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Factors Affecting Adoption, Implementation and Sustainability of Telemedicine Information Systems in Uganda

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Abstract. Telemedicine has become a method of choice for improved access to quality healthcare services world over. The technology, which has been used for decades in the developed world, is now being diffused to developing countries. However, many initiatives have not lived to their expectations. In this paper, we present some of the main hindrances to telemedicine adoption, implementation and sustainability in Uganda. Case studies were carried out in two hospitals that have attempted to use the technology. Both qualitative and quantitative research methods were used to collect and analyze the data. Our findings indicate that the key factors affecting telemedicine in Uganda were lack of telemedicine policy, knowledge and skills and resistance to change by members of staff in the hospitals. A discussion of the findings inline with some selected technology adoption theories and models is done. We have also identified and discussed the key requirements for sustainable telemedicine in Uganda.

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Introduction

Information and communication technology (ICT) is becoming more popular in healthcare management. In the past, computers were predominantly used to keep and maintain patients' medical records. However, in recent years, the proliferation of mobile computing devices has driven a revolutionary change in the computing world, where ICTs have been adopted for purposes of sharing healthcare expertise across the world (Khan *et al.*, 2006 & Saroj *et al.*, 2008). Since the early 1990s, advances in computer and internet technologies have created new possibilities for doctors and their patients. In the developed nations, doctors use computers to send live video, sound and high-resolution images between two distant locations as well as examining patients in clinics that may be thousands of miles away. These technologies are being rolled over to developing countries due to their immense abilities in reducing healthcare costs (McClure, 2007).

The global impact of e-Health is being manifested in the reduction of healthcare costs and improved efficiency through better retention and retrieval of records, better management of chronic diseases, shared health professional staffing, reduced travel times and fewer or shorter hospital stays (McClure, 2007). Telemedicine, a component of e-health is a rapidly developing application of clinical medicine where medical information is transferred via telephone, the internet or other networks for the purpose of consulting, and sometimes remote medical procedures or examinations (Della, 2005; Mishra, 2007). It can be viewed as a new technology offering medical services through communications from geographically distant locations (Olugbemiga & Tanimowo, 2009). A common genre of telemedicine is remote consultation, which aims at improving patient care by giving local health workers access to remote specialists' skills and knowledge and has the potential to significantly impact healthcare in developing countries where there are chronic shortages of medical personnel. The Ugandan healthcare is increasingly using mobile technologies and e-mail with very limited use of video conferencing and high end telemedicine technologies. There have been several new researches and developments in this space. Saroj and Indra (2008) urge that mobile phones are becoming an important ICT tool not only in urban regions, but also in remote and rural areas. The liberalization of the telecommunications sector in Uganda has opened up space for new entrants with new and innovative technological solutions. It is therefore highly anticipated that these service providers will alter their energies and pay special attention to mobile healthcare since this has already been done in other developing countries such as India, where some of the telecommunication service providers are originating.

Despite these developments, the use of telemedicine in Uganda and other developing countries remains a challenge. Many systems have either failed to kick-start or they have stopped working in their infancy stages (Oladosu *et al.* 2009a). Part of the causes of these failures, are the gaps in the implementation frameworks as Oladosu *et al.* (2009b) urge that practicable solutions need to be tailored towards existing success stories and local conditions where the telemedicine strategy is being established and

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that systems such as e-health require contextual considerations in implementation and sustainability.

1. Healthcare in Uganda

Uganda, with a population of approximately 33 million people and over 130 districts has a very complex healthcare system comprising of both the public and private sector. The public healthcare subsector starts with grassroots health care units commonly known as health center IVs which serve between 30,000 and 100,000 people. Although the health center IVs are supposed to be established at parish levels, most of these have been built at sub-county and county headquarters. Health center IVs are supported by district general hospitals, which serve approximately 500,000 people each. There are also regional hospitals that serve at least 2,000,000 people and one national referral hospital that serves the entire country. Most Ugandans live at least 5km away from a health facility (Mugenyi, 2007). On the other hand, the Ugandan private healthcare sub-sector is characterized by many small clinics at the grassroots coupled with a few large hospitals that offer national referral services such as Nsambya and Kampala International Hospital. Most of the private hospitals are located in the capital city, Kampala and most private care patients access health services from dispensaries and drug shops, which are the most common lower level health facilities in the country (Hersh *et al.*, 2006).

Uganda, just like many other developing countries has a shortage of medical personnel, especially specialists such as pathologists, dermatologists, radiologists and cardiologists among others (Ekeland *et al.* 2010). The average doctor to patient ratio is devastatingly 1:20,000 compared to 1:500 in developed countries (Mugenyi, 2007). This problem is worsened by the poor infrastructure that makes it hard for patients to move to places where health services are provided (Mbarika *et al.*, 2007). Some research has been conducted in telemedicine in Africa leading to development of several frameworks (Abrahams & Molefi, 2007; Treurnicht, 2009). However, these frameworks cannot directly be applied in the Ugandan context because the factors that influence telemedicine adoption are not clear. Besides, Uganda has its own unique socio-cultural characteristics such as low levels of education with literacy rates standing just below 65% (Aguti, 2002), low rate of computer usage which stands at 11% (Kohut *et al.* 2007) and poor infrastructure (Mbarika *et al.* 2007). Zlatko *et al.* (2007) urge that differences exist in telemedicine frameworks within different countries and Oladosu *et al.* (2009) call for tailored telemedicine solutions to meet unique user characteristics. The aim of this study was to establish the salient factors that affect the use of telemedicine technologies in Uganda. The study was aimed at answering the question “What factors affect the adoption, implementation and sustainability of Telemedicine Information Systems in Uganda?”

It is hoped that this paper will guide ICT policy makers in formulating effective national IT policies that promote knowledge sharing and management on telemedicine information system platforms. Researchers, donors, academicians and the medical fraternity are always looking for innovative and cost effective ways of delivering health care in Uganda. We also hope that this study will be useful in providing the knowledge needed by these professionals for the successful adoption,

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implementation and sustainability of Telemedicine Information Systems in Uganda and other developing countries.

1.1. Definition of Theoretical Key Terms

This section defines the key theoretical terms used in the study.

Telemedicine is the exchange of medical information between two parties located at different geographical sites via a telecommunication link. It is closely linked to **e-health**, which is largely used to refer to all forms of healthcare that do not involve the physical interaction of medical personnel and/or patients (Adler, 2000; WHO, 1997). Telemedicine at the high end encompasses videoconferencing, where information exchange between health workers and/or patients is done via a video link. However, many other forms of telemedicine include transfer of still images, telephone communication, e-mails, chatrooms, patient portals, remote consultation, nursing call centers and medical education among others (Della, 2005).

2. Diffusion of Technological Innovation Theory

In order to ground our understanding of telemedicine information systems adoption and sustainability in a developing country context, we examined some theories that explain the adoption, diffusion and transfer of technology, including the Technology Acceptance Model (Davis *et al.* 1989) and the Diffusion of Technological Innovation Theory (Rogers & Shoemaker, 1973). After a careful consideration, we decided to align our study to Rogers and Shoemaker's (1973) model that explains why some users of technology adopt to technological innovations early while others adopt late or never adopt all. According to Rogers and Shoemaker (1973), there are five stages through which adoption to new technologies takes place i.e. knowledge, persuasion, decision, implementation and confirmation respectively. Rogers' and Shoemaker urge that users decide to adopt a given technology on two conditions; 1) if they know how to use it and 2) if they know the technology's relative advantage or the benefits that a new technology offers to them through a process called persuasion. Thus Rogers and Sheomaker (1973) categorized users in two types i.e. those that adopt early (early adopters) and those who adopt late (late adopters). Rogers and Shoemaker (1973) further urge that these users (early adopters and late adopters) are the ones that enhance sustainability of such new technologies. However, even when they know how to use a given technology and its benefits, some users still do not adapt. Rogers and Shoemaker classify this process as continued rejection. In section 5.0 to 5.3, a detailed discussion of the findings from this study has been made in relation to Rogers and Shoemaker (1973) Diffusion of Technological Innovation Theory.

3. Research Design

The study adopted and used a case study research design with triangulation research method where both qualitative and quantitative techniques were used for data collection purposes. Qualitative statistics were used to analyze individuals' perceptions and opinions about telemedicine, while quantitative statistics encompassed a descriptive analysis of facts arising from various variables. Interviews with key members of staff who participated in the development, deployment, maintenance and use of telemedicine systems in hospitals were conducted. Currently, there are only three well-known hospitals practicing telemedicine in Uganda. These are Mulago National Referral Hospital, Kampala International Hospital and Nsambya Hospital. In order to get divergent views from both the public and private sector, two hospitals were purposively selected; one public (Mulago National Referral Hospital) and the other private (Nsambya Hospital). A total of 75 stakeholders including Information Systems Managers, ICT Technicians, Administrators and Healers/Doctors were selected using a purposive sampling method to respond to the questionnaires in each of the above hospitals. In addition, a total of 10 participants were interviewed, five from each hospital. These participants included 1 one nurse, 1 doctor, 1 IT technician, 1 administrator and 1 patient. This selection was done to ensure a fair distribution of respondents and diverse opinions. Thus, the total number of respondents for the study was 160. This sample is in line with Roscoe's (1970) rule of thumb that states that a sample size between 30 and 500 is sufficient. A total of 149 questionnaires were returned, however, 3 questionnaires were removed due to inconsistencies and incomplete responses. Therefore, a total of 146 questionnaires, representing 91% of the total questionnaire sample size were analyzed. The sample size design breakdown is shown in Table 1 below:-

Table 1: Breakdown of sample size

Questionnaire respondents		
Hospital	Number of respondents	Sampling method
Mulago	75	Purposive sampling
Nsambya	75	Purposive sampling
Interviews		
Mulago	5	Purposive sampling
Nsambya	5	Purposive sampling
Total	160	

The data was coded and entered in SPSS. Descriptive statistics, including frequencies, percentages and means (Janssens *et al.* 2008) were used to extract the most important factors affecting the adoption, implementation and sustainability of Telemedicine Information Systems in Uganda. Validity tests were done to determine how well the questionnaire measured to the variables under investigation (Miller, 2010). Reliability tests were used to measure the consistence and stability of the questionnaire. Cronbach Alpha Coefficient was used to test for reliability (Carcary, 2008), while Content Validity Index was used to test for validity of the questionnaire (Saha, 2008). The Results in Table 2 indicate that the questionnaire was reliable and valid since all

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variables measured a Cronbach Alpha Coefficient > 0.6 (Krishnaveni & Ranganath, 2011).

Table 2: Validity and Reliability Tests

Variable	N of items	Anchor	Cronbach Alpha coefficient	CVI
Factors affecting telemedicine	13	5 point	0.716	0.742
Knowledge of telemedicine	5	5 point	0.715	0.721
Suggested solutions	11	5 point	0.728	0.566

4. Findings

The findings from the field studies were guided by 2 research objectives; 1) To examine the factors affecting the adoption, implementation and sustainability of Telemedicine Information Systems in Uganda and 2) To determine the requirements for improving Telemedicine Information Systems adoption, implementation and sustainability in Uganda.

4.1. Sample Characteristics

Descriptive statistics were used to extract important information used to understand the characteristics of respondents involved in the study. For example, an analysis of sample characteristics was used to know the user group for telemedicine in terms of age, gender and job title among others. The results in Figure 1 were generated to explore the distribution of the respondents' age by gender.

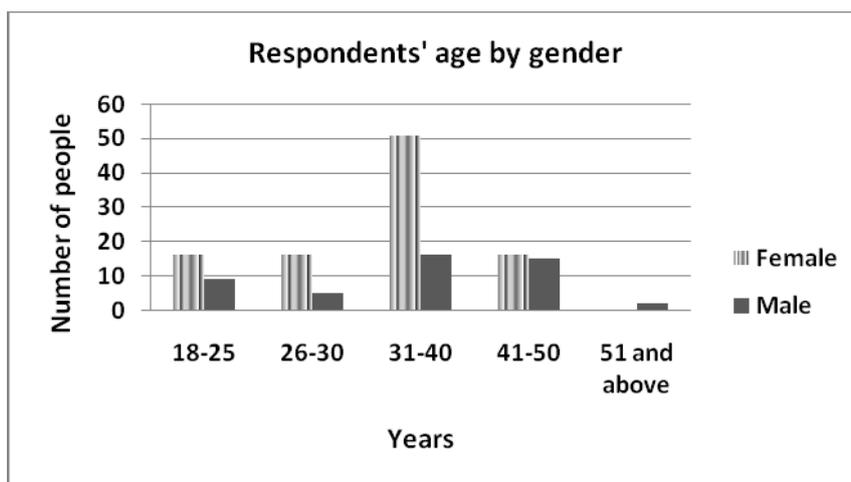


Figure 1- Respondents' Age and Gender (Source: Primary Data)

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Figure 1 shows that age bracket 31-40 years old had the highest number of respondents (51 female and 16 male). This was followed by age bracket 41-50 years old with 16 female and 15 male respondents respectively. The 18-25 years age bracket had 16 female and 9 male respondents while age bracket 26-30 had 16 female and 5 male respondents. Respondents aged 51 and above scored the least with 0 female and only 2 male respondents. Results in Figure 1 further indicate that the majority of respondents were female (99) and only 47 were male respondents.

4.2. Age Bracket By Job Title For Medical Staff

Descriptive statistics were also used to determine the age bracket for each job title for medical staff respondents. The results were analyzed and interpreted as shown Figure 2:

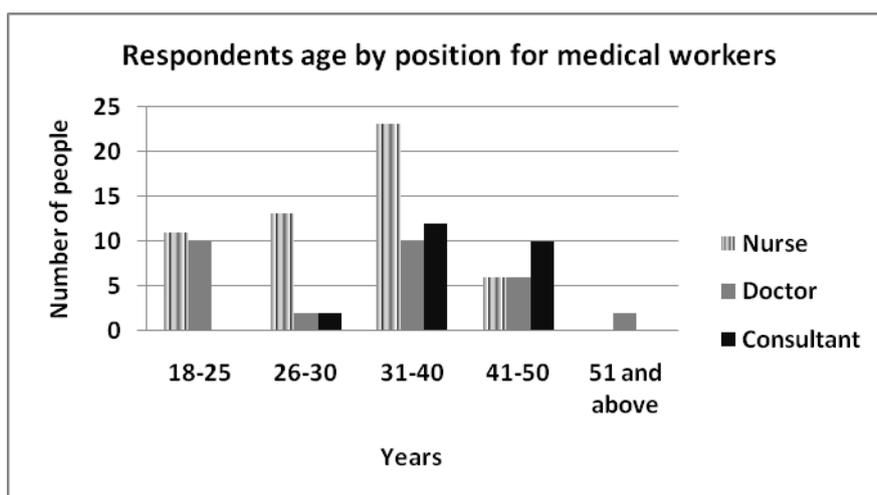


Figure 2 - Respondents Age and position [Source: Primary Data]

Results in figure 2 show that age bracket 31-40 contributed the majority respondents with 23 nurses, 10 doctors and 12 consultants. This was followed by age bracket 41-50 that had 6 nurses, 6 doctors and 10 consultants respectively. The age bracket 18-25 had 11 nurses, 10 doctors and 0 consultants while 26-30 age bracket had 13 nurses, 2 doctors and 2 consultants. Age bracket 51 years and above had only 2 consultants. Overall, nurses constituted the majority of respondents (53) followed by doctors (28) and consultants (26).

4.3. Participation on a telemedicine project

Descriptive statistics were used to determine respondents who had ever participated on any telemedicine project (s). The results as presented in Figure 3 were analyzed and interpreted using percentages.

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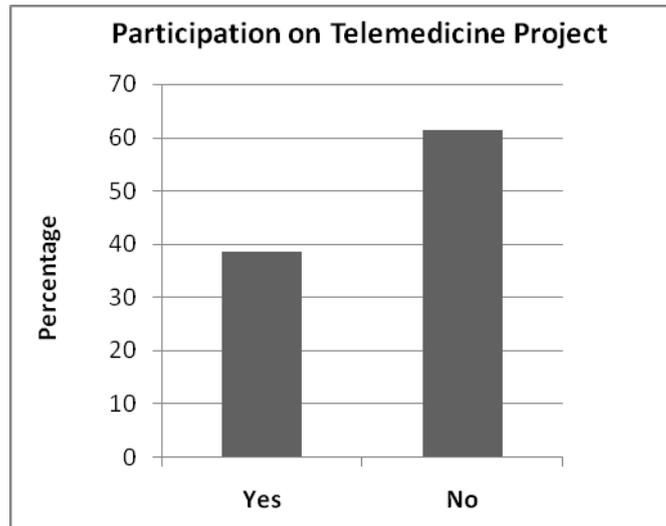


Figure 3: Participation on telemedicine project [Source: Primary Data]

Results in figure 3 show that 61.4% of the respondents had never participated on a telemedicine project. However, 38.6% of the respondents had ever participated on a telemedicine project.

4.4. Medical staff that used telemedicine

Descriptive statistics were also used to determine the categories of medical staff that used telemedicine. The results were analyzed and interpreted using percentages as seen in figure 4.

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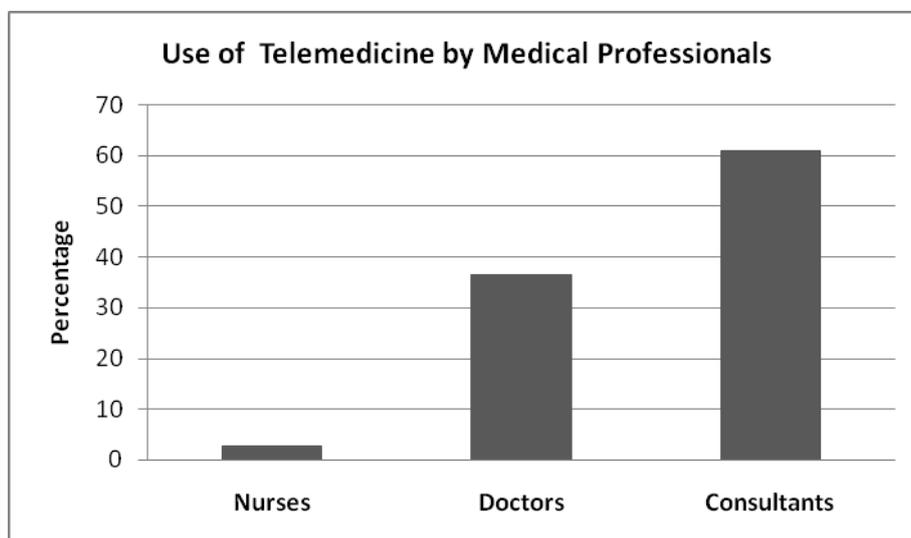


Figure 4: Medical staffs that use telemedicine [Source: Primary Data]

Results in Figure 4 indicate that consultants constituted majority users of telemedicine (61.0%). This was followed by doctors who constituted 36.3% and lastly the nurses, constituting only 2.7%.

4.5. Most applicable telemedicine technology

Descriptive statistics were used to determine the most applicable telemedicine technology in Uganda. The results were analyzed and interpreted basing on the scale ordered with mean values which represented the following: 5-strong agreement, 4-agreement, and 3-not sure, 2-disagreement and 1-strong disagreement.

Results in Table 3 and Figure 5 show that video conferencing where there is instant video communication was found to be the most applicable telemedicine technology (Mean=4.31), followed by television programmes for broadcasting medical information (Mean=4.28). The e-mail used for the exchange of text and pictures had a mean of 4.16. Respondents were undecided as to whether radio programmes were an appropriate technology for broadcasting medical information (Mean=3.25) and whether mobile phones were an appropriate technology for audio information exchange (Mean=3.19).

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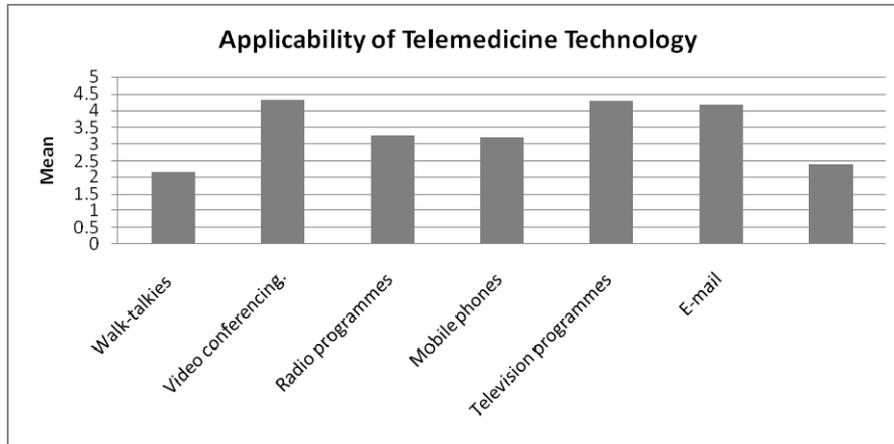


Figure 5: Applicability of Telemedicine Technology

Table 3: Most applicable telemedicine technology

Telemedicine technology	Applicability	Min	Max	Mean
Walk-talkies	Extension of healthcare in rural areas	1	5	2.16
Video conferencing	Availability of video communication	1	5	4.31
Radio programmes	Broadcasting medical information	1	5	3.25
Mobile phones	Exchange of Audio information	1	5	3.19
Television programmes	Broadcasting medical information	1	5	4.28
E-mail	Transmission of text and pictures	1	5	4.16
Using Short Messages (SMS)	Transmission of text messages	1	5	2.40

Source: Primary Data transmit

Respondents disagreed as to whether walk-talkies could be used to extend healthcare in rural areas (Mean=2.16), as well as using Short Message Services (SMS) to send text messages (Mean=2.40). These two telemedicine technologies therefore, have not been widely employed in extending healthcare services in the Ugandan context.

4.6. Factors affecting Telemedicine in Uganda

Descriptive statistics were used to examine the factors affecting Telemedicine Information Systems adoption, implementation and sustainability in Uganda. The results were analyzed and interpreted basing on the scale which was ordered with mean

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values which represented the following: 5-strong agreement, 4- agreement, and 3-neutral, 2-disagreement and 1-strong disagreement.

Table 4: Factors affecting Telemedicine in Uganda

Challenges	N	Min	Max	Mean
Resistance to change by members of staff	146	1	5	4.11
Lack of telemedicine skilled staff in this hospital	146	1	5	4.35
Lack of training support for staff training in telemedicine	146	1	5	4.16
Lack of computers and software for implementing telemedicine	146	1	5	3.33
Lack of policies and guidelines for using telemedicine in the hospital.	146	1	5	4.14
Lack of support for telemedicine by government in the hospital	146	1	5	3.24
Lack of private sector support for telemedicine in the hospital	146	1	5	2.76
High costs of telecommunication services	146	1	5	2.92
Lack of laws protecting telemedicine practitioners in hospitals	146	1	5	3.71
Clients are not free in using telemedicine because of fear of sharing their private information with strangers.	146	1	5	3.58
Clients lack knowledge about telemedicine	146	1	5	3.73
Clients can not afford using telemedicine	146	1	5	3.09
Hospitals lack resources for implementing telemedicine projects	146	1	5	2.45
Valid N (listwise)	146			

Source: Primary Data

Results in Table 4 indicate that most respondents agreed that there was lack of telemedicine skilled staff in their hospitals (Mean=4.35), the hospitals did not support staff training in telemedicine (Mean=4.16), there was no policy and guidelines for using telemedicine in the hospitals (Mean=4.14) and that there was resistance to change by members of staff (Mean=4.11). The respondents also agreed that other factors that significantly hindered telemedicine adoption, implementation and sustainability were lack of knowledge about telemedicine by their clients (Mean=3.73), lack of laws protecting telemedicine users (Mean=3.71), clients' fear of exposing their confidential information (Mean=3.58). The respondents were uncertain on whether the hospitals lacked computers and software for implementing telemedicine (Mean=3.33), the government had not supported telemedicine in the hospitals (3.24) and that their clients could not afford using telemedicine (Mean=3.09).

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However, the respondents disagreed that the cost of telecommunication services was so high (Mean=2.92), there was no private sector support for telemedicine in the hospitals (Mean=2.76) and also disagreed that their hospitals lacked resources for implementing telemedicine projects (Mean=2.45).

4.7. Knowledge as a Challenge to Telemedicine Adoption

Descriptive statistics were also used to determine the respondents' knowledge of telemedicine. The results were analyzed and interpreted basing on the scale which was ordered with mean values which represented the following: 5-very knowledgeable, 4-knowledgeable, and 3-neutral, 2-somewhat knowledgeable and 1-not knowledgeable.

Table 5: Knowledge of Telemedicine

Knowledge	F	%	Valid Percent	Cumulative Percent
Not knowledgeable	60	41.1	41.1	41.1
Somewhat knowledgeable	31	21.2	21.2	62.3
Neutral	32	21.9	21.9	84.2
Knowledgeable	16	11.0	11.0	95.2
Very knowledgeable	7	4.8	4.8	100.0
Total	146	100.0	100.0	

Source: Primary Data

The results in tables 5 show that most of the participants in the study (41.1%) were not knowledgeable about telemedicine while only 11.0% were knowledgeable about telemedicine. 21.9% of the respondents expressed uncertainty as to whether they were knowledgeable about telemedicine. 21.2% of respondents were somewhat knowledgeable while only 4.8% of the respondents were very knowledgeable about telemedicine.

4.8. Requirements for Improving Telemedicine in Uganda

Descriptive statistics were also used to determine the requirements for improving Telemedicine Information Systems adoption, implementation and sustainability in Uganda. The results were analyzed and interpreted basing on the scale which was ordered with mean values which represented the following: 5-strong agreement, 4-agreement, and 3-neutral, 2-disagreement and 1-strong disagreement.

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Table 6: Requirements for improving Telemedicine IS in Uganda

Requirement	N	Min	Max	Mean
Sensitization programs to enable staff embrace changes in technology	146	1	5	4.14
Training for hospital staff in ICTs and telemedicine	146	1	5	4.57
Computers and software for implementing telemedicine in hospitals	146	1	5	4.55
Policies and guidelines for using telemedicine in hospitals.	146	1	5	3.99
Government support for telemedicine projects in hospitals	146	1	5	3.77
Public-private partnerships for successful telemedicine in this hospital	146	1	5	3.88
Affordable cost of telecommunication services	146	1	5	4.08
Formation of laws to guide and protect telemedicine practitioners in the country	146	1	5	4.27
Security and confidentiality of clients data	146	2	5	4.42
Sensitization of clients concerning the benefits of telemedicine	146	1	5	4.23
Free provision of telemedicine services by government hospitals	146	1	5	3.63

Source: Primary Data

Results in Table 6 indicate that the respondents strongly agreed that hospitals should provide training for staff in ICTs and telemedicine (Mean=4.57). The respondents also indicated that hospitals should buy computers and software for implementing telemedicine (Mean=4.55). The respondents agreed that there should be security for clients' data to improve confidentiality (Mean=4.42) and that parliament should enact laws to guide and protect telemedicine practitioners in the country (Mean=4.27). The respondents also agreed that their clients should be sensitized about telemedicine (Mean=4.23) and that there should be sensitization programs to enable staff embrace changes in technology (Mean=4.14). They further agreed that the cost of telecommunication services should be reduced (Mean=4.08) and also agreed that there should be policies and guidelines for using telemedicine in their hospitals (Mean=3.99). Respondents also agreed that there should be public-private partnerships for successful telemedicine in the hospitals (Mean=3.88). In addition, the respondents agreed that the government should support telemedicine projects in the hospitals (Mean=3.77) and also that telemedicine should be provided for free by government hospitals (Mean=3.63).

4.9. Summary of Findings

The above findings answered our research objectives i.e. we were able to determine the factors that affected telemedicine Information Systems adoption, implementation and sustainability in Uganda and the solutions to those identified challenges. Although there were some discrepancies between our findings and literature, especially on the

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challenges, the findings generally were inline with literature on the suggested requirements for sustainable telemedicine in Uganda.

5. Discussion of Findings

To understand the current state of telemedicine, parameters such as knowledge (Davis *et al.* 1989; Rogers and Shoemaker, 1973), challenges faced and the requirements for improved adoption, implementation and sustainability of telemedicine IS in Uganda were used. The following is a discussion of findings in relation to literature:

5.1. Knowledge

Results in table 5 indicated that most respondents were not knowledgeable about telemedicine (41.1%). This means that they were unlikely to adopt the technology as Rogers and Shoemaker (1973) urge that when users are not knowledgeable, they tend to reject the technology. Further to this, Davis *et al.* (1989) urge that knowledge increases perceived ease of use of a technology, thereby changing people's attitudes towards the technology and hence actual usage or adoption. These ideas are actually re-affirmed by results in table 4, in which respondents indicated that there was lack of skilled staff. The failure for staff to embrace changes in technology (see table 4) may be a manifestation of lack of knowledge about the technology, thereby re-affirming Davis *et al.* (1989) and Rogers and Shoemaker (1973) assertion that knowledge played a key role in technology/innovation adoption.

5.2. Challenges

The most hideous challenges for telemedicine adoption, implementation and sustainability in Uganda were identified in table 4 as 1) lack of telemedicine skilled staff (Mean=4.35), 2) inadequate training (Mean=4.16), 3) lack of policy (Mean=4.14) and 4) resistance to change by members of staff (Mean=4.11). All these responses are inline with literature. For example, IDRC (1998), Lucine (2009), Mbarika *et al.* (2007) decried lack of skills, infrastructure and support for implementing telemedicine. Lucine (2009); Meso *et al.* (2009) identified policy as a key factor for sustainable telemedicine. Further to this Nazvia (2011) had identified resources are a big problem for telemedicine sustainability.

However, the respondents disagreed with some challenges. For example they surprisingly, strongly disagreed that their hospitals lacked resources for implementing telemedicine projects (Mean=2.76). This contradicts with Mbarika *et al.* (2007) and Schmidt *et al.* (2008) who urged that resources hindered successful implementation and sustainability of telemedicine in developing countries. Furthermore, the respondents disagreed that the high cost of telecommunication services hindered telemedicine

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implementation and sustainability (Mean=2.92) and also that there was no private sector support for telemedicine in their hospitals (Mean=2.76). In fact the systems in place at Nsambya hospital had been set up by a private donor. The following response from an interview with one of the administrators at Nsambya hospital clearly indicates that these hospitals obtained support from private organization/donors:

“...our doctors identified the need for telemedicine and approached management for action. The project was started with help from our partners, St. Raphael Hospital in Millan in Italy. The project worked well until when St. Raphael Hospital withdrew their support. We have since failed to sustain it.”

5.3. Requirements for sustainable telemedicine IS in Uganda

Other than collecting only the factors affecting telemedicine IS adoption, implementation and sustainability, we went ahead and specifically tasked our respondents to suggest solutions to the challenges. We analyzed the solutions. These solutions are the ones we present as requirements for improved telemedicine in Uganda. From the analysis in table 6, our respondents indicated that they needed training (Mean=4.57), computer hardware and software (Mean=4.55), security for clients data and improved confidentiality (Mean=4.42), telemedicine policy and laws (Mean=4.27), sensitization of clients (Mean=4.23), sensitization for staff to embrace changes in technology (Mean=4.14) and reduced cost of telecommunication services (Mean=4.08). They also suggested that there was need for public-private partnerships (Mean=3.88), government support (Mean=3.77) and that Telemedicine should be provided for free by government hospitals (Mean=3.63).

The above requirements classified under knowledge and usability, policy and infrastructural as suggested by the respondents e.g. training, sensitization, infrastructure, policy all concur with literature although the scholars had urged them out differently under different circumstance (see Rogers and Shoemaker (1973), Davis et al. (1989), IDRC (1998), Lucine (2009), Mbarika *et al.* (2007)).

5.4. Limitations of the Study

The impression we got from our field study was that most of our respondents were not aware about telemedicine. Only a few (mainly those doctors with a postgraduate qualification and those occupying management positions) exhibited a clear knowledge and understanding of telemedicine. Some nurses exhibited a total lack of knowledge about these technologies and most of them had never used telemedicine at all. The doctors who knew about the technology had learnt of it on their postgraduate programmes while a few, especially consultants had used and were using the technology in their daily work life. Based on this experience therefore, it was difficult to collect accurate and relevant data as we had to first enlighten our respondents about

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the subject matter before they answered our questions. For example a number of returned questionnaires were incomplete. This study was also theoretical in nature and did not come up with a practical solution such as a framework for designing and implementing sustainable telemedicine information systems. More over this framework could be tested on site to ensure that the requirements suggested herein constitute a practical workable solution. We did not do this because of limited time. It is therefore premised on these challenges that our findings may have a certain degree of error. However, we tried our best to eliminate the errors. For example we personally administered the questionnaires and where possible, we explained to the respondents why we were carrying out the study and also explained the technological terms for their understanding. Our questionnaire was designed using simple English for clarity and easy understanding by none IT respondents. Further more, we carried out data validation, reliability as seen in table 2 and data cleaning by removing out all those questionnaires that were incomplete and inconsistent before we did the analysis.

6. Conclusion and Future Work

This study is one bold step towards understanding why telemedicine information systems in Uganda fail. It has given a hint on the way forward for sustainable telemedicine in Uganda. For instance the problems hindering telemedicine adoption have been identified. The requirements for sustainable adoption of telemedicine have also been listed. However, due to the above highlighted limitations, we recommend that another study be carried out to develop a framework for designing and implementing sustainable telemedicine information systems in Uganda using the listed requirements (see table 6). This framework should identify key telemedicine stakeholders and tasks that they should perform in a logically iterative manner for sustainable telemedicine in Uganda.

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References

- [1] Abrahams Fortuin, J. & Molefi, M. (2006/2007). Implementing Telemedicine in South Africa "A South African Experience". *International Hospital Federation Reference Book*, 1380-1381.
- [2] Adler Ari T. (2000). A Cost-Effective Portable Telemedicine Kit for Use in Developing Countries. *Massachusetts Institute of Technology*
- [3] Aguti Jessica Norah (2002). Facing up to the challenge of Universal Primary Education, (UPE) in Uganda through Distance Teacher Education Programmes. A paper presented at Pan Commonwealth Forum on Open Learning: *Open Learning. Transforming Education for Development*
- [4] Carcary, M. (2008). The Evaluation of ICT Investment Performance in terms of its Functional Deployment, A Study of Organizational Ability to Leverage Advantage from the Banner MIS in Institutes of Technology in Ireland, *Limerick Institute of Technology*.
- [5] Davis, F. D. (1993). User acceptance of information technology: system characteristics, user perceptions and behavioural impacts. *International Journal of Man-Machine Studies*, 138, 475-487.
- [6] Davis, F. D., Bagozzi, R.P., & Warshaw, P.R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 35, 982-1003.
- [7] Davis, F. D. & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model: three experiments. *International Journal of Human-Computer Studies*, 145, 19-45.
- [8] Della MV (2005). Pererecorded Telemedicine. *J Telemed Telecare 2005: 276-284*
- [9] Ekeland, A. G., Bowes, A., & Flottorp, S. (2010). Effectiveness of telemedicine: A systematic review of reviews. *International Journal of Medical Informatics*, 79(11), 736-771.
- [10] Hersh William R, David H. Hickam, Susan M. Severance, Tracy L. Dana, Kathryn Pyle Krages and Mark Helfand (2006). Telemedicine for the Medicare Population: Update. Evidence Report/Technology Assessment, *Agency for Healthcare Research and Quality*
- [11] IDRC (1998). National Information and Informatics Policies in Africa. *Proceedings of IDRC Regional Seminar*. Addis Ababa, Ethiopia, November, 1998. *International Development Research Centre*.
- [12] Janssens W., Wijnen, K., Pelssacker, P. D. & Kenhove, P. V. (2008), Marketing Research with SPSS, *Prentice Hall*.
- [13] Khan Al-Sakib Pathan, Humayun Kadir Islam, Sabit Anjum Sayeed, Farruk Ahmed, Choong Seon Hong (2006). A Framework for Providing E-Services to the Rural Areas using Wireless Ad Hoc and Sensor Networks. *IEEE ICNEWS*
- [14] Krishnaveni R. and Deepa Ranganath (2011). Development and Validation of an Instrument for measuring the Emotional Intelligence of Individuals in the Work Environment – In the Indian Context. *The International Journal of Educational and Psychological Assessment*
- [15] Kohut Andrew, Richard Wike and Juliana Menasce Horowitz (2007). World Publics Welcome Global Trade But not Immigration; 47-Nation Pew Global Attitudes Survey. *Pew Research Center*
- [16] Lucine Edwards (2009). Notes of a ten-minute oral presentation on telemedicine in St. Vincent and the Grenadines. The CARICOM Minister Summit. *Lloyd Erskine Sandiford Centre in Barbados*.
- [17] Mbarika Victor, Martin Okello, Oryema JOHNSON, and Richard Boateng (2007). Telemedicine in Uganda. *The International Center for Information Technology and Development*.
- [18] McClure David P., (2007) e-Health and America's Broadband Networks An Examination of How Broadband Services Enhance Health Care In America, *A publication of US Internet Industry Association, August 14, 2007*
- [19] Meso Peter, Victor W. A. Mbarika, and Sanjay Prakash Sood (2009). An Overview of Potential Factors for Effective Telemedicine Transfer to Sub-Saharan Africa. *IEEE, VOL. 13, NO. 5*,
- [20] Mishra S.K., (2007), "'E' for Excellence; 'e' for Health", *eHealth Vol. 2 No.1, pp. 36-37, January 2007*
- [21] Mugenyi Possy (2007). Health care in Uganda: Challenges and opportunities. OHSU Seminar proceedings of Feb., 2007. *McGill University*.
- [22] Oladosu J. B., Ajala A. F., and Popoola O.O. (2009a). On The Use of Web Services Technology In E-Health Applications, *Journal of Theoretical and Applied Information Technology*
- [23] Oladosu John B., Sunday. O. Ojo and Mathew O. Adigun (2009b). Framework for a Context-Aware Mobile E-health Service Discovery Infrastructure for Rural/Suburban Healthcare. *Journal of Theoretical and Applied Information Technology. Vol6. No1. (pp 081 - 091)*
- [24] Olugbemiga L Abodunrin and Tanimowo M Akande (2009). Knowledge and Perception of e-Health and Telemedicine among Health Professionals in LAUTECH Teaching Hospital, Osogbo, Nigeria. *International Journal of Health Research*

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- [25] Saha, P. (2008). Government e-Service Delivery: Identification of Success Factors from Citizens' Perspective, Doctoral Thesis.
- [26] Saroj Mishra, K. Ganapathy and Baljit Singh Bedi (2008). The Current Status of eHealth Initiatives in India. *The ehealth connection*.
- [27] Saroj Mishra and Indra Pratap Singh (2008). mHealth: A Developing Country Perspective. *The eHealth Connection*.
- [28] Schmidt N-H, Koray Ereke, Lutz M. Kolbe and Rüdiger Zarnekow (2008). Towards a Procedural Model for Sustainable Information Systems Management, *Universität Göttingen*
- [29] Treurnicht Miekie (2009). A decision Support Framework for Telemedicine implementation in the developing world. *Stellenbosch University, South Africa*
- [30] WHO (2007). Global Summary of The HIV/AIDS Epidemic. *United Nations*.
- [31] Zlatko Stapić, Neven Vrček, Goran Hajdin (2007). Legislative Framework for Telemedicine. Faculty of Organization and Informatics, *University of Zagreb*.