Barriers and Facilitators of eHealth Adoption Among Healthcare Providers in Uganda – A Quantitative Study

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Abstract. Adoption of eHealth among healthcare providers in Uganda is still facing numerous challenges despite several studies indicating the potential of digital health systems in improving health outcomes. Therefore, this study set out to investigate the barriers and facilitators of eHealth adoption among healthcare providers in Uganda. A cross-sectional study using a quantitative approach was used to collect data from 216 healthcare providers working in 78 health facilities covering a period of October 2020 – March 2021. Analysis was done using Pearson's Chi-square and descriptive statistics. Main findings indicated that 59% of the respondents had never used any eHealth system prior to the study. The regional distribution of eHealth uptake showed that Kampala had the highest users 61 (69%) while Gulu had the least 4 (5%). Employing a .05 criterion of statistical significance, the findings reveal that eHealth adoption and education level ($\chi 2 = 40.72$, $\rho < 0.05$), age ($\chi 2 = 13.08$, $\rho < 0.05$), location ($\chi 2 = 20.96$, $\rho < 0.05$), gender ($\chi 2 = 4.40$, $\rho < 0.05$) and institutional place of work ($\chi 2 = 49.67$, $\rho < 0.05$) are statistically significant. Furthermore, training users, ease of use, usefulness of the system and communicating eHealth benefits ($\mu = 4.15 \pm .758$, $\mu = 4.05 \pm .888$, $\mu = 3.76 \pm .836$, $\mu = 3.93 \pm .827$) had the highest mean contribution as facilitators of eHealth adoption, respectively. Any policy that targets integration of eHealth should take into account the demographic characteristics of health professionals, while paying attention to the organizational and technological factors. Future research should investigate eHealth adoption in patients and hospital administrators.

Keywords: eHealth · Healthcare providers · Barriers · Facilitators · Adoption

1 Introduction

Most developing countries have adopted the use of e-health technologies in delivering improved primary healthcare to the citizens with the primary goal of delivering better,

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fast and effective patient care. EHealth encompasses a set of disparate concepts, including health, technology, and commerce [1]. According to World Health Organization (WHO), e-Health is the cost-effective and secure use of information and communication technologies (ICT) in support of health and health-related fields. It includes multiple interventions, including telehealth, telemedicine, mobile health, electronic medical or health records (eMR/eHR), big data, wearables and even artificial intelligence. The role of eHealth has been recognized as centric in realizing overarching health priorities such as Universal health coverage (UHC) and fulfilling the third sustainable development goal (SDG) that aims to ensure good health and well-being to increase life-expectancy [2].

EHealth adoption plays a vital role in shaping the delivery of health services by healthcare providers. This is because it enables healthcare providers to work more effectively and improve quality of patient care [3]. A healthcare provider is an individual or a health facility licensed to provide healthcare diagnosis and treatment services including medication, surgery and medical devices. These include physicians, advanced practice providers, allied health professionals, health professionals and Christian Science practitioners. The adoption of eHealth enables a universal health coverage for instance through providing health services to remote populations and underserved communities through telehealth and mHealth [4]. Therefore, the migration to e-health is necessary to provide quality health care because it allows for seamless flow of health information among various entities. Research has revealed that e-health can be one solution that gives better access to healthcare services for patients as well as enable the healthcare professionals increase care quality [5]. Thus, the demand for high quality and equitable distribution of healthcare has been the major motivation for both government and healthcare providers to concentrate on e-health as an approach to overcome various challenges faced by health institutions.

However, much as the potential of e-health for Sub-Saharan Africa is promising, its uptake has been considerably very poor [6]. Low usage in developing countries is as a result of poor adoption by organizations and users [7, 8], shortage of health professionals, high telecommunication cost, lack of government will and civil unrest which frequently results in damage to infrastructure [6, 9]. In contrast, a lot can be achieved with improved infrastructure (both Internet and cellular phone based) leading to affordable and reliable eHealth services.

Uganda, like most developing countries, has employed eHealth technologies to improve healthcare delivery and public health [10], however there is growing evidence of the low adoption of the same despite the great investment in the sector at individual, national, regional and international level [11, 12]. Uganda's eHealth policy and strategy was developed to guide the development and implementation of eHealth in the country. The National eHealth Strategy further points out the need to evaluate digital health interventions and keep track of their results in terms of outcomes and impact, however, most eHealth processes are not systematically documented and lack ongoing monitoring or measurement mechanisms [13]. eHealth adoption has been further incapacitated because of the high cost of information technology infrastructure and low level of human capacity to adopt eHealth [14]. Whereas several studies [8, 15–21] have investigated the barriers and facilitators of eHealth in Uganda, few have investigated eHealth adoption

and health providers, yet the success of the former greatly depends on knowing the prevailing conditions facilitating the latter's uptake to technology. Understanding the barriers and facilitators of eHealth is therefore important to accelerate adoption among healthcare providers, which was the purpose of this study.

2 Methods and Materials

2.1 Study Setting, Design and Sampling

The study was conducted in the health facilities of the following districts; Kampala, Mbarara, Jinja, Mbale and Gulu located in the central, southwestern, eastern and northern Uganda. The choice of the five districts was purposive based on i) having a regional balance, ii) the need to conduct a comparative analysis, and iii) the fact that regional disparities can influence adoption. Equally, the health facilities were purposively selected but the study participants (health providers) were randomly selected using stratified random sampling method. However, within each strata, participants were randomly selected using simple random sampling strategy.

Kampala and Jinja population represents a typical urban population that is rapidly growing with high demand for high-quality services, and provides a representative sample to understand urban health [22]. Kampala is Uganda's national and commercial capital bordering Lake Victoria with an estimated population of 1,680,800 people; covering an area of 3,263.3 square miles [22]. It is reported to be among the fastest growing cities in Africa, with an annual growth rate of 4.03% [23]. Jinja is a city in the Eastern region of Uganda, located on the shores of Lake Victoria and lies in the north of the lake, with a total population of 72,931 people [24] over an area of 260 square miles. Mbarara is the administrative capital of South-Western Uganda with a population of 445,600 [25]. The district headquarters is located 270 km (170 miles), by road, Southwest of capital city, Kampala [25]. Mbale district is in Eastern Uganda serving as a main administrative and commercial centre in the sub-region [26]. It has an estimated population of 441, 300 with district headquarters located approximately 245 km (152 miles), by road, northeast of Kampala, the capital of Uganda [27]. Gulu district is located in the Northern region of Uganda serving as the administrative capital of the region [26] with an estimated population of 396,500. The headquarters are approximately 333 km (207 miles), by road, north of Uganda's capital city, Kampala [27].

Focus was majorly on government health facilities because most health services especially in the upcountry regions are concentrated in public hospitals, which increased our likelihood of recruiting more participants (health providers).

Inclusion criteria included healthcare providers working in national and regional referral hospitals, health centre II, III, and IV, private for profit and private not for profit health facilities, clinics and pharmacies located in the five districts. The study excluded hospital administrators like accountants, secretaries and managers. Thirty-eight health facilities were visited in Kampala, 15 in Gulu, 6 in Mbale, 11 in Jinja and 8 in Mbarara district as shown in Fig. 1a. Table 1 shows the health facilities that were visited and the healthcare providers within these health facilities that participated in the study.

Table 1. Respondents and their corresponding health units

Type of health facilities	Facilities visited	Health providers
National referral hospital	2	19
Regional referral hospital/research institutes/maternity homes	7	19
Private not for profit	3	25
Private for profit/clinics/laboratories/pharmacies	56	67
Health centre II	3	34
Health centre III	4	45
Health centre IV	3	7
Total	*78*	*216*

2.2 Study Design

The study employed a cross sectional design using a quantitative data collection approach covering a period of October 2020 – March 2021. The survey questionnaire investigated the barriers and facilitators of eHealth adoption among healthcare providers. A survey questionnaire formulated in English with three main themes (demographic data, barriers and facilitators) was used to collect data. Thematic data (barriers and facilitators) of the questionnaire was drawn from existing studies [6, 9, 17, 22, 28–30] that described the barriers and facilitators of eHealth adoption.

To reduce bias and check the validity of the questionnaire, a pre-test was conducted with the healthcare providers at Norvik hospital. At the advent of the CoVID-19 pandemic, there was a mandatory requirement to observe the Ministry of Health CoVID-19 standard operating procedures especially when in public, to adhere to that, data was collected in three different ways, i) using the ODK tool, ii) using a google form, and iii) a physical questionnaire. Respondents were given the liberty to choose a method of their convenience, but could not use more than one.

2.3 Sampling and Data Collection

Two hundred and fifty healthcare providers working in 78 selected health facilities located across the five districts received questionnaires, but 216 successfully filled the questionnaires, contributing 86% to the response rate. The sampling was random based on two different strata, that is, i) area of clinical practice and ii) gender. Apart from pharmacies and some clinics, all units offered twenty-four hour services, which increased our chances of recruiting more study participants. At the health facilities, the clinical practice strata included the following; obstetricians/gynecologists, physicians, dentists, nurses, midwives, oculist/ophthalmologists, pharmacists, clinicians and lab technicians. Initially, verbal consent was sought from study participants for approval to participate in the study. Upon approval, those who met the eligibility requirements were selected using simple random sampling strategy and a consent form seeking approval was presented

prior administering the questionnaire. At this point, the rights of those who had consented were clearly spelt out.

On average, it took the respondents approximately three weeks to have a questionnaire completed and the last batch of questionnaires was collected on 18th- March-2021. At the end of the exercise, thirty-four participants did not return the questionnaires citing reasons like being busy, long questionnaire and lack of time.

Twelve research assistants (RA's) together with the authors participated in the distribution of the questionnaires. All RA's were graduate students who, despite their experience in data collection, had to first be trained on the primary objective of the research, research ethics, code of conduct and communication skills.

2.4 Analysis

All data was coded, processed and analyzed using IBM SPSS Statistics Version 25 (New York, USA). Descriptive statistics using the mean, frequencies, standard deviation and cross tabulation were used to provide basic information on the demographic distribution of the participants. Pearson's Chi-square test (χ^2) was used to test the independence of the variables and cross tabulation was performed to examine relationships within the dataset.

2.5 Ethical Approval

Approval was first sought from the research ethics committee of the School of Public Health, Makerere University under registration number SPH-2021-42. This was followed by consent from the Uganda National Council for Science and Technology registered under SS945ES. Upon receiving the two approvals, written consent was further sought from health facilities and the study participants. Consent at all levels was either verbal or written. The right of each participant to participate or withdraw from the study was respected.

3 Results

Results from Fig. 1 indicate that majority of the healthcare providers 119 (51%) were from Kampala, 45 (21%) from Mbale, 21 (10%) from Mbarara, 20 (9%) from Gulu and 19 (9%) from Jinja (see Fig. 1a). Of the 216 respondents, 125 (58%) were male being the largest represented while the rest were females 91 (42%) indicated in Fig. 1b. Majority of participants worked in government aided facilities, i.e. 45 (21%) from HC III, 7 (3%) from HCIV, 34 (16%) from HC II, 19 (9%) from a national referral and 19 (9%) from regional referral hospitals while the rest were from private facilities i.e. private-for-profit health facilities 67 (31%) and 25 (12%) from private-not-for-profit, as shown in Fig. 1c. It was revealed that, prior to the study, only 89 (41%) had ever used eHealth technologies (see Fig. 1d).

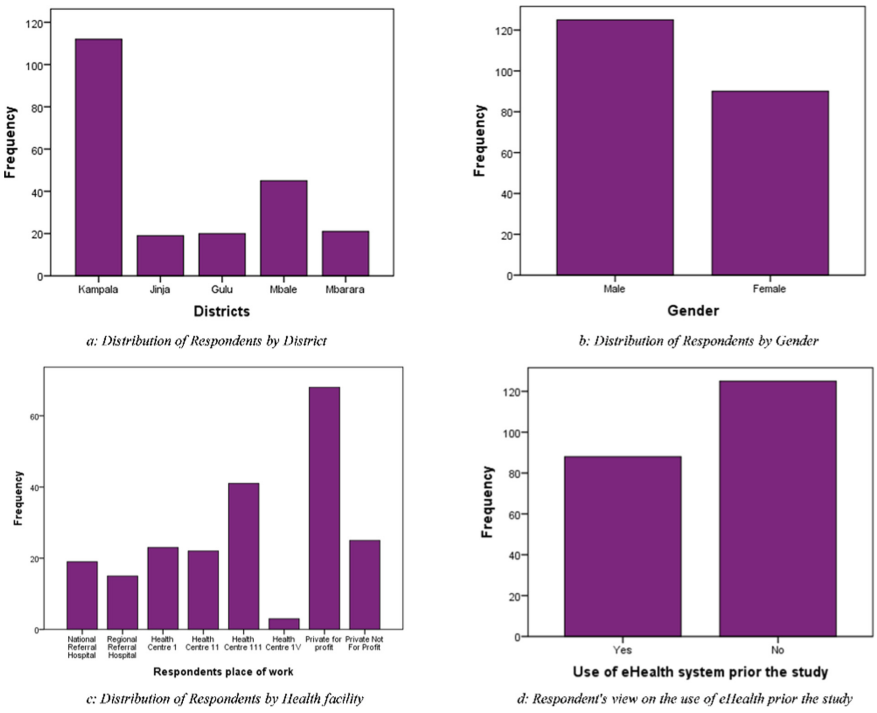

Fig. 1. Demographics data of the study participants

Table 2 presents information to understand the characteristics of the respondents and their demographic distribution.

Analysis in Table 2 indicates that the greatest majority 68 (54%) of healthcare providers who had never used eHealth systems were diploma holders and were the most represented 111 (51%). Of the 59 (27%) degree holders, majority 41 (46%) had used eHealth systems. Results further indicate that across gender and age demographics, male respondents 59 (66%) and those between the ages of 18–30 years had a better uptake of eHealth than their counterparts. This is similar across those that were residing in Kampala 61 (69%). Employing a .05 criterion of statistical significance, we can conclude that education level ($\chi^2 = 40.72$, $\rho < 0.05$), age ($\chi^2 = 13.08$, $\rho < 0.05$), location ($\chi^2 = 20.96$, $\rho < 0.05$), gender ($\chi^2 = 4.40$, $\rho < 0.05$) and institutional place of work ($\chi^2 = 49.67$, $\rho < 0.05$) are not independent of eHealth adoption and that there is a statistically significant relationship between these variables and eHealth adoption.

Table 2. Demographics of the respondents

Number that participated and returned questionnaires	Number/Percent of health providers N = 216				
	eHealth adoption			Pearson's Chi-square	
	Yes	No	Total	χ^2	Sig.
Prior use of eHealth	89 (41%)	127 (59%)	216 (100%)		
Education level				40.72	.000
Certificate	2 (2%)	37 (29%)	39 (18%)		
Diploma	43 (48%)	68 (54%)	111 (51%)		
Degree	41 (46%)	18 (14%)	59 (27%)		
Others	3 (3%)	4 (3%)	7 (3%)		
Age				13.08	.004
18–30 years	32 (36%)	53 (42%)	85 (39%)		
31–40 years	28 (32%)	54 (43%)	82 (38%)		
41–49 years	26 (29%)	13 (10%)	39 (18%)		
Above 51 years	3 (3%)	7 (6%)	10 (5%)		
Location				20.96	.000
Kampala	61 (69%)	50 (39%)	119 (51%)		
Jinja	7 (8%)	12 (9%)	19 (9%)		
Gulu	4 (5%)	16 (13%)	20 (9%)		
Mbale	9 (10%)	36 (28%)	45 (21%)		
Mbarara	8 (9%)	13 (10%)	21 (10)		
Gender				4.40	.036
Male	59 (66%)	66 (52%)	125 (58%)		
Female	30 (34%)	61 (48%)	91 (42%)		
Institutional place of work				49.67	.000
National referral hospital	11 (12%)	8 (6%)	19 (9%)		
Regional referral hospital/research institutes/maternity homes	10 (11%)	9 (7%)	19 (9%)		
Private not for profit	22 (25%)	3 (2%)	25 (12%)		
Private for profit/clinics/laboratories/pharmacies	32 (36%)	35 (28%)	67 (31%)		
ealth centre II	6 (7%)	28 (22%)	34 (16%)		
Health centre III	6 (7%)	39 (31%)	45 (21%)		
Health centre IV	2 (2%)	5 (4%)	7 (3%)		

Results in Table 3 demonstrates eHealth facilitators or enablers categorized as organizational, technological and individual. Specifically, organizational factors looked at the enabling conditions within the hospital; the technological factors were looking at hardware, software, data, standards and policies. Individual facilitators focused on issues inherent to a tech-user.

Table 3. Showing facilitators of eHealth adoption

Organizational factors	**Mean**	**Std. dev.**
Training of users of the system is important to accelerate adoption of ehealth systems	4.15	.758
Communicating ehealth benefits to the users is very crucial in successful adoption	3.93	.827
Size of the health facility will determine the successful adoption of ehealth systems	3.39	1.214
Top management support / organizational readiness (strategy, structure, process) is critical to ehealth adoption	3.79	.923
eHealth adoption necessitates change and if change is appropriately handled, it will influence adoption (change management)	3.52	.919
The impact of ehealth systems to the organization-wide processes will improve adoption	3.71	.866
The cost-effectiveness of the ehealth systems contributes to successful adoption	3.68	1.145
Assigning people to take full responsibility of the entire process is critical in ehealth adoption	3.73	.863
Once the ehealth system improves communication between the patient and the health provider, it will improve adoption	3.68	1.035
Involvement of key stakeholders in the preliminary implementation of ehealth services is critical for adoption	3.80	.924
In my opinion, the role of local champions to promote the service and motivate users is vital for successful ehealth adoption	3.67	1.017
In my opinion, if the policies for using generated data for research are flexible and transparent, then many will use ehealth systems	3.73	.831
The lack of ownership by the users bars adoption of health systems	3.64	.959
The popularity of the ehealth system accelerates adoption	3.58	1.122
If there are supporting laws and regulations for ehealth use, adoption becomes easy	3.75	1.148
Technological factors	**Mean**	**Std. dev.**
Ehealth systems that cut across different functions (finance, marketing, HR) will be widely adopted	3.65	.977
If the ehealth system is easy to use with an effective interface between the human and machine, it fosters adoption (ease of use)	4.05	.888
If the quality of the system is good and data readily available, people are obliged to use ehealth systems	3.74	1.025
Embedding ehealth systems in existing health care infrastructure can spearhead adoption (system integration)	3.98	.895
Establishing common standards for interoperability improves ehealth adoption	3.72	.891
In my opinion, security of patient data drives ehealth adoption	4.12	.870
If appropriate technical support for the installation and maintenance of the system is provided, adoption of ehealth systems is accelerated	3.91	3.634
If the IT infrastructure to support the implementation of the ehealth systems is readily available, adoption becomes easy	3.92	.984
Reliability of the ehealth systems is important in ehealth adoption	3.67	1.165

(*continued*)

Table 3. (*continued*)

When there is multiple channels (online, offline, mobile apps, web apps) to exchange information people will be motivated to use the ehealth system(multi-channel access)	3.97	.915
If the service rendered through the ehealth improves health outcomes, adoption is easy	3.79	1.098
High quality evaluation during the development process leads to identification and correction of bugs/errors, increasing system reliability hence increasing adoption	3.57	1.104
A well- designed system that reflects the user's requirements/needs will most likely be widely adopted (system's usefulness)	3.76	.836
Individual factors	**Mean**	**Std. dev.**
Usefulness of ehealth systems in personal healthcare drives adoption	3.69	1.073
Factors like attitude towards change, motivation will influence ehealth use	3.84	.977
The need for fast execution of processes will motivate users to use ehealth systems	3.89	1.040
If the users of the system trust the service, they will be obliged to use it	3.81	.873
In my opinion, if the system facilitates research and development, adoption will increase	3.65	.981

Results in Table 3 indicate the scores of training system users are clustered more closely around the mean of that group compared to the distribution of the cases around the means of the other organizational facilitators. In essence, the mean of training users is more representative of the scores of respondents in that group than the means of the other facilitators. Whereas the means and standard deviation of all organizational facilitators are somewhat similar, five major factors stood out; training users of the system ($\mu = 4.15 \pm .758$), communicating eHealth benefits ($\mu = 3.93 \pm .827$), impact of eHealth systems to the organization-wide processes ($\mu = 3.71 \pm .866$), assigning people to take full responsibility ($\mu = 3.73 \pm .863$) and flexible and transparent policies for using generated data ($\mu = 3.73 \pm .831$).

Although the respondent's opinion on the technological facilitators were more inclined to ease of use ($\mu = 4.05 \pm .888$), integrating eHealth with existing healthcare infrastructure ($\mu = 3.98 \pm .895$), establishing common interoperability standards ($\mu = 3.72 \pm .891$), security of patient data ($\mu = 4.12 \pm .870$) and usefulness of the system ($\mu = 3.76 \pm .836$), there is not really much difference between the other technological facilitators. This is because the variance in their means and the standard deviation is negligible.

Like organizational and technological facilitators, individual factors that influence the uptake of eHealth among healthcare providers had similar results on mean and standard deviation. However, the need for fast execution of processes ($\mu = 3.89 \pm 1.040$), user's trust in the system ($\mu = 3.81 \pm .873$) and user's attitude towards change ($\mu = 3.84 \pm .977$) got a considerably higher score as compared to the other factors.

Information in Table 4 highlights barriers of eHealth categorized as organizational, technological, individual and external factors.

Table 4. Barriers of eHealth adoption

Organizational barriers	**Mean**	**Std. dev.**
The lack of prior planning impedes ehealth adoption	3.85	1.024
The lack of funding is a stumbling block to ehealth systems	3.98	1.036
The lack of training in ehealth systems slows adoption	3.94	1.091
When there is no time to keep up with and learn new technology, this slows ehealth adoption	3.76	.975
Reluctance to invest in it slows technology progression	3.61	1.012
The lack of proper organisation change management strategy to embrace and fuse ehealth technology	3.72	.922
The inadequate promotion of ehealth systems hinders	3.71	1.103
It may not be cost-effective to provide ehealth services	3.49	1.085
The lack of coordination among the health providers and policy makers hinders adoption of ehealth systems	3.65	1.111
The fear of alteration of traditional workflow patterns bars ehealth adoption	3.64	.968
The lack of sustainable business models to allow for ehealth continuity impedes adoption	3.60	1.166
The fear of losing control when using e-services for instance e-consultations	3.66	.981
The lack of ownership by the users bars adoptions	3.55	1.129
Technological barriers	**Mean**	**Std. dev.**
The lack of developer support affects ehealth adoption	3.56	1.002
The unreliable ehealth systems slow the adoption because users are not certain of the availability of the data or the system	3.79	.904
Ehealth systems that are not secure may hinder users from using them	3.69	1.128
Missing standards for patient data and data exchange creates fear to use ehealth systems	3.72	.961
The lack of compatibility or interoperability of the ehealth system hinders organisations to adapt them	3.43	1.138
The lack of appropriate ICT infrastructure impede adoption of ehealth systems	3.69	.912
The lack of proof of effectiveness and efficiency of ehealth systems	3.53	1.134
Limited content of health issues in local content slows adoption	3.34	1.078
When the ehealth systems design does not fit the user's needs, it impedes adoption	3.74	1.017
Several ehealth systems modules operate in isolation which delays the execution of some business processes	3.44	1.128
The interfaces of some ehealth systems are not user-friendly and hard to navigate	3.52	1.008
Individual barriers	**Mean**	**Std. dev.**
Digital illiteracy among users hinders the use of ehealth systems	3.75	.969
The issue of confidentiality of ehealth data hinders users to use ehealth systems	3.60	1.149
The capability to learn is very low among different users which bars them from embracing new technology	3.58	1.032
Unclear benefits of the ehealth systems renders many users to shun ehealth systems	3.43	1.193
Bad information about existing ehealth systems limits adoption	3.37	1.119

(*continued*)

Table 4. (*continued*)

The lack of trust in several ehealth systems hinders adoption	3.56	1.076
The lack of system's acceptance among users limits ehealth adoption	3.58	1.029
In my opinion, technophobic nature of some ehealth users slows down adoption	3.56	1.119
Patient barriers like users with disabilities or physical impairments like blindness bars adoption of ehealth systems	3.51	1.007
The low level of expertise in ehealth systems impedes adoption	3.59	.994
The lack of incentives to use ehealth systems will hinder some users from using ehealth systems	3.64	1.010
External barriers	**Mean**	**Std. dev.**
Sometimes the regulatory policies impede adoption of ehealth system	3.57	1.061
Unreliable broadband connectivity does not motivate users to use technology	3.65	.921
Existing business models for health are state funded increasing pressure on government health budget, therefore becoming unsustainable by government due to budget cuts	3.58	1.042

Barriers to eHealth adoption were categorized into organizational, technological, individual and external barriers as indicated in Table 4. Under organizational barriers, the mean and standard deviation scores were somewhat close however, lack of time to learn new technology ($\mu = 3.76 \pm .975$), lack of proper organization change management strategy ($\mu = 3.72 \pm .922$), fear to alter traditional work patterns ($\mu = 3.64 \pm .968$) and fear of losing control when using e-services ($\mu = 3.66 \pm .981$) had a relatively high mean scores.

Similarly, the means and the standard deviation results for technological barriers are slightly different implying a minimal difference in the respondent's opinion. Nevertheless, unreliable eHealth systems ($\mu = 3.79 \pm .904$), missing standards for patient data ($\mu = 3.72 \pm .961$) and the lack of appropriate ICT infrastructure ($\mu = 3.69 \pm .912$) indicates that the respondents did not greatly differ in opinion.

Like organizational and technological barriers, the mean and standard deviation scores of individual barriers have no big difference. Nonetheless, digital illiteracy ($\mu = 3.75 \pm .969$) and the issue of confidentiality of ehealth data ($\mu = 3.60 \pm 1.149$) had the highest mean score as compared to other factors. The external factors equally had the mean and standard deviation scores within the same range although unreliable broadband ($\mu = 3.65 \pm .921$) and existing business models for health that are state funded ($\mu = 3.58 \pm 1.042$) scored a little more than the other factors within the same group.

Results in Table 5 were generated to compare the means of two groups i.e. male and female respondents. Because both the mean and standard deviation are very similar, there is not a notable difference in the uptake of eHealth adoption between males and females. This analysis is therefore producing some reasonably strong evidence that the use of eHealth among healthcare providers is not dependent on someone's gender.

Table 5. Comparing the means across gender

Gender	eHealth adoption		
	Mean	N	Std. deviation
Male	1.53	125	.501
Female	1.67	91	.473
Total	1.59	216	.493

4 Discussion

The key findings of this study have been sub-categorized into individual, organizational and technological factors influencing eHealth adoption.

The study revealed that demographic factors such as education (having a higher education), age (being young), and location of the respondent's work place had a strong influence on eHealth adoption.

Similarly, individual factors such as user's trust in the system, user's attitude towards change, expertise in eHealth systems greatly influenced the adoption of eHealth technologies.

Organizational facilitators of eHealth as regarded by the respondents, were, the institutions ability to train users of the system, institutional place of work, communicating eHealth benefits, flexible and transparent policies for using generated data. The organizational barriers were lack of time to learn new technology, lack of proper organization change management strategy and fear to alter traditional work patterns.

For technological facilitators, the following stood out, ease of use, integrating eHealth with existing healthcare infrastructure, establishing common interoperability standards, security of patient data and usefulness of the system. The barriers included unreliable eHealth systems and the lack of appropriate ICT infrastructure.

4.1 Demographic Factors

The first major finding from this study indicates that demographic factors have a strong influence on eHealth adoption. eHealth adoption was high among respondents who were relatively more educated than their counterparts. This can be corroborated with a study that was conducted in Ghana [3] which found out that, the higher the education level, the more likely it was for someone to adopt eHealth systems. If the healthcare provider does not possess attributes for technology use, which in this case, is partly education, then adoption cannot ensue. It is evident that there is slow eHealth adoption in Uganda largely because of human resource challenges ranging from inadequate staff and lack of digitally trained health professionals. The skills to use digital technology are highly needed, and it is premised that the more educated one is, the more likely it is to embrace technology [31]. Some studies [32, 33] have revealed that education increases staff acceptance of eHealth systems. Education plays a pivotal role in achieving digital inclusion in the health service sector.

In addition, this study revealed that much younger healthcare providers were more inclined to use eHealth technologies than those above forty years. Age seems to be a predetermining factor for technology acceptance and adoption. Whereas some studies [34] cite age as a hurdle to eHealth adoption, a study conducted by [33] indicated that individual factors such as age were seldom considered as ICT adoption factors among healthcare providers. Many other studies [3, 20] also allude to the same.

4.2 Individual Factors

Users' trust in the system, attitude towards change and expertise greatly influenced uptake of eHealth systems among healthcare providers in Uganda. Acceptance of eHealth systems is correlated with the users trust in the technology. Before users trust the technology, they need to trust the institution of work, trust that the patients will divulge correct information about their health and trust their peers. Only then will they be obliged to trust that the technology will fulfill their needs. In a study that was conducted in Malawi [35], it was found out that trust of online healthcare service providers was significant in influencing the decisions of users to use eHealth services. There is a salient relationship between trust and someone's attitude towards eHealth systems. Some studies [36] affirm that consumer attitude to technology, and particularly trust, has an effect on how that technology is used. Once there is considerable level of trust in the technology, it will, to a certain extent influence someone's attitude to use. Having expertise in digital technologies was found to have a significant effect on eHealth adoption. Several authors [6, 22, 29] postulate that sufficient digital skills accelerate adoption of eHealth. This could be attributed to the fact that digital skills improve one's ability to navigate the system and builds confidence of the user. With the ability to operate a digital gadget, this will most definitely, change someone's attitude towards adoption. Hence, the user's trust in the system and their level of expertise can largely influence their attitude to use eHealth system.

4.3 Organizational Factors

This study revealed that the institution's ability to train users and communicate eHealth benefits facilitated eHealth adoption among healthcare providers. Training users received high scores under in this category of facilitators. Many studies [21, 30, 37] have underscored the importance of training in accelerating eHealth adoption. Training end users is a critical step to successful implementation of any system. Training is usually intended to equip users with the skills to use the system but also to communicate the benefits of the same. If the institution does not encourage the use of ICT, it will be of no relevance [3].

Communicating benefits of eHealth to the end-users, a factor that was revealed in this study as significant, is paramount for user buyer-in. Similar studies [8, 37] conducted in Uganda also emphasized the critical benefit of involving and communicating the system's benefits to the users. This in the end, creates system's appreciation and accelerates adoption.

The findings also indicated that the respondent's institutional work place greatly influenced adoption of eHealth. The study saw many eHealth users from Kampala than

any of the four other regions. Kampala being the capital and a hub of most economic activities, it has a better socio-economic status than any other region in the country. A good socio-economic status implies that people can own digital gadgets, are more informed of their technology needs and can afford internet services. A study by [3] points out the critical role that the location of the health institution plays in eHealth adoption among healthcare providers.

In addition, this study revealed that flexible and transparent policies for using generated data was key in enhancing adoption. Like other studies [18, 38], having strict guidelines that govern the collection, use and storage of health data contributes to building trust among users, improves confidentiality and integrity of the data but most importantly alleviates the fear associated with data misuse.

The organizational barriers limiting adoption of eHealth revealed by this study were the lack of time to learn new technology. Having no time to learn new technology was one of the most reported barriers. Some studies [9, 18, 37] have also emphasized the organization's inability to create time to engage and train users on the new technologies as a key barrier in eHealth adoption. Because of the structured nature of most health facilities and the strict adherence to the normal work processes and protocol, setting time aside to train users may affect service delivery. In a context where health professionals' time constraints or heavy workload manifested as barriers to the introduction of an innovation, time was often viewed as an important aspect in relation with ICT adoption [33].

This study further found out that lack of proper organization change management strategy slows down uptake of eHealth. Some studies [11, 30] have stressed the relative importance of having a formal change management structure for technology adoption. By virtue of the work processes in health facilities, a proper change management strategy will help to prepare, equip and support end-users in embracing change.

The fear to alter traditional work patterns was a factor that was revealed in this study to be affecting eHealth adoption. Changing from traditional delivery of health service to e-service delivery is met with a lot of fear and resistance. A report by [39] revealed that changing work practices especially in the medical field hampers service delivery and to a greater extent demotivates healthcare providers.

4.4 Technological Factors

This study revealed that the ease associated to the use of eHealth technologies contributes greatly to its adoption. Many studies [8, 17, 40] equally stressed the importance of usability of the system not only in increasing acceptability but accomplishing tasks effectively. Knowing how to navigate the system reduces the turn-around time, improves efficiency, which results into quick execution of tasks. Usability can be improved through training and gradually embedding e-services in the routine work processes.

Like other studies [8, 29, 41–43], this study revealed that usefulness of the system has far reaching effects on adoption. For eHealth technologies, usefulness can be assessed in terms of the system's ability to improve health outcomes, efficiency, effectiveness and delivery of services in the shortest time possible.

The ability to integrate eHealth systems with existing healthcare infrastructure was found to be very crucial to eHealth adoption. Some studies [8, 11, 18, 37] conform to

this assertion. This integration enables business continuity and reduces user resistance since the old system is not completely overhauled. Integration can be achieved through the establishment of common interoperability standards. Interoperability enables timely access to patient information and reduces the need to re-capture the same information [44]. In fact, a report by Ministry of Health [11] emphasized interoperability as a major impediment to eHealth adoption. This is due to the fact that the absence of it impedes information sharing and creates overlapping eHealth standards [3].

The study revealed that healthcare providers considered security of patient data very vital if embracing eHealth technologies is to ensue. Once health facilities guarantee the security of this data, patients will unhesitatingly be willing to disclose even the most personal information. Some researchers [38, 45] stress the importance of securing patient data because it increases systems acceptability and confidence which are key ingredients to system's adoption. The survival of eHealth systems, especially those that involve both a health provider and a patient, depends on either partys' trust in the system.

The key impediment to eHealth adoption, as revealed by this study was unreliable eHealth systems, a finding commensurate with other similar studies [8, 17, 28]. Unreliability ranges from hardware infrastructure, Internet services, electricity and software reliability. These impair service delivery and as such may render healthcare providers to resort to their traditional workflow processes.

The lack of appropriate ICT infrastructure was one of the factors that was revealed to be hampering eHealth adoption. As reported from several scholars [11, 16, 18, 21], lack of appropriate ICT infrastructure (hardware, software and peripherals) at all levels of the health system limits service delivery. This involves the lack of computers, smart phones, secure network infrastructure [11], poor network coverage [28] and poor internet services [46]. A successful eHealth network requires that all these are functional, reliable and available.

5 Conclusion and Recommendations

This study found out that demographic factors such as age, education and gender have a significant influence on eHealth adoption. Likewise, it was revealed that organizational and technological factors specifically, training users, user's work institution, communicating eHealth benefits, having transparent policies on the use of generated data, time to learn new technology, ease of use, usefulness of eHealth and integrating eHealth systems in existing healthcare infrastructure significantly affected adoption.

Any policy that targets integration of eHealth should take into account the demographic characteristics of health professionals, while paying attention to the organizational and technological factors. Also, for successful adoption of eHealth, all factors (individual, organization, technological) should be given adequate attention. There is need to advocate for private sector involvement to drive and actively participate in promoting eHealth across the country. Future research should investigate adoption of eHealth among patients and hospital administrators.

5.1 Limitation of the Study

There was a big setback due to the advent the COVID-19 pandemic, which made data collection very hard especially, that we were dealing with health facilities. Similarly, the study was purely quantitative, hence it did not give the research team the flexibility of knowing healthcare providers opinions, which we believe would have been a key ingredient to the findings. The other limitation is the small sample size that limits the generalization of the results. However, we intend to address this issue in the subsequent studies.

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