

Key challenges to develop and implement e-Health & Telemedicine in a developing country: the case of Bangladesh

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Abstract—The management information system (MIS) of Director General of Health Services (DGHS), Bangladesh has marked challenges to develop e-Health standard and interoperable framework in database system. The development will be done under the Ministry of Health and Family Welfare and other ministries. It indicates that, Bangladesh is embarking on national e-Health. So, there is a need to examine its preparedness in terms of culture, technology infrastructure, operational preparedness, skilled human resources and awareness of the general people about e-Health and Telemedicine. This paper aims to identify the key challenges in development and implementation of e-Health and Telemedicine in Bangladesh, by which developing countries can get an effective way for the successful implementation of their national e-Health initiative. After analyzing the key challenges of adopting e-Health in Bangladesh, it identifies that, more than 40 percent rural area have lack of skilled operators, limited availability of medical professionals, low medical insurance, low funding in health sector, limited affordability of health care services, complex industry, unreliability in e-Health (remote health care via technological support), overall low literacy rate, poor socioeconomic issues, and technology infrastructure problems are the key challenges. The paper wraps up about the key challenges of e-Health and Telemedicine in developing countries and the struggle of countries to adopt e-Health. Motivation of this paper is to make realization about the potential benefits of e-Health and its strength to regulate a sustainable e-Health service.

Index Terms— Developing Country, e-Health, Telemedicine, Key Challenges, Implementation, Solution

1 INTRODUCTION

e-Health and Telemedicine are the buzz word in this technologically modern world. One can get help very easily by this new technological concept. E-Health helps to take more effective decision making for the health professionals and upgrade the quality of health care. Through telemedicine concept it can save millions of lives in both rural and urban areas. Among all health care system e-Health and telemedicine is considered more conducive and cost efficient. E-Health maintained faster and errorless access to medical history of any patients. E-Health reduced the time and money for any patient and also makes sure about the proper treatment of emergency patients. By using the video technology, diagnosis and proper treatment can be received at low medical cost [1]. This paper will overview the key challenges to develop and implement e-Health and Telemedicine in Bangladesh. This will be interesting for all the stakeholders in e-Health and telemedicine. e-Health and Telemedicine is very important for all because, by this

system patient can get remedy with a minimum cost and other stakeholders can earn more without working hard in daily life. This topic will be quite interesting for those who wants to make things easier and need to get quick solution of any problems related to e-Health and Telemedicine. It will also be beneficial for those people who wants to keep themselves updated with the advanced technology. This topic is important because it will help the people by highlighting the key challenges in telemedicine sector in Bangladesh and by solving some problems regarding e-Health and Telemedicine, the stakeholders can develop such services. Hope, this paper will reveal something new.

2 RESEARCH METHODOLOGY

2.1 Problem

Information technology plays an important role in e-Health. In health sector, e-Health and telemedicine are the combinations of using information technology and electronic communication. It is an important sector for monitoring human health within a short span of time with the help of technological support. But it is unfortunate that the knowledge and awareness about this sector is very less. Therefore, awareness about this sector is essential to bring it to light.

What are the challenges in e-Health and Telemedicine? The interconnection of medical research with healthcare is the main challenge in e-Health. There should be a balance between medical treatment with research outcomes. For this reason, an efficient transfer of knowledge is needed from the sphere of research to develop and implement telemedicine in Bangladesh. Again restorative research needs solid information and tests from patients. Cost-viability of

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telemedicine and e-Health enhances extensively at the time of coordination with media communications and data innovation in the well-being division [2]. This prompted the distinguishing proof of e-well-being as an umbrella term, with definitions, for example, another term expected to depict the joined utilization of electronic correspondence and data innovation in the well-being division. The utilization in the well-being area of computerized information transmitted, put away and recovered electronically for clinical, instructive and authoritative purposes, both at the nearby site and at separation [3], [4]. In the use of the words e-Health and Telemedicine, there is a bit difference. The investors focus on their profits from the investment though it takes couple of years. Considering this view, telemedicine is insufficient because of market category meanwhile e-Health covers many things and more convincing.

The focus of e-Health and telemedicine is to connect and utilize information and communication technologies (ICT) for delivering health services and telemedicine. This paper begins with an overview of telemedicine, synthesizing current literature that illuminates the use of telemedicine in developing countries, and highlighting key challenges to implement e-Health and Telemedicine in Bangladesh.

2.2 Background

Use of e-Health, or electronic data technologies, has unfold to cities and remote villages worldwide. Countries like African country square measure activating nationwide e-health networks. The philanthropist Foundations month-long 2008 conference creating the e-Health Connection: international Partners, native Solutions accelerated this method. Conference participants planned international partnerships, health technology solutions supported native wants, cross-border ability, leverage current ASCII text file networks, and shared scientific discipline systems; they achieved progress on a shared, cross-border understanding of e-Health solutions and policy. Early steps toward furthering these goals embrace creation of a replacement organization, the eHealth Alliance, to coordinate efforts, however cooperative investments square measure is required to begin the promise of e-Health [5]. e-Health has huge potential to confirm care quality, accessibility, and affordability in developing countries. The appliance of data and communication technology to care, particularly e-Health, is chop-chop advancing in Bangladesh. The general public and personal sectors have contributed to the event of the e-Health infrastructure throughout the country.

This standing of e-Health in Bangladesh, however, has not been assessed. within the gift study, we have a tendency to explored this standing of e-Health within the public and personal sectors, moreover, because the technical and social control challenges facing e-Health comes in Bangladesh. Our findings unconcealed that though e-Health in Bangladesh remains somewhat problematic, the difficulties can be overcome. supported this state of affairs and challenges of e-Health, the scope of some fields needs any improvement.

The finding of this study can facilitate policymakers to form effective selections concerning e-Health services [6]. Health is the most vital facet for the economic property of a rustic. Bangladesh is facing loads of challenges in quality care management. The recent advances in data and communication technologies (ICT) might play a very important role in up care services and reaching them to the threshold of the marginalized individuals.

This analysis aims to gauge the current health standing of the country and explores the relevancy of e-Health additionally because of the challenges and problems with electronic care development. Based on the patient's expectations and views regarding the betterment of e-Health management, a study was conducted. The survey was conducted in some elect rural and concrete hospitals/clinics where the information and communication technology was not good enough to get a better result. This analysis helps to boost the access, effectiveness, and quality of health services used by care organizations, doctors, patients, and shoppers in an endeavor to select up the health standing of patients and by facing emergencies in a couple of cases. In the end, a group of suggestions has been provided to help the implementation of a thriving electronic care system [7].

2.3 Research Aim

This paper aim is to explore the key challenges in developing countries where Bangladesh is taken as context and the implementation of e-Health and telemedicine.

2.4 Research Objectives

2.4.1. To identify the major obstacles in e-Health and telemedicine.

2.4.2. To observe the implementation environment of e-Health and telemedicine.

2.5 Related Research Works

In developing countries like Bangladesh, the major limitation of e-Health and telemedicine are inadequate funding, slow internet connection, unawareness among people, and so on. If the limitation can be overcome, then several telemedicine services can be implemented effortlessly. The scope that can be identified is Electronic Health Record (EHR), laboratory system, Picture Archiving, and Communication Systems (PACS) [14]. For improving health services, Information and Communication Technologies (ICT) can play an efficient role. ICT can improve health services by giving modem, user-friendly environment of communication, and storing information. The error in medical reports can be prevented by ICT. However, an effective network between human society and technology is a must for productive ICT [14]. The week information infrastructure in developing countries like Bangladesh is identified as one of the major problems. The improvement of information infrastructure can reduce the health systems operation, waiting time, communication between doctors and patients, and improve interdepartmental [13]. Specialists' access to rural areas is the

main problem that is facing the people of the underserved population. Telemedicine helps the specialists to consult with the patients without leaving the physician's actual location. Diagnosis and treatment are considered as the improvement of e-Health and telemedicine. Telemedicine also decrease patients travel to the health center and mutual knowledge access to the doctors [13].

2.6 Research Question

1.6.1. Main Question. What are the key difficulties that developing countries are facing to implement e-Health and telemedicine?

1.6.2. What would be the obstacles?

1.6.3. How one can observe the environment of e-Health and Telemedicine?

2.7 Limitation of Study

Since finding the key challenges to implement e-Health and Telemedicine in developing countries is the topic and this paper is based on developing countries like Bangladesh. During the data collection, some difficulties had been faced. Because e-Health and Telemedicine are not familiar in Bangladesh among the people. Apart from that, there is a lack of resources and materials as well.

3 DATA COLLECTION

The literature was searched for key challenges for e-Health adoption in developing countries; and recognition of the foreseen benefits through IEEE, Google Scholar, and Google search engines. Twenty-three (23) articles were reviewed were from more than 250 related articles that were found. The literature review found many objectives in e-Health in Bangladesh: providing health education for rural people in the remote area via teleconferencing. Bangladesh has taken many projects in health education, such as model village, school health education, develop and disseminate IEC/BCC material, health education research center, sensitization, creating awareness on emerging health issues, observing health days [8].

3.1 Data collection method

As the topic is a social issue, the data collection process is done by website information. The information provided on the websites is gathered as data. In the strategy of gathering information from websites, the important step is being studied on various papers for valid information. The available information on websites is considered as the data which provided the output for the research. Various sites studying and pointing out the important data would be the strategy for collecting information. The more the web sites would be read, the more information can be gathered. This would be the main strategy for data collection. As the data collection would not be done on the people's opinion, the web-based data collection would be the best strategy for collecting data which is easy and appropriate.

As the topic is a social issue, the data collection process is done by website information. The information provided on

the websites is or Web-Based data collection method, the collection of data is not done by one particular paper or a particular source, a various number of website information is gathered for the data collection. The different websites supply data about the challenges of e-Health and telemedicine. The valid data collection will provide the output of the project in terms of developing the country.

Another technique is observation unremarkably connected with qualitative information, which is additionally known as literature study however as our objective is said with utterly new analysis filed some concepts are taken from different papers associated with this analysis work.

Social media are important for collecting the data for the topic of key challenges in e-Health and telemedicine in the developing country.

Web-based information supplies a considerable about of research data and the process requires less time, money, and healthy data collection.

3.2 Participants/sampling

This research is works with the web based information. Above 90 percent data are collected from various websites. The challenges of e-Health and telemedicine are identified and the valid data are collected for this research via websites. The data are collected in respect of Bangladesh and developing countries situation. For comparing the situation developed countries data are also considered.

3.3 Data Analysis

Many graph and quantitative data are collected via the web site, for better comparison many graphs have been created. The various graphs are shown as collected data. This will be easy for identifying and comparison between the data.

3.4 Research ethics

The internet-based research ethics are related to computer and the information ethics such as ethical issues as security, the integrity of data, intellectually property issue and professional standard and norms are considered the ethics that required to be ensured. All the ethics are followed to collect data. The privacy of using this data will be carefully handled.

4 ANALYSIS AND RESULTS

4.1 Analysis

4.1.1. *Data Analysis Procedure.* For Data analysis, the raw data is analyzed and studied carefully. This data helps in the result measurement of our research. To analyze qualitative data, the data revised by us and we avoid personal opinions in the analysis. This procedure is called re-read and analyzed for several times. After getting a clear concept about the collected data, we use the verified data and use it for further research output.

4.1.2. *Data preparation plan.* The data preparation plan is to collect raw data from various websites. The result gathered from the websites helped for further results. By gathering the

data from the field, we write down notes and revised the whole data set and take steps as the outcome of the research. As the data is collected from a web-based source, the repentance and the recent data have been shown for further work.

4.1.3 Initial Exploration Plan. The re-reading of the collected data will be important for the initial exploration plan. The researcher will learn the data and try to make the data improved for further interpretations and it will make the research easier and clear to understand.

4.1.4 Analysis Plan. The analysis plan began after understanding the data structure. The re-read of the data is a must for research. The next step is to interpret the data and the extraction of code and graphs.

4.1.5 Presentation Plan. The result of the data collected from the websites is presented in this step. The qualitative data information has been described in this part. According to the data analysis, the data is interpreted and the result is briefly analyzed for the output result.

4.1.6 Tools. The tools used for data analysis are pen, paper, laptop, excel sheet, etc. Tubule public is used for graph simulation. And this software is open-source software. This software connects the data with data warehouses, such as Microsoft Excel and web-based data. It is easy to share data with social media or with clients. As the data is collected from websites the Microsoft Excel is needed to convert data for further use.

4.2 Results

The data are collected from websites, which provide a clear concept about the key challenge of e-Health and telemedicine in developing countries. The data are shown through graphs and excel files. As a result, over the percentage of the data is found for this topic. The e-Health and telemedicine are not very famous among the developing countries, the key challenges are identified and the

1. Illiteracy rate in Bangladesh.

TABLE 1
LITERACY RATE IN BANGLADESH [10]

Date	Adult Literacy Rate Female (%)	Adult Literacy Rate Male (%)	Adult Literacy Rate (%)	Adult Literacy Rate 15-24 Female (%)	Adult Literacy Rate 15-24 Male (%)	Adult Literacy Rate (%)
2017	70.09	75.70	72.89	94.38	91.54	92.95
2016	69.90	75.62	72.76	93.54	90.91	92.24
2015	62.25	68.06	65.14	89.54	86.19	87.89
2014	57.86	64.37	61.09	86.48	84.63	85.55
2013	57.79	64.21	61.02	86.93	84.09	85.53
2012	54.24	61.54	57.86	79.37	76.28	77.83
2011	46.74	47.45	47.08	72.65	55.75	65.71
2007	43.74	49.83	46.66	67.49	54.27	61.87
2001	40.82	53.90	47.49	60.26	67.16	63.62
1991	25.84	44.31	35.32	37.99	51.74	44.68
1981	17.97	39.73	29.23	27.15	44.36	35.65

percentages of the people collaboration is shown in the research.

2. Unawareness of Technology.

In Bangladesh Total number of Population is 164,669,751 and The total number of Internet Users are 29,673,489. In Percentage, only 18.02 percent of people are aware of the internet. And by that statistics, the rank of Bangladesh in internet users is 180 in the world.

3. Lack of IT Infrastructure.

4. Unavailability of Physician.

By a statistic of WHO, it's come to know that, only 3.05 physicians are here for per 10,000 populations and 1.07 nurses per 10,000 populations [11]. So Unavailability of the physician is one of the major challenge.

5. Physicians have minimum knowledge about e-Health and telemedicine.

6. Percentage of Underdeveloped and costal area.

The coastal region of Bangladesh covers about 20 percent of the total land area [12], which is an underdeveloped area, and technological support is very low in those areas.

7. Unreliability in e-Health and telemedicine.

There is plenty of population who do not believe in online service, that's why this is one of the major challenges for implementing e-Health in Bangladesh.

8. Lack of budget in health sector.

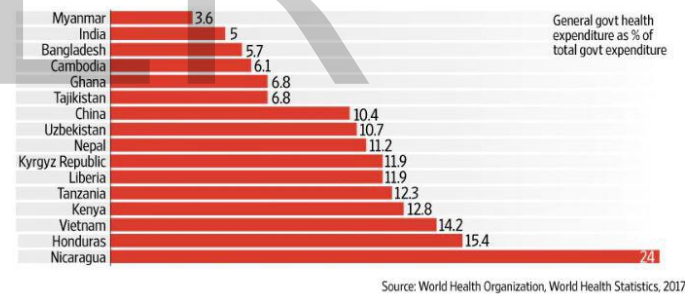


Fig: Budget in health sector in Bangladesh

By that figure, it is easily understandable that Bangladesh spends so little in the health sector. And this is also a key challenge for e-Health.

9. Compliance Concerns.

10. Complex Industry.

11. Low medical Insurance.

The overall data are collected from various websites to give a clear concept about the overall position of e-Health and telemedicine. The output will help for taking the necessary steps needed to implement and develop e-Health and telemedicine service in a developing country like Bangladesh.

After analyzing the data some points are found, which can be considered as the key challenges for implementation and development e-Health and telemedicine in Bangladesh.

5 CONCLUSION

In developing countries, using health care technology is becoming an important issue. The use of technology in health issues will make humans' life healthy and secure. E-Health and telemedicine provide the potentiality of improving human health issues. It also provides secure health care, immediate health service, and cheap medical services. One of the major problems with e-Health and telemedicine is the bad impact of the network in telecommunication in South Asian countries like Bangladesh. The effective connection of the communication system is found to be the main problem in rural areas. Many other problems are found in e-Health and Telemedicine. The problems are lack of knowledge about e-Health, low funding by the government, complex system, etc. The major tasks of e-Health and Telemedicine sector is to identify all the obstacles and make the implementation environment of the health sector. E-Health and Telemedicine also provide security of the patients and low cost in these health services. Along with the security and privacy aspects, inconsistent responsibility is also an important factor. To ensure the patient's services are given by doctors the telemedicine must be maintained. Structural and organizational guideline should be properly described for the well-being of the e-Health users.

APPENDIX A: GLOSSARY OF TERMS AND ABBREVIATIONS

1. MIS = Management Information System.
2. DGHS = Directorate General of Health Services.
3. ICT = Information and Communication Technologies
4. IEEE =Institute of Electrical and Electronics Engineers.
5. IEC = International Electro-Technical Commission.
6. BCC = Blind Carbon Copy.
7. WHO = World Health Organization.
8. EHR = Electronic Health Record.
9. PACS = Picture Archiving and Communication Systems.

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