with higher technological expertise and larger staff are generally more innovative. Interconnectedness within a social system, or the extent of interpersonal networks linking organizational units, also enhances innovation adoption (Rogers, 1995).

**Technology-Organization-Environment (TOE) Framework**

The TOE framework was developed by Tonartzky and Fleischer (1990) and provides an integral analytical framework that can be used for studying organization adoption of new innovation (Oliveira & Martin, 2011). According to Tonartzky and Fleischer (1990), there are three factors impacting on the adoption of IS including technology, organization and environment which can influence adoption when theory interact with each other (Oliveira & Martin, 2011). The framework has however been criticized for influencing the decision to adopt innovation. The three elements of the framework are deemed appropriate for large organizations rather than small organizations because stakeholders in larger organizations are assured of firm's operational continuity and fewer complexities after adoption of innovation but the same is not assured to small organizations that can be resource-challenged (Parker & Castleman, 2009; Awa *et al*., 2011). However, the TOE framework has gained empirical validity at organizations' level and has a proven theoretical basis and consistent theoretical support by organizations wishing to adopt innovation (Oliveira & Martin., 2011).

The framework is deemed to have the potential of adoption in the IS field (Zhu *et al*., 2006; Oliveira & Martin, 2011). For instance, previous research utilizing TOE model has investigated and found support for determinants of adoption of EDI to be costs, benefits as well as the regulatory environment (Lacovou *et al*., 1995; Hsu *et al*., 2006). Moreover, Hsu *et al*. (2006) applied TOE framework on USA firms adopting e-Business and established that pressure from the government through policies and laws determined its adoption. Likewise, Teo *et al*. (2009) adopted the model and established that costs, benefits, regulatory environment and organizational culture influenced e-procurement adoption. Therefore, in HMIS study, TOE framework is appropriate for studying adoption of HMIS because its adoption is enabled by factors described in the model that is, organization's readiness as well as technological and environmental factors (Zhu *et al*., 2006).

**HOT-Fit Framework**

The HOT-Fit framework was developed in 2006 by (Yusof, Paul, & Stergioulas, 2006). The model is suitable for evaluation of interrelationship between human, organization, and environment contexts which are crucial aspects to be considered for successful adoption and implementation of IS in hospitals (Yusof *et al*., 2006). It is recommended that, an evaluation of IS should be conducted because of unpredictability of IS and the goal of healthcare organization in enhancing operation efficiency, improving service delivery and reducing

costs of operations (VanBemmel & Musen., 1997; Yusof. *et al*., 2006). An evaluation of previous literature is deemed important in determining suitable techniques to analyze failure and rejection on IS and acquire lessons from past experience (Yusof.*et al*., 2006). The acquired lessons will assist healthcare organizations avoid repeating the same mistakes that previous studies had done. By avoiding such mistakes hospitals will likely cultivate favorable conditions for adoption of IS implementation. However, the healthcare industry is still facing challenges in ensuring successful adoption of HMIS in hospitals (Ahmadi. *et al*., 2017). HMIS suggests that there is a need for development of new methods and extensions to previous methods in order minimize the challenges of adoption of innovation in healthcare organizations (Moehr, 2002). There is need for new extensions and methods to improve existing frameworks and methods and provide alternative appropriate models to ensure success in HMIS adoption (Moehr *et al*, 2003).

**Conceptual Framework**

The review and analysis of past literature, theories and current state of the healthcare sector as well as HMIS in Puntland State of Somalia has highlighted several themes related to the understanding of significance of implementation of HMIS in the public health facilities in Puntland State of Somalia. The conceptual Framework in Figure 2.1 has thus been developed based on the theoretical underpinnings of Tonartzky and Fleischer (1990), Rogers (2003) and Yusof *et al*. (2006) to act as an evaluative lens to make sense of the gathered data. Several factors have been identified by prior empirical studies pertaining implementation of HMIS that utilize DOI, TOE and Hot-Fit theoretical model variables and thus, this study focused on interrogating the effect of Technological factors, organizational factors, environmental factors and human factors which largely remain untested in the context of Puntland State of Somalia.

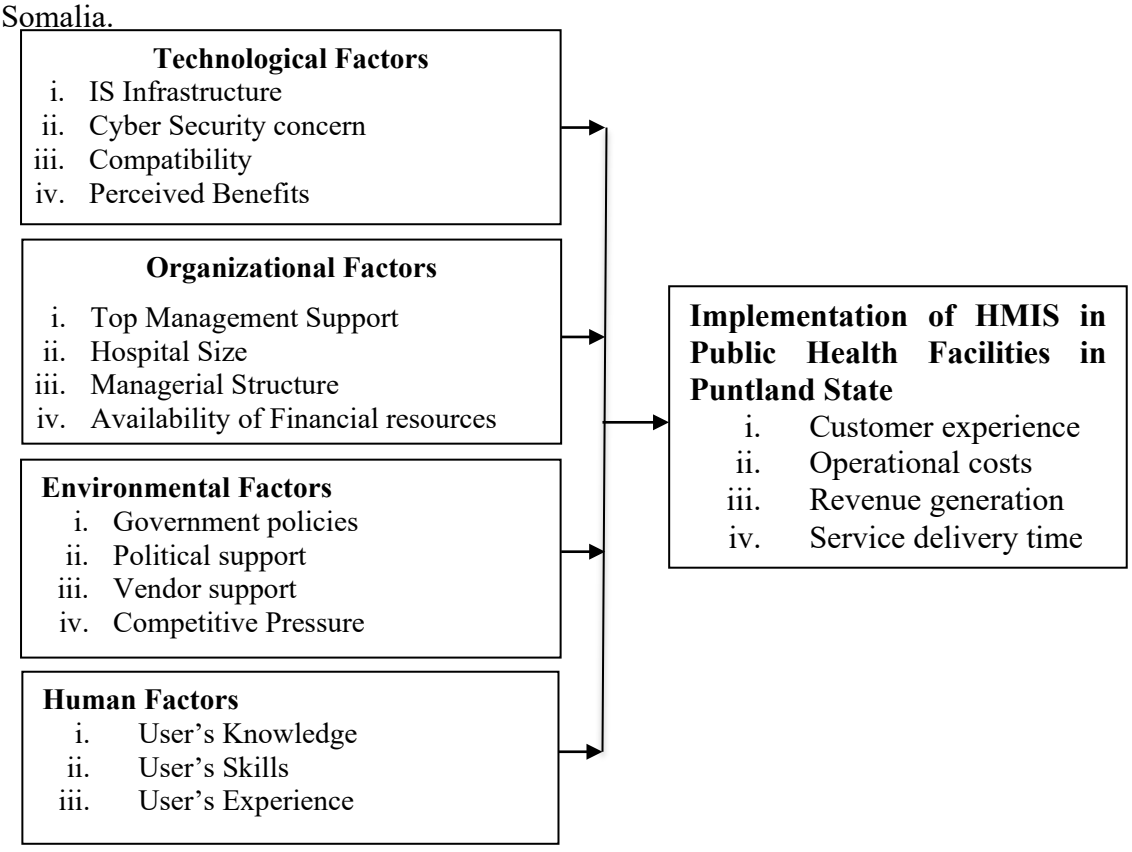


**Figure 1: Conceptual Framework**

## RESEARCH METHODOLOGY

The study adopted a descriptive research design. The study was targeted the users of HMIS system (the staff) as well as the top management team of the public health facilities in Puntland State of Somalia. According to the Heritage Institute for Policy Studies and City University of Mogadishu (2020) survey, there are 5 District hospitals and 8 regional hospitals in Puntland State. The study was targeted the top management team responsible for providing support for HMIS systems implementation as well as the users of the system since they understand the need for HMIS in the hospitals. The Heritage Institute for Policy Studies and City University of Mogadishu (2020) survey indicated that in Puntland state, there is a cumulative number of 834 healthcare personnel across the two tiers of healthcare in Puntland of which 790 are clinical staff and 44 are administrators (Table 1). These formed the unit of observation for the study.

**Table 1: Target Population**

| Human Resource Category | Population |
|---|---|
| Physicians | 120 |
| Pharmacists | 6 |
| Registered Nurses | 664 |
| Hospital Administrators | 44 |
| **Total** | **834** |

Source: Heritage Institute for Policy Studies and City University of Mogadishu (2020)

## RESULTS AND DISCUSSION

The research study targeted two hundred and seventy (270) respondents. However, out of the distributed 270, two hundred and twenty-seven (227) were filled and returned, representing 84.44% rate of response. The response rate was an exceptional representation and conforms to Mugenda and Mugenda (2003), who proposes that a response rate of 50% and above, 60% and above, and 70% and over is adequate, reasonable, excellent for analysis and reporting, respectively. The response rate was considered exceptionally sufficient to allow for the factors determining successful implementation of Health Management Information System in Public Health Facilities located in Punt Land State, Somalia.

### Implementation of HMIS

The respondents were asked whether they thought adopting of information technology aided in information management in the hospital.

**Table 2: Implementation of HMIS**

| | | F | % |
|---|---|---|---|
| Adopting of information technology | Yes | 157 | 69.2 |
| | No | 70 | 30.8 |
| **Total** | | **227** | **100.0** |

The results in Table 2, revealed that majority 157(69.2%) of the respondents thought adopting of information technology aided in information management in the hospital, while 71(30.8%) indicated that they did not think that adopting of information technology aided in information management in the hospital.

The respondents were asked to indicate whether there were necessary plans in the hospital to adopt HMIS.

**Table 3: Plans to adopt HMIS**

| | F | % |
|---|---|---|
| Yes | 143 | 63.0 |
| No | 84 | 37.0 |
| **Total** | **228** | **100.0** |

The results in Table 3, revealed that 143(63.0%) of the respondents indicated that there were necessary plans in the hospital to adopt HMIS while 84(37.9%) indicated there were no necessary plans in the hospital to adopt HMIS.

The respondents were asked whether there would be a will to adopt HMIS if the prerequisites for adoption of a new technology were considered and the necessary top management support given.

**Table 4: Top management support and adoption of HMIS**

| | F | % |
|---|---|---|
| Yes | 143 | 63.0 |
| No | 83 | 36.0 |
| **Total** | **228** | **100.0** |

The results in Table 4 143(63.0%) indicated that if the prerequisites for adoption of a new technol`1ogy are considered and the necessary top management support given, there will be a will to adopt HMIS, while 83(36.6%) indicated there will be no will to adopt HMIS if the prerequisites for adoption of a new technology are considered and the necessary top management support given.

**Organization Experience**

The respondents were asked to rate their level of agreement with various organizational experiences, a 5-point Likert scale was used to rate responses of this variable and it ranged from; 1 = Not at all to 5 = Very high extent. The findings are presented in Table 5.

**Table 5: Organization Experience**

| Statement | NA | LE | ME | HE | VHE | DECISION |
|---|---|---|---|---|---|---|
| The hospital often uses HMIS in its operations | 21(9.4%) | 54(23.7%) | 9(3.8%) | 88(38.6%) | 56(24.5%) | Low perception |
| The time used to carry out operations has reduced | 4(1.9%) | 30(13.2%) | 15(6.6%) | 96(42.5%) | 81(35.8%) | High perception |
| Operational costs have reduced due to implementation of HMIS | 6(2.8%) | 26(11.3%) | 13(5.7%) | 113(50.0%) | 69(30.2%) | High perception |
| Revenue has increased due to implementation of HMIS | 17(7.5%) | 30(13.2%) | 34(15.1%) | 92(40.6%) | 54(23.6%) | Low perception |
| Customer experience statistics have improved due to the use of HMIS | 6(2.8%) | 21(9.4%) | 9(3.8%) | 100(44.3%) | 90(39.6%) | High perception |
| The overall service delivery in the hospital has improved due to the use of HMIS | 26(11.3%) | 77(34.0%) | 17(7.5%) | 66(29.2%) | 41(17.9%) | Low perception |
| **Weighted Average** | | | | | | |

**Note**: N=227, NA=Not at all, LE=Low extent, ME=Moderate extent, HE=High extent, VHE= Very High extent. **Decision= Weighted Average**

From the results obtained, the respondents had a high perception when asked whether the time used to carry out operations had reduced. They also held a high perception that operational costs had reduced. Further, they perceived that customer experience statistics had improved due to the use of HMIS. These findings were consistent with those of Kuyo, Muiruri and Njuguna (2018); Batra and Pall (2015), Kithinji (2018) and Crepaldi *et al*. (2018). However, there was low perception on whether the facilities under study frequently used HMIS in their operations. Respondents also had a low perception when asked whether they thought HMIS had led to increased revenue. Further findings revealed that respondents

had a low perception on whether overall service delivery in their hospitals had improved due to the use of HMIS.

**Technology Factors**

The respondents were asked to rate their level of agreement with various statements on technological factors. The findings are presented in Table 6

**Table 6: Technological Factors and Adoption of HMIS**

| Statement | SD | D | NS | A | SA | DECISION |
|---|---|---|---|---|---|---|
| Existing technology systems can support implementation of HMIS | 15(6.6%) | 21(9.4%) | 11(4.7%) | 107(47.2%) | 73(32.1%) | High perception |
| Existing IT infrastructure can support implementation of HMIS | 11(4.7%) | 19(8.5%) | 11(4.7%) | 109(48.1%) | 77(34.0%) | High perception |
| The staff consider technological innovation as easy to learn | 15(6.6%) | 30(13.2%) | 17(7.5%) | 92(40.6%) | 73(32.1%) | High perception |
| The staff consider technological innovation as easy to use | 34(1.5%) | 4(1.9%) | 13(5.7%) | 84(36.8%) | 92(40.6%) | Low perception |
| The staff consider technological innovation as easy to implement | 9(3.8%) | 34(15.1%) | 30(13.2%) | 97(42.5%) | 58(25.5%) | High perception |
| The staff consider technological innovation as less complex to use | 19(8.5%) | 36(16.0%) | 34(15.1%) | 74(33.0%) | 62(27.4%) | Low perception |
| The management is ready to train the staff on IT skills | 4(1.9%) | 51(22.6%) | 11(4.7%) | 115(50.9%) | 45(19.8%) | Low perception |
| **Weighted Average** | | | | | | |

**Note**: N=227, SD=Strongly Disagree, D=Disagree, NS=Not sure, A=Agree, SA= Strongly agree. **Decision= Weighted Average**

The survey results on the perceptions of respondents regarding the compatibility and ease of use of existing technology systems for Hospital Management Information System (HMIS) implementation reveal that respondents expressed a high perception that existing technology systems can support the implementation of HMIS, with 47.2% indicating Agreement and 32.1% Strong Agreement. Similarly, there was a high perception that existing IT infrastructure can support HMIS implementation, with 48.1% indicating Agreement and 34.0% Strong Agreement. The staff were perceived to consider technological innovation as easy to learn and easy to implement. There was a mixed perception when it comes to considering technological innovation as easy to use. While 36.8% agreed and 40.6% strongly agreed, a notable 15.1% expressed disagreement. Respondents had a low perception that the staff considers technological innovation as less complex to use, with 33.0% indicating Agreement and 27.4% Strong Agreement. There was a low perception that the management is ready to train the staff on IT skills, with only 50.9% in Agreement and 19.8% in Strong Agreement. These findings concur with those of Lin (2014) and in line with proposals by Walker & Jones, (2012).

**Organizational Factors**

The respondents were asked to rate their level of agreement with various statements on organizational factors. The findings are presented in Table 7

**Table 7: Organizational Factors and HMIS Implementation**

| Statement | SD | D | NS | A | SA | Decision |
|---|---|---|---|---|---|---|
| The organization top management supports adoption of HMIS | 6(2.8%) | 15(6.6%) | 11(4.7%) | 109 (48.1%) | 86(37.7%) | High perception |
| The organization can provide financial resources for adoption of HMIS | 19(8.7%) | 24(10.8%) | 13(5.8%) | 68(29.9%) | 100(44.4%) | High perception |
| The organization facilitates staff training on IT | 11(4.7%) | 26(11.3%) | 4(1.9%) | 75(33.0%) | 111(49.1%) | High perception |

| | | | | | | |
|---|---|---|---|---|---|---|
| The organization supports IT support | 19(8.5%) | 54(23.6%) | 19(8.5%) | 99(43.4%) | 36(16.0%) | Low perception |
| The organization formulates its ICT policy in line with the national ICT policy | 8(3.8%) | 36(16.0%) | 9(3.8%) | 99(43.4%) | 75(33.0%) | High perception |
| The organization formulates favorable ICT policy to support HMIS implementation | 18(7.9%) | 39(17.3%) | 27(11.7%) | 65(28.5%) | 74(32.4%) | Low perception |
| **Weighted Average** | | | | | | |

**Note**: N=227, SD=Strongly Disagree, D=Disagree, NS=Not sure, A=Agree, SA= strongly agree. **Decision= Weighted Average**

The survey results pertaining to organizational support and resources for the adoption of Hospital Management Information System (HMIS) shows that respondents expressed a high perception that the organization's top management supports the adoption of HMIS, with 48.1% indicating Agreement and a significant 37.7% Strong Agreement. There was a high perception that the organization can provide financial resources for the adoption of HMIS, with 29.9% in Agreement and a substantial 44.4% in Strong Agreement. Similarly, respondents perceived a high level of support from the organization for staff training on IT, with 33.0% in Agreement and a notable 49.1% in Strong Agreement. These findings tally with observations by Hameed *et al.* (2012) whose assertions indicated that organizational readiness was more important in adoption of HMIS.

There was a low perception regarding the organization's support for IT support, with 43.4% in Agreement but a relatively high 16.0% in Disagreement.. The mean score is 3.35, indicating a Low perception. Further respondents expressed a low perception that the organization formulates a favorable ICT policy to support HMIS implementation, with 28.5% in Agreement and 32.4% in Strong Agreement. The mean score is 3.54, categorizing it as a Low perception. The weighted average across all statements related to organizational support and resources for HMIS adoption is 3.81, reflecting an overall positive perception.

In summary, respondents had a positive perception of top management support, financial resources availability, and support for staff training. However, there were concerns about the organization's support for IT and the formulation of a favorable ICT policy to support HMIS implementation, as indicated by lower perceptions in these areas.

**Human Factors**

The respondents were asked to indicate their level of agreement with statements related to human factors and HMIS implementation. A 5-point Likert scale was used to rate responses of this variable and it ranged from; 1 = strongly disagree to 5 = strongly agree. The findings were recoded to two, agree, and disagree. The findings are presented in Table 8.

**Table 8: Human related factors and HMIS implementation**

| Statement | SD | D | NS | A | SA | Decision |
|---|---|---|---|---|---|---|
| The user's level of education influences implementation of HMIS | 27(12%) | 44(19.6%) | 28(12.3%) | 53(23.3) | 74(32.7%) | High perception |
| The users IT skills influences implementation of HMIS | 21(9.1%) | 31(13.5%) | 13(5.8%) | 72(31.6%) | 91(40%) | High perception |
| The user's level of training influences implementation of HMIS | 19(8.3%) | 62(27.1%) | 31(13.8%) | 66(29.1%) | 47(20.9%) | Low perception |
| The users perceived usefulness influences their use of HMIS | 19(8.5%) | 51(22.3%) | 24(10.8%) | 55(24.3%) | 77(32.9%) | High perception |
| The users perceived ease of use influences their use of HMIS | 23(10.0%) | 57(25.0%) | 28(12.2%) | 56(24.9%) | 60(26.6%) | Low perception |
| The users perceived complexity influences their use of HMIS | 23(10.2%) | 53(23.2%) | 30(13.1%) | 53(23.3%) | 59(26.2%) | Low perception |
| The organizational culture influences the staff use of HMIS | 22(9.8%) | 24(16.6%) | 34(15.0%) | 58(25.6%) | 62(27.4%) | Low perception |

| **Weighted Average** | | | | | | |
|---|---|---|---|---|---|---|

**Note**: N=227, SD=Strongly Disagree, D=Disagree, NS=Not sure, A=Agree, SA= strongly agree. **Decision= Weighted Average**

Respondents expressed a high perception that the user's level of education influences the implementation of HMIS, with 23.3% in Agreement and a substantial 32.7% in Strong Agreement. Similarly, there was a high perception that the user's IT skills influence the implementation of HMIS, with 31.6% in Agreement and a significant 40.0% in Strong Agreement. The users' perceived usefulness influencing their use of HMIS also received a high perception, with 24.3% in Agreement and 32.9% in Strong Agreement. These results agree with those of Lian, *et al*. (2014) that if IS staff possesses sufficient knowledge and adequate skills to adopt technological innovation; they are at a better position to implement the new technologies. These also concurs with Farzandipur (2016) who argued that the availability of IS infrastructure, skills, know-how, and access to experts such as IT developers positively affects the adoption of technology innovations. However, respondents expressed a low perception that the user's level of training influences the implementation of HMIS, with 29.1% in Agreement but a notable 27.1% in Disagreement. There was a low perception that the users' perceived ease of use and perceived complexity influence their use of HMIS, with mean scores of 3.29 and 3.20, respectively. The organizational culture influencing staff use of HMIS also received a low perception, with 25.6% in Agreement and 27.4% in Strong Agreement. The weighted average across all statements related to user-related factors is 3.39, reflecting a moderate overall perception.

**Environmental Factors**

The respondents were asked to indicate their level of agreement with statements related to environmental factors and HMIS implementation. A 5-point Likert scale was used to rate responses of this variable and it ranged from; 1 = strongly disagree to 5 = strongly agree. The findings were recoded to two, agree, and disagree. The findings are presented in Table 9

**Table 9: Environmental factors and HMIS implementation**

| Statement | SD | D | NS | A | SA | Decision |
|---|---|---|---|---|---|---|
| It is a strategic necessity to adopt HMIS | 41(17.9 %) | 24(10.5 %) | 12(11.3 %) | 41(17.9 %) | 96(42.4 %) | Low perception |
| The government policy towards adoption of HMIS favors its implementation | 59(26.4 %) | 104(46.2 %) | 15(6.6 %) | 32(14.2 %) | 15(6.6% ) | Low perception |
| The continuous information mismanagement creates a need to adopt HMIS | 41(17.9 %) | 90(39.6 %) | 9(3.8%) | 66(29.2 %) | 21(9.4% ) | High perception |
| Pressure from the patients enhances the decision to adopt HMIS | 47(20.8 %) | 79(34.9 %) | 9(3.8%) | 73(32.1 %) | 19(8.5% ) | High perception |
| Pressure from the local administration enhances the decision to adopt HMIS | 20(8.7 %) | 25(10.8 %) | 13(5.8 %) | 69(29.9 %) | 100(44.4 %) | High perception |
| **Weighted Average** | | | | | | |

**Note**: N=227, SD=Strongly Disagree, D=Disagree, NS=Not sure, A=Agree, SA= Strongly agree. **Decision= Weighted Average**

Respondents expressed a low perception that adopting HMIS is a strategic necessity, with 17.9% in Agreement and a substantial 42.4% in Strong Agreement. There was also a low perception that the government policy towards the adoption of HMIS favors its implementation, with 46.2% in Disagreement and only 6.6% in Agreement. Respondents, however, expressed a high perception that continuous information mismanagement creates a need to adopt HMIS, with 39.6% in Agreement and a notable 9.4% in Strong Agreement.

Similarly, there was a high perception that pressure from patients enhances the decision to adopt HMIS, with 32.1% in Agreement and a substantial 8.5% in Strong Agreement. Respondents also expressed a high perception that pressure from the local administration enhances the decision to adopt HMIS, with 29.9% in Agreement and a significant 44.4% in Strong Agreement. The weighted average across all statements related to external factors is 3.70, reflecting a positive overall perception.

**Correlation Analysis**

The correlation coefficient can range from -1 to +1, with -1 indicating a perfect negative correlation, +1 indicating a perfect positive correlation, and 0 indicating no correlation at all. The correlation analysis results are presented in Table 10

**Table 10: Correlation Analysis**

| | | OF | HF | TF | EF | HMIS |
|---|---|---|---|---|---|---|
| OF | Pearson Correlation | 1 | | | | |
| | Sig. (2-tailed) | | | | | |
| | N | 227 | | | | |
| HF | Pearson Correlation | .288** | 1 | | | |
| | Sig. (2-tailed) | .000 | | | | |
| | N | 227 | 227 | | | |
| TF | Pearson Correlation | .084 | .029 | 1 | | |
| | Sig. (2-tailed) | .209 | .662 | | | |
| | N | 227 | 227 | 227 | | |
| EF | Pearson Correlation | .137* | .036 | .286** | 1 | |
| | Sig. (2-tailed) | .039 | .589 | .000 | | |
| | N | 227 | 227 | 227 | 227 | |
| HMIS | Pearson Correlation | .334** | .289** | .274** | .208** | 1 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .002 | |
| | N | 227 | 227 | 227 | 227 | 227 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

OF = Organizational factors; HF = Human factors; TF = Technological factors; EF = Environmental factors and HMIS implementation = Health Management Information System

The correlation analysis explores the relationships between different variables: Organizational Factors (OF), Human Factors (HF), Technological Factors (TF), Environmental Factors (EF), and Hospital Management Information System (HMIS). (OF) Organizational Factors shows a statistically significant positive correlation with HF ($r = 0.288$, $p < 0.01$), EF ($r = 0.137$, $p < 0.05$), and HMIS ($r = 0.334$, $p < 0.01$). The positive correlations suggest that as organizational factors increase, there is a tendency for HF, EF, and HMIS to also increase. Human Factors has a statistically significant positive correlation with OF ($r = 0.288$, $p < 0.01$), but no significant correlations with TF and EF. The positive correlation with OF implies that as human factors increase, organizational factors tend to increase as well. Technological Factors does not show statistically significant correlations with OF, HF, and EF.

The correlation with EF is particularly weak ($r = 0.029$, $p > 0.05$).Environmental Factors exhibits statistically significant positive correlations with OF ($r = 0.137$, $p < 0.05$), TF ($r = 0.286$, $p < 0.01$), and HMIS ($r = 0.208$, $p < 0.01$). This suggests that as environmental factors increase, there is a tendency for OF, TF, and HMIS to also increase. Hospital Management Information System shows statistically significant positive correlations with OF ($r = 0.334$, $p < 0.01$), HF ($r = 0.289$, $p < 0.01$), TF ($r = 0.274$, $p < 0.01$), and EF ($r = 0.208$, $p < 0.01$). This indicates that as HMIS increases, there is a tendency for organizational, human, technological, and environmental factors to increase. The significant positive correlations

between OF, HF, EF, and HMIS suggest that these factors are interrelated, and improvements in one may lead to improvements in others.

The lack of significant correlations for TF with other factors suggests that technological factors may be relatively independent or have a more nuanced relationship with organizational, human, and environmental factors. In summary, the correlation analysis highlights the interdependencies and positive relationships between organizational, human, environmental factors, and the implementation of Hospital Management Information System (HMIS). These findings provide insights into how various factors are associated with each other in the context of healthcare information management.

**Logistic Regression Analysis**

A binary logistic regression model was done to identify the predictor variables that were independently associated with the implementation of HMIS (outcome variables).

**Table 11: Parameter Estimates**

| | | | | | | | 95% Confidence Interval for Exp(B) | |
|---|---|---|---|---|---|---|---|---|
| | B | Std. Error | Wald | df | Sig. | Exp(B) | Lower Bound | Upper Bound |
| Intercept | 5.877 | .946 | 38.632 | 1 | .000 | | | |
| Organizational factors | 1.160 | .322 | 13.010 | 1 | .000 | .314 | .167 | .589 |
| Human factors | 1.159 | .331 | 12.245 | 1 | .000 | .314 | .164 | .601 |
| Technological factors | 1.464 | .404 | 13.113 | 1 | .000 | .231 | .105 | .511 |
| Environmental factors | .719 | .354 | 4.130 | 1 | .042 | .487 | .243 | .975 |

a. The reference category is: HMIS Not implemented.

From the results in Table 11, the study obtained the regression outcome as follows:

Implementation of HMIS = 5.877 + 1.160OF + 1.159HF + 1.464TF + 0.719EF

According to the results in Table 11, technological factors were a significant predictor ($\beta$ = 1.464, S.E. = .404, P value < 0.05) indicating that technological factors was likely to improve the implementation of HMIS in Public Health Facilities in Punt Land State, Somalia. The odds ratio of 1.464 indicates that for every unit increase in technological factors, the odds of improving HMIS implementation changed by a factor of 1.464. Also, human factors were a significant predictor ($\beta$ = 1.159, S.E. = .331, P value < 0.05) indicating that human factors were likely to improve the implementation of HMIS in Public Health Facilities in Punt Land State, Somalia. The odds ratio of 1.159 indicates that for every unit increase in human factors, the odds of improving HMIS implementation changed by a factor of 1.159.

Further, organizational factors were not a significant predictor ($\beta$ = 1.160, S.E. = .331, P value < 0.05) indicating that organizational factors were likely to improve the implementation of HMIS in Public Health Facilities in Punt Land State, Somalia. The odds ratio of 1.160 indicates that for every unit increase in organizational factors, the odds of improving HMIS implementation changed by a factor of 1.160. Lastly, environmental factors were significant predictor ($\beta$ = 0.719, S.E. = 0.354, P value < 0.05) indicating that environmental factors were likely to improve the implementation of HMIS in Public Health Facilities in Punt Land State, Somalia. The odds ratio of .719 however indicates that environmental factors did not play a role in improving HMIS implementation.

**Conclusions**

The study concludes that technological factors have a significant effect on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia. In addition, organizational factors have a significant effect on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia. Also, the study makes a conclusion that environmental factors have a significant effect on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia. Moreover, the study concludes that human factors

have a significant effect on implementation of Health Management Information System in Public Health Facilities in Punt Land State, Somalia.

**Recommendations**

From the findings, the study makes the following recommendations:

1. **Ensure Continuous Improvement of ICT Infrastructure in Public Health Facilities in Punt Land State**: It is crucial to regularly assess the current ICT infrastructure within public health facilities to pinpoint areas needing enhancement. By implementing state-of-the-art technologies that support health management information systems (HMIS), these facilities can significantly improve service delivery.
2. **Establish a Well-Developed Infrastructure System**: Developing a robust plan for building and maintaining ICT infrastructure is essential for all public health facilities. This includes ensuring a reliable power supply and backup systems to prevent any disruptions in ICT services. High-speed internet connections must be installed to support efficient data exchange and telemedicine services, which are increasingly important for modern healthcare delivery.
3. **Continuously Improve WAN Infrastructure**: Upgrading Wide Area Network (WAN) connections are vital to ensure seamless communication between different health facilities and central databases. Security measures must be implemented to protect data integrity and confidentiality across the network.
4. **Financial Resources are Important for HMIS Implementation**: Increasing budget allocations specifically for ICT and HMIS projects within the health sector is essential. Local government should advocate for these changes, and external funding opportunities, such as grants and partnerships with international organizations, should be explored to supplement local resources.
5. **Increase Financial Resource Allocation for HMIS in Punt Land State**: Lobbying for policy changes that prioritize financial investment in health informatics is necessary for sustained progress. Allocating a dedicated percentage of the health budget to the development and maintenance of HMIS will ensure consistent funding.
6. **Ensure Staff Training in Information Technology**: Comprehensive training programs that cover all aspects of HMIS and ICT tools used in health facilities are essential. Training should be practical, hands-on, and tailored to the specific needs of different staff roles. Regular evaluation of training effectiveness and updates based on feedback and technological advancements will help maintain high standards.
7. **Increase Training Frequency from Yearly to Biannually or Quarterly**: Implementing a structured training schedule that ensures continuous professional development for all staff is vital. Refresher courses and advanced training sessions should be provided regularly to keep staff updated with the latest developments in health informatics.
8. **Local Government Should Improve HMIS Adoption and Implementation**: Developing and enforcing policies that mandate the use of HMIS in all public health facilities is crucial. Providing support and incentives for health facilities to adopt and effectively use HMIS will encourage widespread implementation.

**Recommendation for Further Research**

Conduct further studies on the factors influencing HMIS implementation in Public Health Facilities in other states in Somalia. In addition, future research should delve deeper into the factors affecting user acceptance and satisfaction with HMIS in public health facilities. Understanding the specific concerns and preferences of healthcare workers can inform more tailored approaches to training and system design. Also, comparative studies between Punt Land State and other states in Somalia or countries with similar socio-economic and

healthcare contexts can highlight unique challenges and successful strategies. Such comparisons can offer a broader perspective on best practices and innovative solutions.

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