Potentialities of E-health in Bangladesh: Cooperation from Japan

Nami Avento[1], Tunazzina Sultana[2]

[1] University of Milano-Bicocca, PhD student in Sociology
[2] University of Milano-Bicocca, PhD student in Computer Science-Associate Professor in Chittagong University

{n.avento, t.sultana}@campus.unimib.it

Abstract. "E-health" indicates healthcare practices supported by the use of technology and new forms of communication. Thus, the paper identifies the opportunities and challenges deriving from the implementation of e-health services particularly in developing countries. The authors provide an overview of the healthcare scenario in Japan and Bangladesh and discuss if there is scope for better practice e-health in Bangladesh with the cooperation of Japan. The paper develops a framework to meet the objectives through literature review. The work ends suggesting that cooperation between Bangladesh and Japan can lead to knowledge and technological transfer to Bangladesh, contributing to the improvement of the country's general healthcare condition.

Keywords: Bangladesh, e-health, health care, International Cooperation, Japan.

1 Introduction

During 90s researchers of Pittsburgh University and Justsystem Pittsburgh Research Center anticipated that, improved information exchange should be considered as the prior condition of the effectiveness of physicians' time. The quality of health care could be improved with the design and the use of advanced artificial intelligence techniques to build an interactive system [4, 5].

> '…….One means of facilitating information exchange between patients and physicians in the near future is to use advanced computer technology to make the reading of informative materials more like face-to-face communication……' [4]

In 21st century, e-health might be the consequence of such prediction. E-health refers to the storage and transfer of health resources by electronic means and it is considered as one of the most appropriate situation to improve the quality and safety of health care with the use of latest information and communication technology. The e-health activities are becoming common and have the potential to improve health care sector in both developed and developing countries [9-12, 18].

In the developed country new technologies are now available to help integration and deliver care at home and communities of people. For example, in Japan, the promotion of Electronic Patient Record (EPR) and Computerized Physician Order Entry (CPOE) systems are today a priority to improve the healthcare sector.

Nevertheless, the country is facing difficulties mainly due to the lack of standardisation of the data and poor interoperability of the communication means [3].
On the other hand, while the developed countries are at the forefront, the developing countries are still in their early stages of e-health development. Among the Asian countries, India has made some progresses in e-health within the context of national health care system [30].
Bangladesh is one of the many developing countries in Asia with large population and has an acute shortage of doctors, particularly specialists. Moreover, it is one of the most overpopulated countries in the world where the physician patient ratio is 1:4000 [6]. Though in the last few years the development of information and communication infrastructure of Bangladesh is booming, implementation of a reasonable e-health infrastructure would require large numbers of computers and ICT equipment, software, computer-literate staff, troubleshooting technicians, internet costs, etc. The country was supposed to compromise with this reality and limit expectations to a manageable level [27]. However, Soumerai and Koppel (2012), argued that the costs of health IT are too expensive mostly because of IT training and infrastructural development [28]. In contrast to this argument, Dt. Hambleton stated that the cost is incurred mostly in the primary care setting: the right approach, the right information and the right investment in e-health can deliver real benefits to patient care and to the efficiency of the healthcare system [2].

Against this background, in this paper we will discuss the justifications and incentives that induce us to believe that there is hope for a developing country such as Bangladesh for the best practices of e-health services if adequate assistance is provided by the developed countries. This essay is developed from and adds to a previous article written by the author [25]. That article focused on the role of technology in the health service sector for the ageing population both in developed and developing countries. In developed countries, there are contributions of technology in the health service sector in numerous ways, ranging from technological assistive tools to robotics. For this paper, the authors narrowed down the scope of the study area to e-health services and restricted to Japan and Bangladesh in particular for gaining more specific findings.
Existing literature and secondary data analysis was employed in this study. Online publications, research papers as well as reports of WHO and ITU were examined to determine the research framework. The information thus collected was analysed in order to make the study more informative and useful to the readers.
In the second section, the current scenario of e-health services is discussed. In the third section, Japan' healthcare system including e-health is presented. The status of Bangladesh's health sector and the potentiality and difficulties related to the implementation of e-health are analysed in the forth section. In the fifth section, a brief discussion is offered about the advantages that bilateral cooperation between the countries could bring to Bangladesh. Conclusive remarks will end the paper.

2 E-health: challenges and opportunities

E-health is one of the alternatives to the traditional healthcare solutions that attract more interest. In order to cope with the increasing need for medical services and

improving assistive solutions, an innovative approach might be the key in the near future. Developed countries have the instruments to develop health care information solutions due to advancement in Information and Communication Technologies (ICTs). The technological level reached by developed countries might make possible the expansion of e-health in all those fields related to health care but very often the governments face common obstacles. One of the first difficulties is represented by the initial cost that every structural change requires. Funding incentives are not easy to obtain and, for developing countries, this is the first big barrier. This is also related to the political sphere and the ability of the institutions to outline clear guidelines and be able to follow them. From various points of view practical implementation of new initiatives can be possible if the environment is ready to receive them. From a technical point of view modern infrastructure, interoperable systems and standard methods are fundamental before proceeding. Furthermore, the field of education and training have to be rearranged, helping the professionals to become familiar with new tools and services. Finally, promotion is necessary to raise public awareness and create a culture where e-health can be recognised as one pillar of future healthcare.

In other words, in order to be effective, e-health requires prior changes in those sectors that lack an efficient organisation of resources and a new way of thinking about giving/receiving assistance.

E-health could be a concrete chance to increase the possibilities in healthcare. Through e-health solutions, doctors can have more efficient instruments in order to offer assistance to their patients and, from the other hand, patients could receive care under new ways, with the help of technological devices and from remote. E-health services involve the collection of data; however information not only needs to be processed but communicated, otherwise we could only take advantage of a small part of its potentiality. This is one of the main reasons why standardisation and interoperability are at the basis of a major change in the healthcare system of developed and developing countries. E-health systems should be the results of the collaboration among the professionals of different sectors, from the financial to the healthcare, from the telecommunication to the political sphere. For this reason, the preparation of long-term strategic plans or "E-health Master Plans" is the priority for the governments in support of e-health, as mentioned during the World Health Organization Assembly in 2005 [19].

3 Japan's Health Care System

Japan is one of the most developed countries in the world and its health care system has been quite efficient throughout the last decades. The country has the highest average life expectancy worldwide also due to technological and scientific advancement. The number of hospitals per capita is higher than in other OECD countries and the waiting list to obtain a doctor's appointment is much shorter making the healthcare system of Japan one of the most successful example among developed countries. Nevertheless, the system needs to be re-organised and improved in order to be able to face the new challenges that demographic changes are already originating. Demand for care will grow and particular attention should be paid to the services concerning the increasing life expectancy and changing life style. The population of Japan is ageing at a very fast rate and people over 65 years already accounts for 24%

of the total population, making Japan the first hyper-aged society. In the near future this age group will constitute about 40% of the population. This is one of the main reasons why recently the issue of national health care system comes to the fore in public discourse.
Research indicates that the cost of National Health Insurance (NHI) will double in 2035, reaching the 13.5% of the GDP [20]. Though the situation of Japan is better than that of other rich countries, the present national healthcare system is under pressure. Because of a shrinking and ageing population, the demand for care is increasing continuously, therefore resources need to be optimised in order to maintain high quality standards and be able to continue supplying universal care. One possible solution is to allocate more resources to the development of e-health assistance. The use of information technology can facilitate the access to healthcare services while guaranteeing high quality at lower costs.

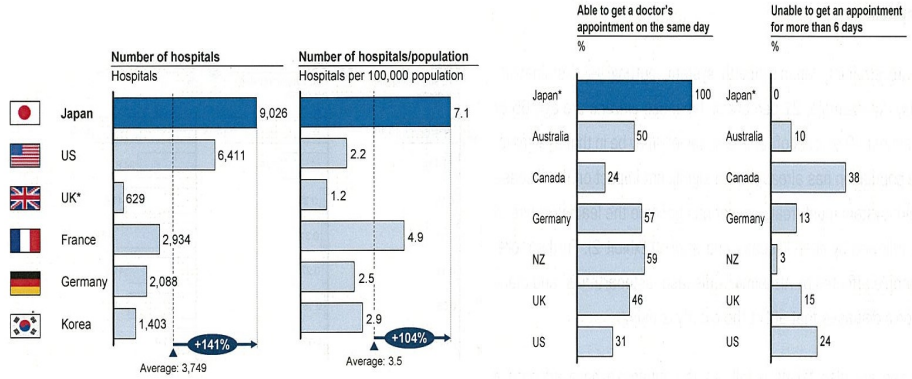

Fig. 1. Above figures show the number of hospitals in Japan is twice as high as in other OECD countries and getting a doctor's appointment is quicker in Japan than other OECD countries. (Source: McKinsey, 2008) [20].

According to a study of the Health Policy Institute (2010), around 40% of the Japanese public would accept receiving medical care from remote [26]. This figure is encouraging but, despite the technological advancement already reached, Japan is still behind many developed countries in the use of e-health.

3.1 E-health and health care information computerisation in Japan

Technology application in medical field is reality in Japan. The on-going research and the technological advancement develop new kind of devices that can be useful in different area of medical science. Robotics is one area that attracts much attention and Japan is at the forefront of technological progress and its commercialisation. We can already find a wide set of robots and machines on the market for example humanoid robots able to lift patients from the bed or to feed people [3].
While robotics is at an advanced level, the same thing cannot be said for e-health services. Since 1993 the issue of healthcare information has been discussed and several strategies and programmes have been developed. Nevertheless, the

development of e-health is behind schedule compared to other developed countries, in particular the implementation of medical informatics. Tools in medical informatics not only refer to computers but also to clinical guidelines, medical terminologies and communication system. The promotion of Electronic Patient Record (EPR) and Computerized Physician Order Entry (CPOE) systems are today a priority for the healthcare institutions as they can play a fundamental role in the advancement of e-health in Japan. EPR offers a great opportunity for specialists in different health care settings to share important medical data, such as a patient history and treatment results, while CPOE allows physicians to fill in an order in electronic format and deliver it to the medical staff and other specialists. In this way, it is more likely to avoid errors, such as those related to handwriting and to improve the quality and the rapidity of fulfilment. The great majority of large hospitals have already adopted CPOE but only few clinics are using EPR (higher rate for large hospitals subsidised by the government) [26].

Despite the existing preconditions, the computerisation of healthcare information has not been fully implemented in Japan mainly because of investment, standardisation and privacy issues. In addition, the existing major healthcare information systems are not interoperable, meaning that nor intra- neither inter-hospital electronic data communication is possible. This means that patients' data stored in one clinic cannot be accessed from remote and no exchange is possible through hospitals. To facilitate the exchange of medical data the Health, Labor and Welfare Ministry is planning to develop a nationwide information exchange system, starting from the establishment of regional networks, by the end of fiscal year 2018 [13]. This project could be a crucial step in order to move toward a more efficient healthcare system with advantages for the government, medical professionals and patients.

Japan is already experiencing demographic decline and it might face a lack of professional workers in the near future. E-health can give a decisive contribution in order to reduce costs, enhance public health and most importantly:

- Collect data: create records in a standardised electronic format;
- Exchange data: physicians can communicate health information thanks to standardised records, which could be exchanged inside or outside an institution and accessed from remote. For instance, data about successful treatments and drug effects could improve decision-making and reduce the risk of errors. The creation of a network of hospitals could be possible, facilitating the circulation of new clinical methods and research results. It would allow specialists to optimise resources as well as their time;
- Offer better care: services provided by the institutions would be more effective, contributing to improve the quality of health assistance and, consequently, the patients quality of life;
- Decrease human errors: IT could help avoid human mistakes such as those related to handwriting, misunderstandings and prescription orders. Having complete and updated records of the patient, the possibility to make a human mistake decrease. Furthermore, e-prescription software can also able interpret data and detect incompatible entries [1];

- Ensure data access in case of emergency: standardised electronic data could be accessed from remote and this could be extremely important in particular situation such as natural disasters or a patient emergency. Unique health records that are not connected to a network of institutions are exposed to natural disasters. The Great East Japan Earthquake of 2011 revealed the vulnerability of the existent data storage system and the lack of an integrated health data management. In addition, personal medical records accessibility could be determining in case of emergency, allowing different care providers to access the patient personal records [1].

Fig. 2. The Great East Japan Earthquake of 2011. Internet connectivity was almost unaffected by the catastrophe. Access of data from remote could be possible in case of natural disaster. (Source: http://spectrum.ieee.org)

It is urgent to foster the use of new health services rapidly in order to meet the needs of the Japanese population. The integration of interoperable models and the start of new services for a better quality of medical care can be of help for a developed country such as Japan, facing dramatic demographic and social transformations. The government has to cope with different circumstances and the priorities are to:

- Design a common "language": data should be standardised in order to be exchanged among medical institutions and professionals;
- Develop a nationwide communication network: as planned by the Health, Labor and Welfare Ministry, Japan needs to put into effect an information exchange system. In this way, communication of standardised data and information could be possible. Besides, a long-term strategy that comprehends allocation of financial resources, facilities management and professionals training is needed.
- Promote e-health: not only in the healthcare sphere and in the academia but in the general public as well. With a good communication strategy, patients will be aware of the advantages and the improvement that e-health can bring and

might allow doctors to treat their personal data. People and the scientific community would benefit from the sharing of electronic information and records;

- Create a database for emergency: in case of unexpected events a personal medical records database (at a regional or national level) could become a lifesaving instrument available to professionals from remote.

Being Japan at the forefront of technology and science, its contribution can have important effect to the widespread of e-health under a global perspective. Developing countries have the opportunity to look at developed countries and to learn lessons from their successful attempts, considering that some of them will experience tomorrow the same problems that developed countries are facing today. From this point of view, the cooperation among developed-developing nations could be beneficial especially for the latter and become a valuable occasion to speed the modernisation process of the existing healthcare systems.

4 Bangladesh's Health Care System

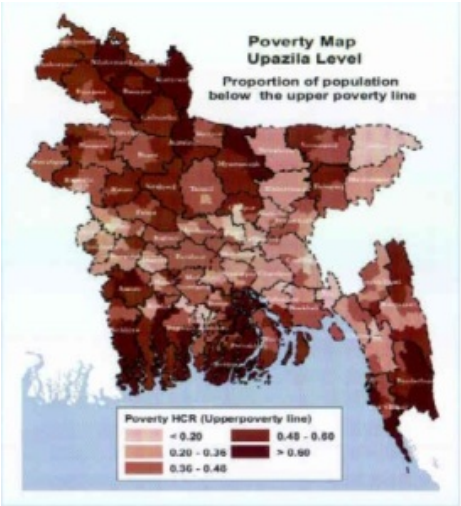

Fig. 3 Bangladesh's Poverty Map (Bangladesh Bureau Statistics, Poverty Map Upazila Level, http://www.bbs.gov.bd)

The history of healthcare in Bangladesh can be outlined to the early 17th century when the East India Company came to rule over the Indian sub-continent and governed it as a police state from England [24]. After independence in 1971, Bangladesh inherited a non-federal state with its capital based in Dhaka and a general administrative network. The health network consisted of:

a) 8 medical colleges and hospitals at the national or regional level;

b) 14 district hospitals;

c) 43 sub-divisional hospitals;
d) 150 rural health centres at the *thana* level (a kind of sub-town);
e) A few sub-centres at the union level.
There also was one dental college and a national level institute to function as public health production, testing and research laboratory. In 1976, the number of hospital beds in each *thana* was raised to 31. So was the number of sub-centres under each *thana*, which was raised to 4 or 5, depending on the size and population of a *thana* [24]. Bangladesh signed the Alma-Ata Declaration of 1978 and expressed its commitment with the world community to render minimum healthcare services for its people through what was called a primary healthcare (PHC) approach [31]. Afterwards, in 1980 Bangladesh prepared a country paper as response to the World Health Organization (WHO) circular to its member countries for formulating individual national strategies and a plan of action for attaining Health For All (HFA) by the year 2000. In subsequent years, the PHC received highest priority in the national 5-year plans as directed in the updated country paper. The improvement of health status and quality of life, the development of healthcare delivery system and the extension of coverage and accessibility were identified as four major priority sectors in formulating national HFA strategies. The pattern of Bangladesh's public health service delivery system is hierarchically structured from the national level to the village level that is based on a top-down approach. All the decisions regarding health policy formulation, service delivery mechanisms, allocation and utilisation of resources etc. are taken at the central level, while the lower level organisations carry out the decisions. Different levels of health institutions, hospitals and health centres provide different public healthcare services to the beneficiaries [17].

4.1 Heath Care Facilities in Bangladesh

Contrary to the developed countries, Bangladesh is one of the highly populated developing countries with most people living in rural areas. More than 140 million people are living within 144,000 square km of land area (1019 person/km2) [29]. There are only 663 Government hospitals in districts' head-quarters and *thana* areas.

Health Care Facilities	**Number**
Number of hospital beds	51,648
Population per hospital bed	2571
Hospital beds per 10,000 population	3.43
Number of health centers	1385
Number of physicians	42,881
Population per physician	3169
Physicians per 10,000 population	3
Population per nurse	6442

Source: [7, 21]

Total number of beds available in both public and private hospitals and clinics is 51,648. The ratio of hospital bed in Bangladesh is around 1:2571. The ratio of doctor to population is 1:3169, which is 1: 6442 in case of nurse to population [7]. Like every service, a huge disparity exists between rural and urban areas in health services of the country.

Around 75% of the total population of Bangladesh lives in rural areas and rural health centres are not equipped adequately. Moreover, most of the doctors are city-based as they do not want to lose the urban benefits. Usually the doctors get employment in remote health centre of Bangladesh when they are being selected as cadres of Bangladesh Civil Services (BCS). The possibility of becoming professionally isolated as well as working in poor infrastructures of villages induce most of them to leave the rural areas within 1-2 years and shift to city areas. Therefore, health staffs in rural areas are usually young with little work experience and they show the tendency of high job rotation. Mostly, rural health centres are supported by infirmary technicians who are hardly well trained. In this situation, when the rural people go to the health centres in *thana* or *upazila* (sub-districts at the lower level of the administrative hierarchy structure), rarely get any specialist doctor's advice. This situation results in spending most of the money of the rural people to visit doctor in urban areas to get better consultancy. Sometimes, it becomes impossible to transfer on time a patient to the urban areas due to his/her critical health condition and poor communication facilities in those areas [21]. It is easily understood that patients are not getting adequate services even in the urban area because of scarcity of adequate doctors and facilities. Moreover, it can be predicted that Bangladesh is one of the developing countries where life expectancy at birth is going to raise gradually. Hence, mobility in terms of movement, which is not a major problem in the country now, might be a problem for the elderly by that time. This situation directs the option for such a service that might be possible to provide from distant locations with trained people and adequate facilities for improving the health condition. Therefore, e-health services are the best possible solution for meeting this demand supply gap in health services. Under these circumstances, e-health may be an easier and convenient way to disseminate healthcare facilities to the rural areas.

4.2 E-health Care in Bangladesh

In Bangladesh e-health initiatives began in 1998 when the Ministry of Health & Family Welfare (MOHFW) undertook the Health & Population Sector Program (HPSP) to enhance efficiency of programme implementation. All health and population-based activities were listed and grouped in different lines or sectors under this programme. As part of gradual development of e-health infrastructure and its use in the country, the government has taken wide range of specific programmes: administration and management of health services, collection and exchange of health service data, performance analysis of vertical programmes, population surveys, professional communication, supporting medical education and research, telemedicine and e-records. In 2003, the HPSP was revised and renamed the Health, Nutrition and Population Sector Program (HNPSP) with a new Operational Plan (OP). Current e-health activities are thus being implemented under HNPSP FY2003-2010 OP. All health and population-based activities were listed and grouped in different lines or

sectors. One Line Director was assigned to look after each sector. The major responsibility of e-health implementation in the health services went to Line Director of MIS (health).
Under this plan, the Line Director of Management Information System (MIS) is responsible for:

(a) The collection and exchange of health service data across all service delivery points, health managers at different tiers and officials at MOHFW to support monitoring of progress of health programmes and policy decisions;
(b) Conducting annual household survey (Geographical Reconnaissance or GR) personnel, logistic and financial MIS;
(c) Telemedicine;
(d) E-records, etc.

Computers have been provided to the MOHFW, central stores for medical supplies (national level), all national and regional tertiary hospitals, 64 district health managers and most of the 464 sub-district hospitals. These computers are connected through the internet. Hospital-based service data is still collected in formats compiled locally with limited possibility of disaggregation. Domiciliary data collected by field health workers is compiled at sub-district health offices and sent to MIS-HQ in Dhaka. Annual GR data are collected on each household and also processed at MIS-HQ. The Health Service Personnel Database is being routinely used during the placement of health personnel.
Financial MIS and logistic MIS are still in the developmental phase. The Director of MIS (health) has an ambitious plan to establish telemedicine centres in several key tertiary care and specialised hospitals, with links to selected remote district and sub-district hospitals. However, this is still in the planning phase.
Major challenges associated with implementing e-health in Bangladesh are basically related to finance and technology.

4.3 Potentials for E-health in Bangladesh

In Bangladesh, where 75% of the population lives in rural areas, only 25% physicians are available to serve the whole nations need for medical services. Information and communication technologies can improve access to healthcare and quality of services in the said sector, though costs are highly involved with this.
The country has the readiness for moving forward with ICT in the health sector. Numbers of mobile phone users are increasing in a dramatic way. Most of the patients, both in rural and urban area, have access to mobile phones. Moreover, health providers are interested in computerised records and feel it would benefit both their work and their patients. Most importantly, the government has initiated ICTs-based healthcare services at the national level and installed computers in all Upazila Health Complexes [31].
Bangladesh is in a position to take full advantage of the opportunities offered by the use of e-health. It has growing access to high speed internet, a pre-condition for web based applications like patients records and communication via email. Furthermore, Bangladesh has a number of highly talented programmers who can develop

specialised applications that could make e-health a valuable tool for health specialists. However, the above mentioned challenges are hampering the boost of e-health in real sense in Bangladesh.

5. International cooperation for healthcare

E-health could signify a shift from a traditional doctor-patient relationship to a contemporary one, more technologically oriented. The scientific world is going to find new ways of taking care of patients and the professional workers involved in e-health is likely to increase. At the basis, a good training of these workers is necessary. Developed countries have the instruments to guarantee adequate training arrangements for apprentices but the same thing cannot be said for developing countries, which may not be in the position to ensure appropriate preparation for new healthcare solutions independently. For this reason, agreements and partnerships can be a first step toward a long-term collaboration among developed and developing countries. Japan has signed Economic Partnership Agreements (EPA) with Asian countries, such as Philippines, Indonesia and India, in order to strengthen cooperation in Asia. Under EPAs the Japanese government accepts a fixed number of nurses and care workers as an attempt to meet the need for professionals in healthcare, a necessity that Japan is experiencing today and that is going to increase dramatically in the future. Candidates, that are already professionals in their countries of origin, are trained in local institutions and must pass a qualification test in Japanese in order to be allowed to work in Japan. Only few foreign candidates have successful examination results and due to the language barrier, Japanese professionals might still be preferred to foreign workers, restricting the potential benefits for both countries. In addition, medical institutions are required to support foreign workers under EPAs paying for their training and language education: if the candidate fail to pass the national examination, the money that hospitals and nursing care facilities spent on their training will be lost. There is scepticism about the efficiency of the present nurses training system under EPAs [22]. However, cooperation seems to be quite successful and essential in the health sector of Bangladesh. A breast cancer programme based in Bangladesh under a partnership between the International Breast Cancer Research Foundation and NGO of Bangladesh is one illustration of the potential for implementing e-health in Bangladesh and other developing countries. This partnership is bringing advanced e-health technologies to both rural and urban areas of Bangladesh, which merged international medical research activities and locally based expertise in the information technology field. Under this programme, a secured web based study registration and patient data entry system was used. Through this system medical specialists working under this project entered all aspects of patients' medical history, diagnosis, treatment and follow up; the collaborative diagnosis facilities helped to upload patients' relevant laboratory reports that became available to the treating doctors regardless of location. Availability of the information helped doctors to make the best possible decisions that brought better health outcomes for the patients. Under this programme, patients are viewed by doctors in different parts of the world through video conferencing [8].

In case of practicing e-health, developing countries including Bangladesh are well ahead in some cases [16]. Hence, it could be inferred that cooperation from other developed countries might bring a good platform for practicing e-health in Bangladesh. However, due to the barriers connected to current healthcare settings like power supply interruption, lack of computers and broadband internet connections, practices of e-health services are hampered. Another barrier is the lack of general education about the use of computers. Building an environment in which medical professionals like doctors, nurses, paramedics and other health assistants are comfortable using computers for day-to-day tasks will make the use of e-health technologies easier as well as demanding.
In order to achieve the high potentials and the benefits of e-health in Bangladesh, support/commitment from developed countries for the improvement of the infrastructures needed to use these technologies as well as education of medical professionals is necessary. Under this circumstance, cooperation with developed countries like Japan, where e-health technologies are already available, can be an opportunity for Bangladesh to overcome some of the challenges above mentioned. There is successful precedence of partnership that helped Bangladesh in e-health sector.

5.1 Motivation behind Considering Japan as Cooperating Partner

Japan has used its knowledge and experience to contribute to the socioeconomic progress of developing countries preliminary in East Asian region, where it vigorously provided assistance mainly in infrastructure improvement, social development and enhancing human resource as one of the major donor countries. Since formulating the Country Assistance Program document in March 2000, Japan has identified the following as priority areas when formulating and implementing its assistance:
(1) Agriculture, rural development and improvement of agricultural productivity;
(2) Improvement in the social sector (basic human needs, human resource development);
(3) Basic infrastructure for investment and export promotion;
(4) Disaster management.
Based on these priorities, Japan has provided assistance among other things for agricultural infrastructure development, participatory agricultural development, maternal and child health, polio eradication, science and mathematics education, bridge construction and cyclone shelter construction. Moreover, one of the characteristics of Japan's record of assistance is that large-scale infrastructure projects through yen loans have been undertaken in the field of basic infrastructure development, and assistance in this area accounts for approximately 60% of Japan's total amount of official development assistance (ODA) on a monetary basis. Besides, Japan has provided assistance also through technical cooperation and grant aid in the field of social development. As there is international request to reduce the debt burden of the poorest countries, Japan began providing grant aid for debt relief in 1978 and has been implementing debt cancellation instead of grant aid for debt relief since FY2003 [14].

Japan and Bangladesh have maintained friendly relations since 1972, through economic and technical cooperation. Japan is a major development partner for Bangladesh, extending support to the efforts of Bangladesh for its economic and social development. The two governments signed the Agreement on Technical Cooperation on December 8th, 2002 to strengthen further mutual technical cooperation by consolidating the infrastructure of Bangladesh and simplifying the process under a single umbrella framework [15]. Japan is committed to focus its assistance on infrastructure development regarding physical facilities and human resource development, which will contribute to ICTs-related industrial promotion, sector reform and capacity building of relevant governmental institutions. Therefore, it is reasonable thinking about cooperation between Japan and Bangladesh for e-health. Moreover, as part of human resource development, training can be provided to the doctors, nurses and other health workers with the assistance of Japan. Such training will help healthcare professionals to overcome barriers due to the use of technology, a prime need in order to foster e-health.

6 Recommendations

Cooperation among countries has played an essential role in Asia's remarkable growth, development and integration in recent decades. Such cooperation between Japan and Bangladesh would provide social benefits to Japan and economic benefits to Bangladesh. As Japan is at the advanced stage of technology and science, its support for developing a strong platform for e-health will have a significant important outcome to the extension of e-health in Bangladesh. Financial and technological barriers are identified as the main challenges of the best practices of e-health. Therefore, as a financially wealthy and technologically well-equipped cooperating partner, Japan can provide the best solution for Bangladesh for achieving important results in e-services.

Japan is an ageing society. The size of the national population is shrinking and it is characterised by high life expectancy and low birth rate. Elderly assistance is going to create difficulties to the current healthcare system and the institutions urgently need to plan structural changes in order to able to face the challenge of tomorrow. The existing training programmes launched by EPAs have revealed their weaknesses. From an educational point of view, more has to be done in order to make the training period effective for both the medical institutions and the candidates. From a financial point of view, the governments should give incentives to hospitals and nursing homes in order to limit the waste of resources. In addition, the aim of the training programme for nurses and specialists from abroad is to include them in the Japanese labour market. If the programme were successful, Japan would benefit from the presence of new professional workers but at the same time, developing countries will lose specialised workforce. Along with EPAs programme, Japan could be responsible for the promotion of different kinds of partnerships and cooperation agreements having at the centre the development of new training strategies aimed at preparing future workers in the medical fields from developing countries. As lack of infrastructural facilities and staff's expertise have been identified as major challenges for better

practices of e-health in Bangladesh, the stress could be put on cooperation and exchange of knowledge rather than a direct economic outcome from Japan. Under these agreements, a fixed number of people would go to Japan to participate in training courses, acquiring a certain level of knowledge that could be later applied in the healthcare system in the home country after the end of the programme. Japan has already signed agreements with a number of nations for a wide range of purposes but more can be done to foster cooperation aimed at contributing to the improvement of the quality of life in developing regions. Bangladesh and Japan has diplomatic relations since 1972 and Japan has become one of the major contributors to the development of the Asian developing country. During an official meeting in 2010, the Prime Ministers in office of Bangladesh and Japan highlighted the fundamental role of ICTs tools and networks in supporting the efforts on human resource development [23]. Special scholarships could be designed by the Japanese government in order to allow professionals in the medical field from Bangladesh to spend a period of time in Japanese healthcare facilities or institutions. Moreover, a formal commitment of Japan in facilitating the transfer of knowledge to Bangladesh can give origin to projects of bilateral cooperation with the purpose of creating education and training programmes directly in Bangladesh or through the Internet (e-learning).
E-health in Bangladesh, as in other developing country, is still at a primordial stage. Possibilities to develop e-health services are restricted mainly due to insufficient investments, ICTs infrastructures and human resources. One opportunity might come from the progress of mobile telephone market. It could give a boost to the development of a tailor-made strategy to inform the general public and promote e-health starting from a different perspective in a more organised way. To approach e-health in Bangladesh through mobile telephones could lead to a gradual but widespread development of new healthcare services delivered with the help of ICTs. They could be subsequently applied also to other devices increasing the means to provide a wider variety of care and assistance.

7 Conclusions

The application of e-health solutions has brought significant advancements in the healthcare industry, which has already been embraced in the industrialised countries. Developing countries are also striving to readjust the healthcare industry by use of ICTs in different ways. IT training and infrastructure development has been identified as the most expensive part of e-health implementation. For this reason, cooperation from Japan for providing training as well as investment in infrastructural development would make a positive difference in the health sector of Bangladesh in the near future.

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