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Expected Challenges to Implement Telemedicine Service in Public Hospitals of Bangladesh

By Alif İbn HAKIM †

Abstract. Bangladesh is a developing country where providing sufficient and affordable health-care is a challenge due to the high population density and poor healthcare infrastructure. Considering this reality, the Government of Bangladesh is going to implement telemedicine in public hospitals of Bangladesh. In order to introduce telemedicine in public hospitals in Bangladesh itis important to identify and address issues and challenges that may affect successful implementation. So, the aim of our project was to identify the challenges to implement telemedicine in public hospitals of Bangladesh. A Qualitative exploratory research approach has been used to conduct the study. The model of Khalifehsoltani & Gerami (2010) was used to investigate the six areas of expected challenges to implement telemedicine in public hospitals of Bangladesh in our study. After analysing the collected data in the light of a conceptual mode it was found that the expected challenges to implement telemedicine in public hospitals of Bangladesh are related to a lack of sufficient funds, the anxieties of patients about telemedicine, the lack of widespread and continuous education for public use of e-health services, a weakness of the software to deal with increasing workloads, shortage of technologically skilled manpower, the lack of a comprehensive legal framework about telemedicine, lack of telemedicine related policy and lack of telecommunication network in some areas of the country. Before being able to successfully implement the telemedicine project in public hospitals the government of Bangladesh needs to take some serious initiatives to solve these challenges.
Keywords. E-health, Telemedicine, Challenges, Implement, Public hospitals.
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1. Introduction

E-health is a very important aspect of e-Government because e-health is the use of information and communication technology, especially the internet, to improve or enable health and healthcare. E-health resources can help to improve health status, reduce healthcare costs and empower people. Besides this, E-Health resources contribute to enhance clinical care and services as well as reduce health disparities (Joshi & Kalshetti, 2005).

E-health is a vast topic. For the hospital care setting e-health refers to electronic patient administration systems; laboratory and radiology information systems; electronic messaging systems; and telemedicine which includes teleconsultations, telepathology, teledermatology etc. In case of the home care setting examples include teleconsultations and remote vital signs monitoring systems used for diabetes medicine, asthma monitoring and home dialysis systems. For the primary

† University of Adelaire, 2/99 Montague Road, Pooraka, 5095, South Australia.
. +610415906792
. alifdu_20@yahoo.com

care setting, e-health can refer to the use of computer systems by general practitioners and pharmacists for patient management, medical records and electronic prescribing (Health Ministry of Canada, 2012). Telemedicine which is part of e-health is our research area.

1.1. Telemedicine: Definition & Concept

According to Wootton et. al (2006, p4) "Telemedicine is the delivery of health care and the exchange of health-care information across distances. The prefix `Tele´ derives from the Greek for 'at a distance'; hence, more simply, telemedicine is medicine at a distance. As such, it encompasses the whole range of medical activities including diagnosis, treatment and prevention of disease, continuing education of healthcare providers and consumers, as well as research and evaluation".

According to Bowonder (2005), "telemedicine has the potential to revolutionize the whole of the health care industry by 1- building bridges between clinicians and patients to overcome the barriers of distance and time; 2- developing virtual communities that interact and share knowledge; 3- improving access to healthcare in remote or isolated areas; 4- enhancing continuity of care. Telemedicine has three generic applications, namely: 1- Clinical applications; Administrative applications; 3- Educational applications.

Clinical applications include handling urgent consultations, scheduled consultations, remote visits of patients and the video reviews of certain studies done in advance. Administrative applications cover telemedicine systems for promoting and accelerating the replication, update and transfer of clinical information including medical records, examination data and financial information. Educational applications include applications that facilitate the process of sharing the material available for teaching and examination purposes in the medical field.

Interesting cases from a conference room, auditorium and teleconference to physicians and residents scattered throughout the network are presented using this technology. Besides this, Telemedicine has a number of benefits, namely: 1- reducing the cost of service delivery; 2- easy and quick access to the specialist; 3- cost- effective post-treatment consultation; 4- travel time reduction; 5- enhanced quality and efficiency" (p. 451-452).

1.1.1. Existing Status of Telemedicine and ICT in Bangladesh

Telemedicine services have now been established in eight public hospitals (two tertiary hospitals, three district hospitals and three upazilla hospitals) of Bangladesh equipped with high quality video conferencing devices. The prime minister of Bangladesh formally inaugurated the telemedicine service in July 2011. To further expand the Telemedicine service in all public hospitals MIS (Management Information System) health has also provided web cameras to all upazilla hospitals. Besides this, with a view to expand Telemedicine service to remote rural areas of Bangladesh the government has instigated a project named MIS-Health and Community Clinics. For this purpose it has been planned to provide mini-laptops and /or mobile devices to the community clinics for health workers to use to help citizens (patients) consult upazilla hospital doctors by video-conferencing (Director General of Health Service, 2012)

Besides this, "the success of Telemedicine depends on the improvement of information and communication infrastructure structure. The Telecommunication sector in Bangladesh has undergone a huge boom in last few years. A wide range of private and public telecommunication operators has established their networks all over the country. As they are expanding their operations to the most rural areas, they are also working to improve the network performance and introduce the latest technologies to the people.

Bangladesh is the first optical fibre network user in Asia. It established 1800 km

optical fibre network for Bangladesh Railways in 1986 along with the installation of digital switching. Bangladesh Telegraph and Telephone Board (BTTB) have also established optical fibre links in most cities. SEA. MEWE-4 is a Submarine cable consortium connecting a total of 14 countries at 16 landing stations. To connect the whole country with this submarine cable, different activities have been undertaken" (Nessa et al., 2010, p. 140-141).

1.1.2. Importance of Identifying Challenges of Telemedicine

Before selecting our research topic we collected some literature which addressed Telemedicine related issues of Bangladesh. For example, Shahid & Khan (2011) did research about Electronic Health Records (EHRS) which is a technical part of Telemedicine. In their paper they addressed the challenges related to issues of Electronic Health Records of Telemedicine. Besides this, Nessa et al. (2010) made a study of Telemedicine of Bangladesh. They highlighted the existing status and future prospects of Telemedicine of Bangladesh. However, nobody has performed a holistic study about challenges related to issues of Telemedicine in Bangladesh. As the government of Bangladesh is implementing the Telemedicine project in all public hospitals and there has been no research on the challenges facing this implementation, we have chosen the challenges related to the issue of Telemedicine as our research area.

Besides this, in order to introduce Telemedicine in all public hospitals in Bangladesh it is important to identify and address issues and challenges that may affect successful implementation. In our study the term 'challenge' implies problems and barriers to the implementation of Telemedicine and implementation implies 'adoption' and 'usage'. The identification is important, as despite many benefits of Telemedicine in general, if the planned benefits and goals from the particular implemented system are not achieved or do not seem to have been achieved the value of the system or future systems may be questioned (WHO, 2006) and any ideas and any ideas of implementation of similar or different systems in the future would face bigger challenges at various levels.

However, many European, as well as North American, countries have lagged behind in implementing e-health. Only 29% of primary care physicians in the European Union have implemented EHRs as part of e-health in 2001 and less than 17% of primary care physicians commonly use EHRs as part of e-health in their daily practices (Harris Interactive news, 2002). If this is the situation in developed countries for implementing EHRS which is just part of a holistic e-health project where resources are available, it is essential to consider this issue from the perspective of developing countries like Bangladesh where computers are a luxury and E-health is still a new concept. (as cited in Shahid, & Khan 2011).

So the aim and objective of this research is to identify the challenges to implementing Telemedicine in public hospitals of Bangladesh.

1.2. Research context

Bangladesh is a developing country where providing sufficient and affordable health-care is a big challenge due to the high population density and poor healthcare infrastructure (Mostafa et al., 2010). Besides this, more than 75% of the population lives in rural areas (Pocketbook, 2009) and 40% of the whole population live below the poverty line (CIA World Fact Book, 2010). The health status of this land is not very promising. The reality is that there are no specialist physicians in most districts and upazilla level hospitals yet and almost all citizens (patients) come to doctors without any previous health record. It is true that roads and highways of this country are under-developed, but they are well covered by Telecom networks and this is rapidly growing. A review of the available Telemedicine devices and the existing communication networks in Bangladesh shows a bright future for flourishing Telemedicine service facilities (Mostafa et al.,

2010). The rapid dissemination of communication tools, mobile, or wireless, even in the remotest parts of Bangladesh, has created the opportunity to decentralize operations and centralize the planning process (Zakir, 2009). It is a fact that the citizens need better and modernized medical services. Bangladesh is a place where there is a crying need to implement a Telemedicine service (as cited in Shahid & Khan, 2011), so it is important to investigate the challenges related to issues in implementing a Telemedicine service in public hospitals of Bangladesh. Therefore, we formulated the following research question:

2. Literature Review

The World Health Organization (WHO, 2009) has defined Telemedicine as,

> the delivery of health care services, where distance is a critical factor, by healthcare professionals using ICTs for the exchange of vital information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interest of advancing the health of individuals and their communities.

The Norwegian Centre for Integrated Care and Telemedicine (NST) has been using the following definition:

> Telemedicine is the investigation, monitoring and management of patients and the education of patients and staff using systems which allow ready access to expert advice and patient information no matter where the patient or relevant information is located, (As cited in Piya, 2010, p.12).

We found the following information about our research area through a literature review: The vast start up cost, as well as patients' privacy and safety is a big challenge to implement a Telemedicine service in public hospitals in Bangladesh (Kalam, 2010). Besides this, there is the financial constraint preventing the purchase of an appropriate number and type of ICT equipment, the unavailability of an adequate number of computer literate personnel to implement e-health, weak internet backbone and high internet access cost are some challenges (Commonwealth Health Ministers book, 2008).

Moreover, According to Bowonder (2005) confidentiality in the transfer of electronic medical records is of prime concern in Telemedicine service. There exists a question mark on the adequacy and accuracy of electronically transmitted data for establishing a correct diagnosis if, due to technical malfunction, the patient's data are not transferred correctly, e.g image degradation in an echocardiogram or in a histopathology slide that will alter the diagnosis. Who will be responsible-the attending physician, the hospital, the manufacturer or distributor of the equipment, or the telecommunication department?

Internet connection is slow, expensive and limited, and mainly confined to major cities only. Rural penetration is almost negligible (Piya, 2010). E-health has a number of challenges to overcome before it can be integrated into the overall fabric of health care. They can be broadly categorized as technical, knowledge, organizational, regulatory and policy related and social (Ganesh, 2004).

Technical and operational challenges- losing and missing electric health record, weakness of software with increasing workloads. Social and cultural challenges-lack of widespread and continuous education for public use of e-health service, Disbelief of people in this new service. Financial challenge- lack of framework for economic analysis of benefits and the results of remote health control. Lack of consideration of financial and operative situations of each of the host countries, separately. Legal challenge- lack of government's ratified laws, lack of existing suitable laws regarding personal rights and keeping patients' private surroundings.

Policy related challenges-lack of comprehensive and national strategies regarding electronic health, lack of management and health officer's knowledge

about the need for electronic health service (Khalifehsoltani, & Gerami, 2010).

With a view to choose an appropriate conceptual model for our research we reviewed the literature but we did not discover any paper or article using a suitable model to apply to our research area precisely except Khalifehsoltani & Gerami's (2010) paper. We selected Khalifehsoltani & Gerami's (2010)'s Model of E-health Challenges in Developing countries. Using this model they identified six areas of e-health challenges in developing countries. As Bangladesh is one of the developing countries and the challenges related to issues of all developing countries are similar, for this reason we have taken this model as the conceptual framework for our problem area.

Khalifehsoltani & Gerami's (2010)'s Model of e-health Challenges in Developing countries shows six areas of e-health challenges in developing countries namely:

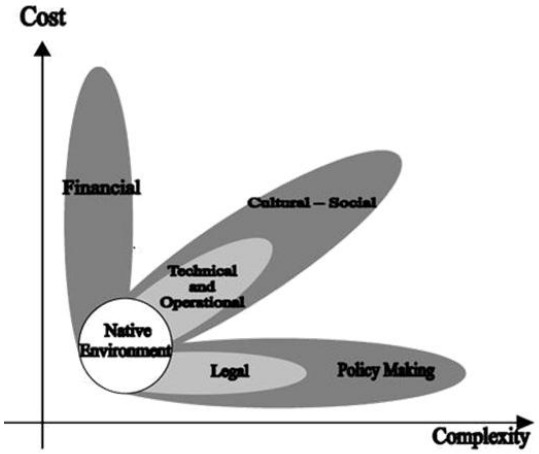

Figure 1. *Model of E-Health Challenges in Bangladesh.(Khalifehsoltani, & Gerami,2010).*

Financial challenges: Lack of framework for economic analysis of benefits and the results of remote health control, lack of consideration of financial and operative situations of each of the host countries, separately. Costs and capability of mass production of equipment for the public usage. Social and cultural challenges: Lack of widespread and continuous education for public use of e-health services, cultural limitations against executing e-health services, inadequate knowledge level of people with regards to using e-health services, Disbelief of people in new service

Technological Challenges: Lack of proper framework for information quality characteristics, needing suitable medical equipment, losing and missing electronic health records, weakness of software with increasing work.

Legal Challenges: Lack of government's ratified laws, lack of existing suitable laws regarding personal rights and keeping patient's private surroundings, Lack of accepted method for solving discrepancies between clients and contractors.

Policy related challenges: Lack of comprehensive and national strategies regarding electronic health, lack of management and health officials' knowledge about the need for electronic health services. Native environment challenges: Lack of proper coverage of various regions in using medical equipment, lack of equipping service centers, both quantitatively and qualitatively.

3. Methodology

We used a qualitative exploratory research approach to conduct the research because qualitative data have been collected through using open ended questions in our study**.** For this qualitative exploratory case study, we collected data primarily

conducting semi- structured interviews with the representatives of stakeholders. Besides this, we reviewed the existing literature on our research area.

3.1. Data Collection

We used the Electronic Library Information Navigator ELIN@ Orebro, Google scholar and Google search engine with a view to getting updated and relevant fresh papers for our research area. We used the search terms (e-health, e-health and telemedicine, e-health in Bangladesh/ South Asian combination with challenges, problems, obstacles and all words were used in different combinations). The result was successful.

We initially selected papers based on title and abstract. We took into consideration about 120 papers from that heap of documents for our research area. We finally selected the papers which are shown in the reference list. However, the rest of the literature was excluded based on the following factors:

1. They were not addressing our research area properly.
2. They were very technical.

Besides this, it should be mentioned here that at first we selected the Bangladesh based literature which covered our research area then with a view to get more accurate information on our research area we selected the documents involving India and Nepal, including developing countries.

Moreover, we chose a semi-structured interview approach as the main method of data collection because interviews can produce better data when a researcher wants to obtain detailed information about the research area, and explore emotions, experiences, or feelings that cannot be easily observed (Oates, 2006). Besides this, an interview is an excellent means of qualitative research to deal with topics in depth and in detail. Moreover, the interview method needs relatively little equipment and in this method the researcher can check the informant is the appropriate person to be answering the question. Considering these issues, we chose the interview as the main method of data collection.

Selection of interviewee is an important aspect of the interview based qualitative research method. Oates (2006) suggested checking the background information of interviewees because it can highlight issues which the researchers want to raise with the interviewee and help to assess the accuracy of some of the information given by the interviewee. We chose five stakeholders who are shown in Table 1 with a view to collect data through interviews.

Table 1. *List of Stakeholders*

No	Stakeholder(Representative)	Workplace	Way of communication
1	Doctor	NIDCH, BTA	Mobile & e-mail
2.	Technologist	UHC	Mobile & e-mail
3.	Government Official	NIPORT	Mobile & e-mail
4.	User (who get Telemedicine service)	Lecturer, DIU	Mobile, skype & email
5	Non-User (who don't get Telemedicine service but know about this service)01	Lecture, DU	Skype

We divided the stakeholders into five groups in our research such as, Doctors, Government officials, Technologist, user and non-user. Then we contacted the citizens of each group of stakeholder through internet and mobile phone. Some of our friends of Bangladesh helped us providing the personal mobile phone numbers and e-mail address of the stakeholders. Besides this, we collected some e-mail address of the stakeholders from the government official website where they work. From each group of stakeholders we selected one person as representative of that group and interviewed them because it was really difficult to convince more

citizens of each stakeholder to participate. We requested some higher government officials and high profile politicians for interview but they did not show any interest. However, we were able to convince some citizens to be interviewed.

We selected one person as representative of each stakeholder in our study because we could not manage more member of each stakeholder who have Telemedicine related knowledge and experience. However, all representatives of our study except user and non-user are involved in the Telemedicine project of government directly or indirectly. The doctor as a representative of stakeholder is general secretary of Bangladesh Telemedicine Association and consults patients through the Telemedicine service. Besides this, the government official as the representative of stakeholders is a high official in the NIPORT who is involved with the Telemedicine project of the government. Moreover, the technologist as the representative of stakeholder is a government medical officer and responsible for technical aspects of Digital Health in Sub-national health facilities of Bangladesh. Furthermore, the user is one who has received medical treatment already through the Telemedicine service. He is a teacher at a private university of Bangladesh. In addition, the non-user is a conscious citizen who has good knowledge about health related issues of Bangladesh and he is also a teacher at a public university of Bangladesh.

According to Oates (2006) Interview questions need to be clearly phrased and easily understood, not too long, nor two questions jumbled together, nor full of jargon or academic terms unfamiliar to the interviewees. He also suggested asking open rather than closed questions (p.192). In order to answer the research question we designed some questions for interview purposes which are easily comprehensible, not too long, and free from jargon and familiar to the interviewees. These have been added as an appendix (Appendix 1).

Practical organization of the data collection session is one of the important aspects of interview based qualitative research approach. According to Oates (2006), the interviewer needs to obtain agreement from the interviewee. He must tell the interviewee the purpose of the interview and the likely duration. Regarding time management there is a good quotation "Do not take up too much of your interviewee".

We communicated with the representatives of all stakeholders through mobile phone and e-mail and we discussed the details about the purpose of the interview. After hearing everything they gave us their consent. We conducted the interview with the representatives of all stakeholders initially through Skype and mobile phone but sometimes we experienced communication problems then we sent the questionnaire to them via e-mail.

According to Oates (2006), the interviewer should take his interview notes or the transcript back to the interviewee for checking. This allows the interviewee to confirm that any facts are correct and that what was said was what was really meant (p.194). We sent the interview information to all the representatives of the stakeholders through e-mail to ensure the ethical aspect of the research and after their final approval we used the interview based information for our research purpose.

3.2. Data Analyses

After collecting the data using a semi-structure interview approach according to the conceptual framework we inserted all relevant data in the form of a table which is shown in the result and discussion section under the name of Table 2. Besides this, to properly interpret the data which have been collected from the representative of each stakeholder we designed five additional tables each of which consists of two columns. According to our conceptual framework the six areas of challenge related issues are on the left side and the questions relating to the six

areas have been inserted on the right side of each table. All these tables have been added in Appendix 3.

4. Results &Discussion

4.1. Financial Challenges

Telemedicine is an expensive project. Implementation of a reasonable Telemedicine infrastructure in all public hospitals of Bangladesh would require a large number of computers and ICT equipment, software, computer-literate staff, troubleshooting technicians, internet costs, etc. From Table 2,we can see that lack of enough funds is a big challenge to implement Telemedicine in all public hospitals of Bangladesh reported by the government official. He also added that government needs to borrow funds from international financial institutes like World Bank or Asian Development Bank (ADB) to implement such a type of project in all public hospitals of Bangladesh. The opinion of doctors and technologists about the financial challenges to implement Telemedicine in all public hospitals in Bangladesh is almost the same. Sufficient budget deficiency and financial scarcity were mentioned by doctors and technologists, respectively, as a financial challenge. Besides this, users said that it is expensive to get treatment from Telemedicine. He gave the Telemedicine consultant 10000 BDT just for one time consultation. Furthermore, the non-user as a conscious citizen reported that the government has a shortage of sufficient funds to implement this type of project in all public hospitals in Bangladesh.

The government should take some innovative initiative to raise the funds for the Telemedicine project. For example, making a public limited company of the Telemedicine project could help the government raise the required funds from the stock market of Bangladesh.

4.2. Social and Cultural Challenges:

Cultural development is a process in which the change of citizens' viewpoints leads to the change of behaviors. In order to make the citizens of Bangladesh understand about the effectiveness of Telemedicine the government should show propaganda through mass media, i.e. Television, Radio, Newspapers etc. because Telemedicine is a very new concept in Bangladesh.

Table 2. *Selected concepts related to each stakeholder*

Stakeholder	Financial	Cultural/Social	Technological – operational	Legal	Policy making	Native environmental
Doctor	Lack of sufficient funds Huge budget needed	Psychological problem of patients about Telemedicine	Telecommunication system not strong. Problem in internet speed	No complete legal frame-work about Telemedicine	No Telemedicine related policy yet	Problem to cover some areas in using Telemedicine equipment
Technologist	Financial scarcity	Some people are not quite satisfied	Speed of internet is slow Shortage of echno-logically skilled manpower	Lack of explicit cyber law	Government did not make e-health and Telemedicine related policy	Difficult t ensure telemedicine service to some regions particularly coastal areas for want of sufficient telecom network
Government official	Lacking enough funds is big challenge to implement e-health Telemedicine is financially expensive project Government may need to	Rural people may not show interest in this new way of treatment	Need to strengthen telecom network Shortage of Telemedicine related skilled human resources	Need to frame strong cyber law	Government could still not formulate e-health and Telemedicine related policy	Problem to provide Telemedicine service in some areas due to surface communication

	borrow funds from inter-national finance organisations					
User	Expensive	Disbelief of citizens in new services	Very few doctors are skilled in Telemedicine service	If they experience wrong treatment how will they take proper action against doctors	I believe a good policy is essential	Problem to ensure Telemedicine service in coastal area due to bad communication system
Non-user	Government has shortage of funds	Dissatisfaction of citizens of Telemedicine	Internet connectivity is not strong enough Lack of technologically skilled manpower	Need some agreement	Comprehe nsive Telemedici ne policy must be needed	Difficult to provide Telemedicine service to some areas of Bangladesh because of bad communication

It is seen in Table 2 that there is a psychological problem of patients about Telemedicine provided by the doctor. Besides this, some people are not quite satisfied as reported by the technologist. As social and cultural challenges, Government officials reported that rural people may not show interest in this new way of treatment. Furthermore, user and non-user both mentioned that citizens (patients) may not get mental satisfaction in the Telemedicine health service.

Besides this, through the literature review we have come to know that Inadequate knowledge levels of people with regard to using e-health services, disbelief of people in the new service, people's fear with regard to using e-health services, are all difficulties to be overcome (Khalifehsoltani, & Gerami, 2010).

4.3. Technical and Operational Challenges:

Bangladesh government needs to pay attention to the telecommunication sector. Besides this, with a view to run the Telemedicine project properly in all public hospitals of Bangladesh, a department or wing under the leadership of government needs to be created so that Telemedicine related well trained human resources and other ICT based support systems, for instance software, can be developed.

In Table 2, doctors reported that the telecommunication system of Bangladesh is not strong and also mentioned that there is a problem of internet speed in Bangladesh.

Moreover, our telecommunication network needs to be strengthened, as reported by the government official. He also mentioned that we have a shortage of Telemedicine related skilled human resources. The same information about the shortage of skilled human resources in Telemedicine has been provided by the technologist, user and non-user as stakeholder although we notice in Table2 that the presentation of the technologist, user and non-user about this issue is a bit different. They use the term manpower instead of human resource as part of the technological challenge.

Better internet speed, Telemedicine related good software as well as specialized and skillful human resources is a must to run the Telemedicine project properly. From the literature review we can see that, weakness of software with increasing workloads, security and confidentiality in all parts of the project, shortage of specialized and skillful people for development and management of the project are some challenges to implement Telemedicine in all public hospital. (Khalifehsoltani, & Gerami, 2010).

4.4. Legal Challenges

Telemedicine related law is essential to implement Telemedicine in all public

hospitals of Bangladesh. From the literature review and interviews with the representatives of the five stakeholders we identified an important law related issue which is if any citizen, for example, suffers from wrong treatment through Telemedicine, how he will take proper steps against the physician? Because in the Telemedicine service the doctor is invisible/virtual. So before implementing Telemedicine in all public hospitals of Bangladesh the government must frame a holistic Telemedicine related health law so that health professionals and users (citizens) can reach a good solution if any unexpected situation occurs.

We can see from Table 2 that no complete legal framework about Telemedicine has been reported by doctors. The technologist mentioned that lack of explicit cyber law is a legal challenge. Besides this, the government as one of the stakeholders has said that the government needs to frame a strong cyber law on e-health and Telemedicine. If, due to technical malfunction, the patients' data are not transferred correctly, e.g image degradation in an echocardiogram or in a histopathology slide that will alter the diagnosis, who will be responsible-the attending physician, the hospital, the manufacturer or distributor of the equipment, or the telecommunication department? (Bowonder, 2005).

4.5. Policy Making Challenges

Without a holistic policy we cannot imagine a successful project. From the literature review and interviews with the representatives of five stakeholders we have come to know that no Telemedicine related health policy has yet been developed.

If we notice Table 2 we will be able to see that no Telemedicine related policy has been developed yet provided by the doctor. Besides this, government officials mentioned that the government still could not formulate e-health and Telemedicine related policy. Moreover, technologist provided the same opinion like government officials regarding the policy related challenge of e-health (telemedicine) in all public hospitals in Bangladesh. He mentioned that the government has not created an e-health and Telemedicine related policy. Furthermore, good policy is essential and a comprehensive Telemedicine policy must be needed, mentioned by user (patient) and non-user (conscious citizen), respectively.

So, before implementing a Telemedicine service in all public hospitals the government must formulate a Telemedicine related holistic policy consulting with the experts of the domain of the Telemedicine health service. Otherwise, it will be difficult for the government of Bangladesh to see any success of this project.

4.6. Native Environment Challenges

Native environment is an issue to implement Telemedicine in all public hospitals, particularly government hospitals and clinics in remote coastal areas because surface communication between these territories and the mainland is not good. It can be noticed in Table 2 that there are some problems to cover the wide range of areas in using Telemedicine equipment mentioned by the doctor. It is true because, for example, if we take centmartin an island under Chittagong division which is almost detached from the mainland of Bangladesh it will be difficult for the government to set up Telemedicine equipment there. Besides this, some areas of Bangladesh are still out of the telecommunication network. The technologist, as one of the stakeholders, highlighted this issue. He reported that it is difficult to ensure a Telemedicine service to some regions particularly coastal areas for want of sufficient telecommunication network. It is one of the big native environment challenges in Bangladesh to implement Telemedicine service in remote coastal areas.

The main challenges of related issues to implement Telemedicine in all public hospitals of Bangladesh has been shown here in Table 3.

Table 3. *Major Findings of challenge related issues*

Issues	Findings
Financial	Lack of sufficient funds, lack of sustainable funding models, lack of framework for economic analysis
Social & Cultural	Lack of widespread and continuous education for public use of e-health services, inadequate knowledge levels of citizens with regard to using e-health services, disbelief of people in new services, fear of deprivation from medical services, inadequate education and advertisement, lack of national movements and public participation
Technical & Operational	Weakness of software with increasing workloads, losing and missing electronic health records, shortage of specially trained skilled human resource for development and management of project, problem in internet speed, shortage of technologically skilled (Telemedicine) human resources, etc
Legal	No complete legal framework about Telemedicine, lack of existing suitable laws regarding personal rights and keeping patients' private surroundings.
Policy making	Lack of e-health and Telemedicine related policy, lack of comprehensive and national strategies regarding electronic health, and national strategies regarding e-health, lack of scheduling the stable plans of remote health control
Native environment	No telecom network in some areas of Bangladesh and problem of surface communication between some remote coastal areas and mainland

5. Conclusion

The aim of our research was to identify the expected challenges to implement telemedicine in public hospitals of Bangladesh and the research question was: What are the expected challenges to implement Telemedicine in public hospitals of Bangladesh? In order to answer the research question, we followed a qualitative exploratory case study approach. The model of Khalifehsoltani & Gerami (2010) was used to investigate the six areas of expected challenges to implement Telemedicine in public hospitals of Bangladesh in our study. Data were gathered primarily through a semi-structure interview approach with the representatives of five stakeholders. Besides this, we also reviewed literature. After analysing the collected data in the light of conceptual models, it was found that the expected challenges to implement Telemedicine in public hospitals of Bangladesh are related to Lack of sufficient funds, Anxiety of patients about Telemedicine, Disbelief of citizens in new services, Fear of deprivation from medical services, Lack of widespread and continuous education for public use of e-health services, Weakness of software with increasing workloads, Problems in internet speed, Shortage of technologically skilled manpower, Lack of complete legal framework about Telemedicine, Lack of explicit cyber law, Lack of Telemedicine related policy, Lack of existing suitable laws regarding personal rights and keeping patients' private surroundings and Lack of telecommunication network in some areas of the country. Before implementing the Telemedicine project in public hospitals successfully the government of Bangladesh needs to take some serious initiatives to solve these challenges. We wanted to collect necessary data regarding our research area from the Minister of Health and Family Welfare of Bangladesh but we failed to get his appointment because of his busy work schedule. This is the limitation of our study. Our future directions to the researchers are to identify the rural Bangladeshi citizens' perceptions about the Telemedicine service.

Appendix

1. Questionnaire

We will take interview following semi-structure interview model. However, following are the main queries which will be addressed in the interview session with the doctor who is involved with telemedicine consultation in Bangladesh.

1. Would you please tell me briefly about telemedicine service ?
2. How is going on health service through telemedicine ?
3. Would you please give me the patients (citizen) attitude about the treatment via telemedicine?
4. The government of Bangladesh is going to implement telemedicine in all public hospitals of Bangladesh, what do you think about this project?
5. What kinds of challenges government may face to implement telemedicine service in all public hospitals of Bangladesh?
6. Would you please tell me about financial challenges to implement telemedicine service in all public hospitals of Bangladesh?
7. Can you highlight technical & operational challenges to implement telemedicine in all public hospitals of Bangladesh?
8. What other challenges do you think to implement telemedicine service in all public hospitals of Bangladesh?
9. You told me about lacking of telemedicine related knowledgeable human resources and legal as well as policy related challenges, would you please clarify more about legal and policy related issues?
10. How would you explain native environmental challenge to implement telemedicine in public hospitals of Bangladesh?

Interview Question(Government Official)

1. Would you please tell me about the preparation of government to implement telemedicine service in all Government Hospital of Bangladesh?
2. What are the main challenges do you think to implement telemedicine service in Bangladesh?
3. What are the financial challenge of telemedicine in Bangladesh?
4. How would you address the technical& operational challenges to implement telemedicine in all public hospitals of Bangladesh?
5. What are the legal challenges to implement of telemedicine in public hospitals?
6. Would you please highlight the social and cultural challenges to implement telemedicine in all public hospitals of Bangladesh?
7. How will you explain the policy related challenge to implement telemedicine in all public hospitals of Bangladesh?
8. How would you explain about native environment challenge to implement telemedicine in all public hospitals of Bangladesh?
9. Is government taking any steps to address these challenges?
10. What do you think about the future of the telemedicine project of the government?

Interview questions(Technologist)

1. What is your main duty in this unit?
2. Would you please tell me the existing status of telecommunication system of Bangladesh?
3. Can you tell me details about the technological issues of telemedicine services?
4. What are the citizens psychology towards this service?
5. The government of Bangladesh is going to implement telemedicine in all public hospitals of Bangladesh, what do you think about this project?
6. What kinds of challenges government may face to implement telemedicine service in all public hospitals of Bangladesh?
7. Would you please focus on technical &operational challenges more clearly?
8. How would you address financial challenges to implement telemedicine in all public hospitals of Bangladesh?
9. What are the legal and policy related challenges government may face to implement telemedicine service in all public hospitals of Bangladesh?
10. How government can make a pool of technologically skilled manpower for this project?
11. How will you explain native environmental challenges to implement telemedicine in all public hospitals of Bangladesh?

InterviewQuestion (User)

1. When at first did you take medical treatment via telemedicine service

2. Why did you choose telemedicine service?,
3. Which medical treatment is better? Traditional or telemedicine service?
4. Can you access to this service conveniently? Why, or why not ?
5. How will you describe about psychological problem of telemedicine service?
6. You told me if I suffer from wrong treatment then how will I take proper steps against the doctor? Are you telling about law and policy related related challenge?
7. The government of Bangladesh is going to implement telemedicine service in all public hospitals of the country, Do you think any challenges in this concern ?
8. What do you think about the financial challenges to implement telemedicine in all public hospitals of Bangladesh
9. How will you describe technical and operational challenges to implement telemedicine in all public hospitals of Bangladesh?
10. How will you address native environment challenge to implement telemedicine in all public hospitals of Bangladesh?

Interview Question(Non User)

1. What is your opinion about telemedicine service?
2. The government of Bangladesh is going to implement telemedicine in all public hospitals of Bangladesh, what do you think about this project?
3. What kinds of challenges government may face to implement telemedicine service in all public hospitals of Bangladesh
4. Would you please tell me detail about the economic challenge to implement telemedicine service in all public hospitals of Bangladesh?
5. What is the psychological barrier of telemedicine ?
6. How will you address the technical & operational challenges to implement telemedicine in all public hospitals of Bangladesh?
7. Can you please tell me detail about legal and policy related challenges to implement telemedicine project in all public hospitals of Bangladesh?
8. How will you address the native environment challenge to implement telemedicine in all public hospitals of Bangladesh?
9. Do you have any suggestions about the telemedicine project of the government of Bangladesh?

2. Questionnaire according to six challenges

Table 1. *Doctor*

Issues	Questions Number
Financial	6,
Cultural & Social	3
Technical and Operational	7
Policy Making	9
Legal	9
Native Environment	10

Table 2. *Technologist*

Issues	Questions Number
Financial	8
Cultural & Social	4
Technical and Operational	7
Policy Making	9
Legal	9
Native Environment	11

Table 3. *Government Official*

Issues	Questions Number
Financial	3
Cultural & Social	6
Technical and Operational	4
Policy Making	7
Legal	5
Native Environment	8

Table 4. *User*

Issues	Questions Number
Financial	8
Cultural & Social	5
Technical and Operational	9
Policy Making	6
Legal	6
Native Environment	10

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