

**PROJECT PROPOSAL**  
**FOR**  
**E-HEALTH CARE SOLUTION**  
**BY USING**  
**TOUCH SCREEN KIOSK**

## **1. INTRODUCTION**

In this era of ever advancing technologies, it should be the dearest dream of every human being to be able to utilize technology for the benefit of the global population; spanning from the most advanced to the most remote areas of civilization. Especially in areas where poverty has become a long lasting curse, and where, despite hard work, citizens continue to face tremendous obstacles in creating a sustainable way of life for themselves and their family, it becomes the noble and ethical responsibility of the more fortunate persons and established organizations to provide the less fortunate with these technologies.

This holds true for most of the developing and underdeveloped countries all over the globe. Our dear Bangladesh is no exception to this rule. Here, even after 36 years of freedom, per capita yearly income is only USD599<sup>[1]</sup> with 40% of the entire population living below, and in many cases far below, the poverty line. In terms of health care services, a country of more than 140 million people has only 44,632<sup>[1]</sup> doctors. The lion's share of available medical facilities is situated in the capital city of Dhaka. Areas outside the capital, even the major districts around the country have a severe lack of proper healthcare services. Every year countless Bangladeshis including children and pregnant women face a death which could easily be avoided with proper planning and implementation of technology.

E-health, a recent buzz word in the area of e-technologies, can create new opportunities and work in collaboration with the traditional health care systems of Bangladesh. It can take health care all over the country including the remotest, and neediest, areas. According to Intel, e-health is “a concerned effort undertaken by leaders in healthcare and hi-tech industries to fully harness the benefits available through convergence of the Internet and health care”.

Implementing healthcare facilities through hi-tech systems in Bangladesh can be a very effective way to provide appropriate treatments in a timely and decentralized

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<sup>[1]</sup> [http://www.bbs.gov.bd/dataindex/pb\\_wb\\_page.pdf](http://www.bbs.gov.bd/dataindex/pb_wb_page.pdf) (page: 9-10)

manner. The kiosk based e-healthcare project, which has been proposed in this paper, aims at improving the efficiency and effectiveness of Bangladesh's antiquated healthcare system through the proper use of information technologies. Its vision is to assist the average people of our country in using information and communication technologies (ICTs) properly, in order to improve access to and quality of healthcare delivery while reducing the costs of management.

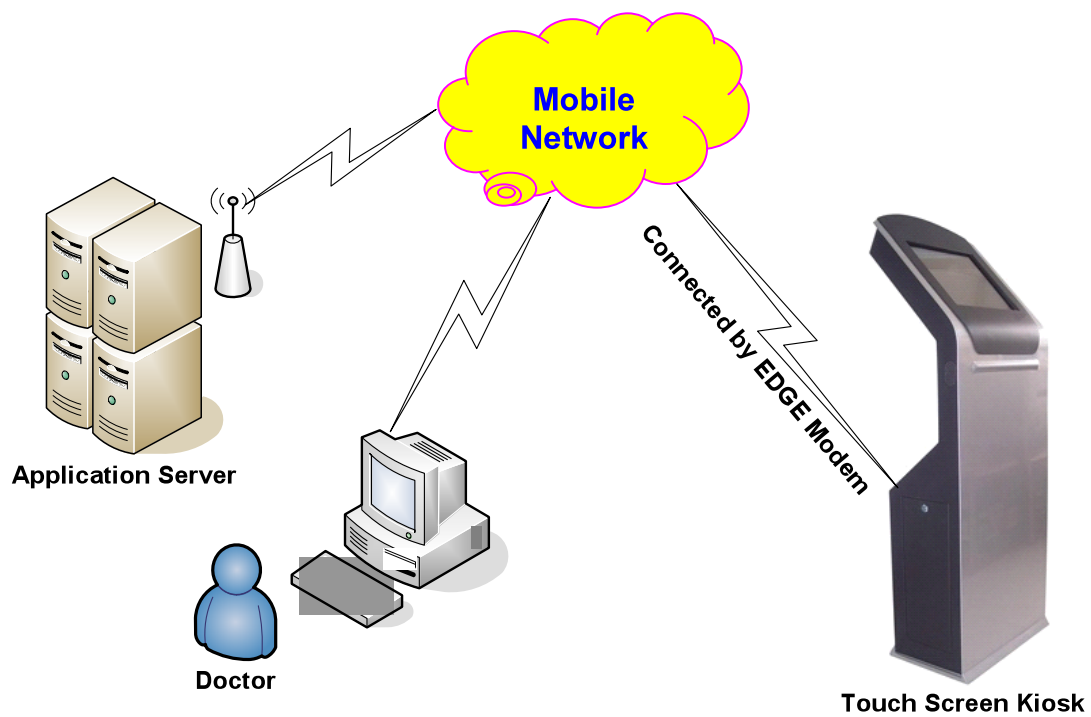


Figure 1: showing e-health care network.

## **2. System Overview**

Touch Screen Kiosk is a booth used for a variety of purposes to act as a user friendly interface between a user and the database. WiMax enabled kiosks can be used as a communication device to connect remote clients with experts. The proposed touch screen kiosk can be a lifesaver for residents of rural and rural areas in several ways.

First, the kiosk will have adequate information on different types of health related issues. Even in the elementary phase it will be able to convey disease, nutrition, and mother and child care related information, as well as updated news alerts. For example: in emergency cases, such as a sudden out break of avian bird flu, the kiosk will be able to broadcast bulletins on prevention, care and cure. Information on doctors and treatment centers will also be available through the kiosk. In the intermediate stage, it will be able to give primary diagnosis services to individual patients. In the advanced stage, with the assistance of proper networking through WiMax or any other suitable system, patients can receive direct feedback from doctors, who are located in distant locations.

The proposed Kiosk booth will be the perfect option for Bangladesh because the kiosk's interface will be very simple and user friendly. Neither a high level of education nor computer literacy will be necessary. The screen will be large and clear and the device will work with the simple touch of a finger. Even those who are completely illiterate will have access because a standby human operator will always be available to assist the user. The system will be voice enabled, so even the human operator need not be highly skilled.

The e-health care solution can be introduced in three phases for the simplicity of research and implementation. A schematic diagram of the three phases is shown below.

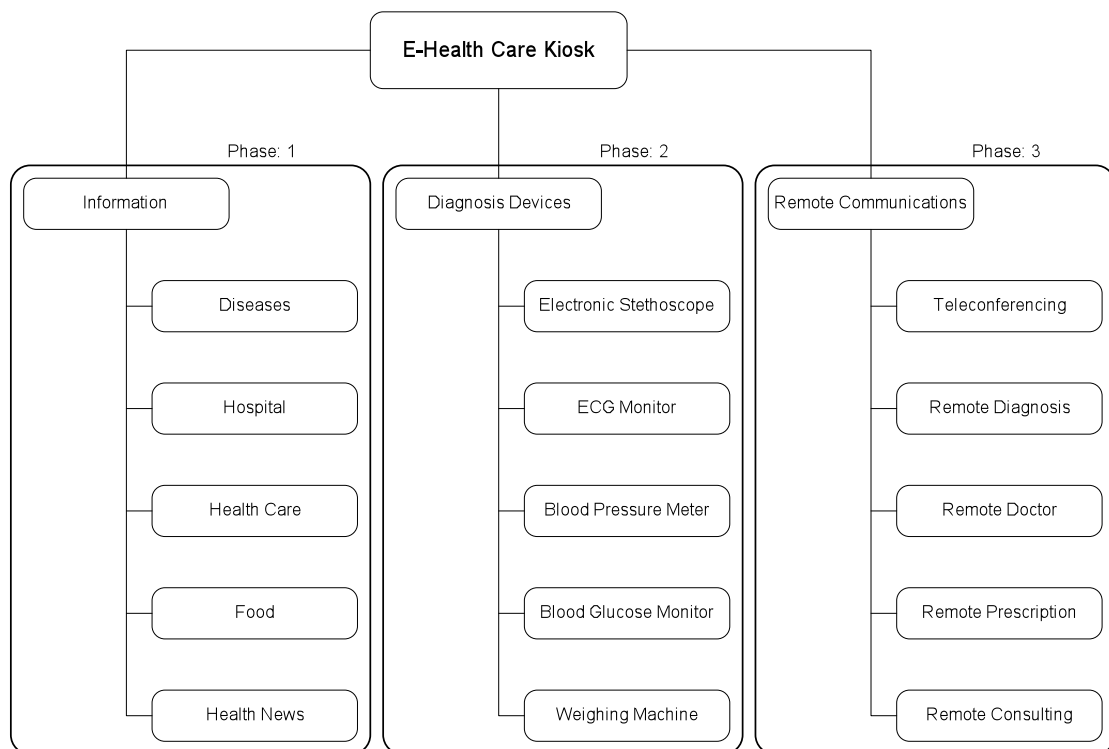


Figure 2: showing e-health workflow by phase.

### 3. System Analysis

#### 3.1 Elementary Phase

In this stage, data on several health related issues will be stored in the kiosks. Patients will be able to get their desired information from the booths; they will also be able to take printouts of the information with a negligible payment. A human operator will assist the booth user in finding the correct information and providing print outs. He or she will also run a drug store, which will be established beside the kiosk.

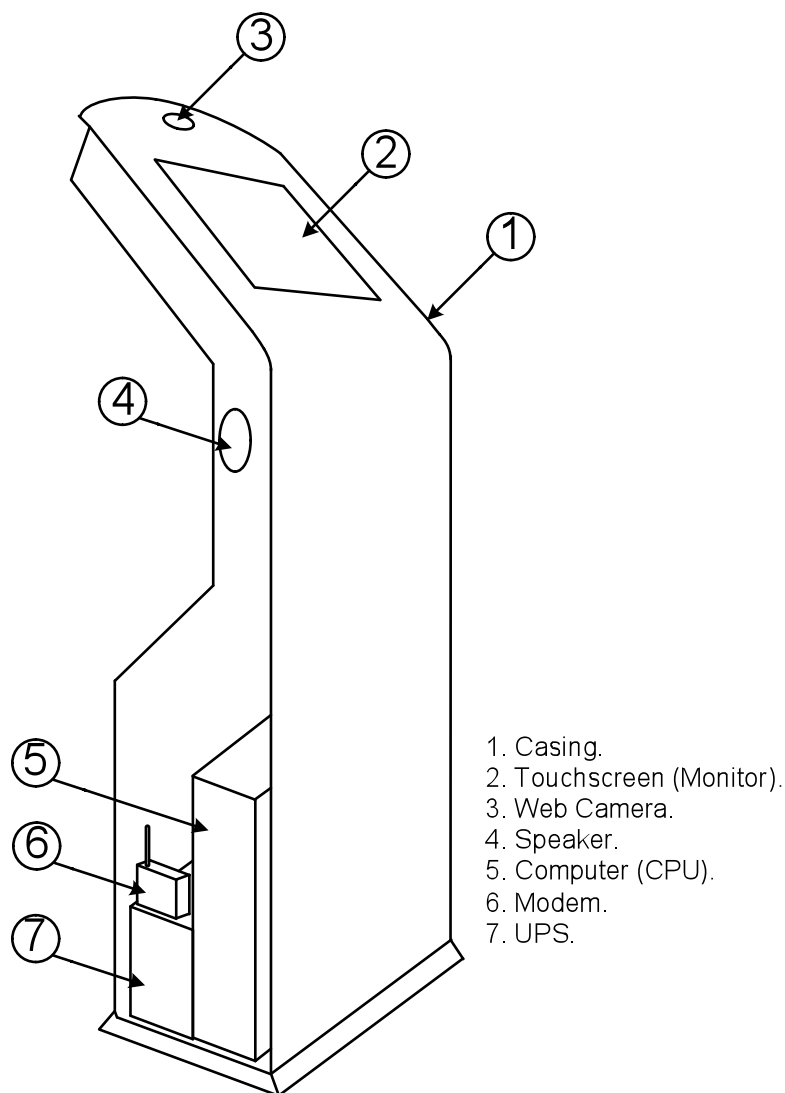


Figure 3: illustrating e-health care touch screen kiosk.

### **3.1.1 Task Distribution**

The users will be able to access the kiosk database to find:

- information on physicians categorized by their location, specialization area, working hours, fees, contact information, etc.
- information and treatment guidelines for commonly occurring physical problems such as peptic ulcer, vision problems, pre- and post- natal problems, seasonal flu, diarrhea, etc.
- information about maternity care including the nearest health care center, pre- and post- natal care, emergency handling, etc.
- diet chart for individuals customized for gender, age, and financial status
- alerts about latest health issues; for example, in crisis periods when certain disease epidemics or other health related problems occur, the kiosk can provide the required information regarding prevention and cure

The information in the kiosk will be sorted out both by location and topic. All the kiosks will be connected through WiMax, so regular up-grades of the databases will be quick and inexpensive.

### **3.1.2 Hardware requirement**

The primary requirements in the elementary phase will require the following:

#### *A) Computer*

A computer is a machine that manipulates data according to a list of instructions. An ASUS EEE PC, also known as a mini laptop, will be sensible in terms of price, quality, and space.

#### *B) UPS*

An uninterruptible power supply (UPS), known as a continuous power supply or a battery backup, is a device which maintains a continuous supply of electric power to connected equipment by supplying power from a separate source when utility power is not available. It differs from an auxiliary power supply or standby generator because a generator does not provide instant protection from a momentary power interruption.

The UPS is typically used to protect computers, telecommunication equipment, or other electrical equipment where an unexpected power disruption could cause injuries, fatalities, serious business disruption or data loss. Therefore, in order to have a smooth system, the kiosks should be equipped with high quality UPS units.

### *C) Touch Screen*

A Touch screen is a display, which can detect the location of touches within the display area. This allows the display to be used as an input device removing the need for a keyboard and/or mouse as the primary input device used to interact with the display's content. Such displays can be attached to computers or, as terminals, to networks. As we do not expect most of the users to be familiar with mouses or key boards, touch screen is the best option in this e-health care project.

The elementary phase will have fundamental elements like kiosk casing, WiMax enabled PC (preferably laptop), touch screen monitor, UPS, speaker, EDGE modem, printer, etc. The costs will also include one full time operator who will be running the booth. The operator will not only run the kiosk, but he will also assist in printing prescriptions and retrieving other data, and run the drug store situated beside the booth.

### **Power Backup Options:**

The kiosks setup all over the country will be basically run by electricity provided by Palli Biddut. However, Palli Biddut is not always able to provide uninterrupted powers supply and alternative supply options should be kept available at all times. In the proposal we have included UPS s the alternative. Solar Panel can also be added to the system as an environmental friendly option. Even in that case UPS should be kept as an option for used in rainy seasons or times when solar panels cannot work due to lack of sunlight.

### 3.1.3 Hardware Budget

SL	Item Name	FOB	Unit Price	Qty	Amount in BDT
01	17" LCD Touch Screen Monitor*	Dhaka	Tk. 40000	1	40,000
02	ASUS EEE PC**	Dhaka	Tk. 26000	1	26,000
03	EDGE/GPRS Modem	Dhaka	Tk. 10000	1	10,000
04	UPS***	Dhaka	Tk. 4000	1	4,000
05	Printer	Dhaka	Tk. 11500	1	11,500
06	Kiosk Casing with Cooler and Cable	Dhaka	Tk. 30000	1	30,000
07	Speaker	Dhaka	Tk. 4000	1	4,000
08	Accessories	Dhaka	Tk. 5000		5,000
09	Miscellaneous		Tk. 10000		10,000
<b>Grand Total:</b>					<b>1,40,500</b>

\*Add Tk. 70800/= For 3M USA

\*\*Wi-Fi Enabled (Mini Laptop)

Speed: 933MHz, RAM: 512MB, HDD: 4GB

\*\*\*Add Tk.. 70800/= for solar panel

### 3.2 Intermediate phase

The intermediate phase is the second stage of the e-health care project and should be put into operation only after the elementary stage is successfully implemented. In this phase, the kiosk booth will also be able to provide individual health care services to the users. Several accessories will be added to the kiosks. The accessories will include blood pressure meters, blood glucose monitors, ECG monitors, digital weight and height meters, etc. Users will have to follow the easily understandable and voice enabled procedures to find out about their blood pressure, blood glucose, heart rate, weight, and height. One operator will assist the user and run a drug store situated beside the kiosk.

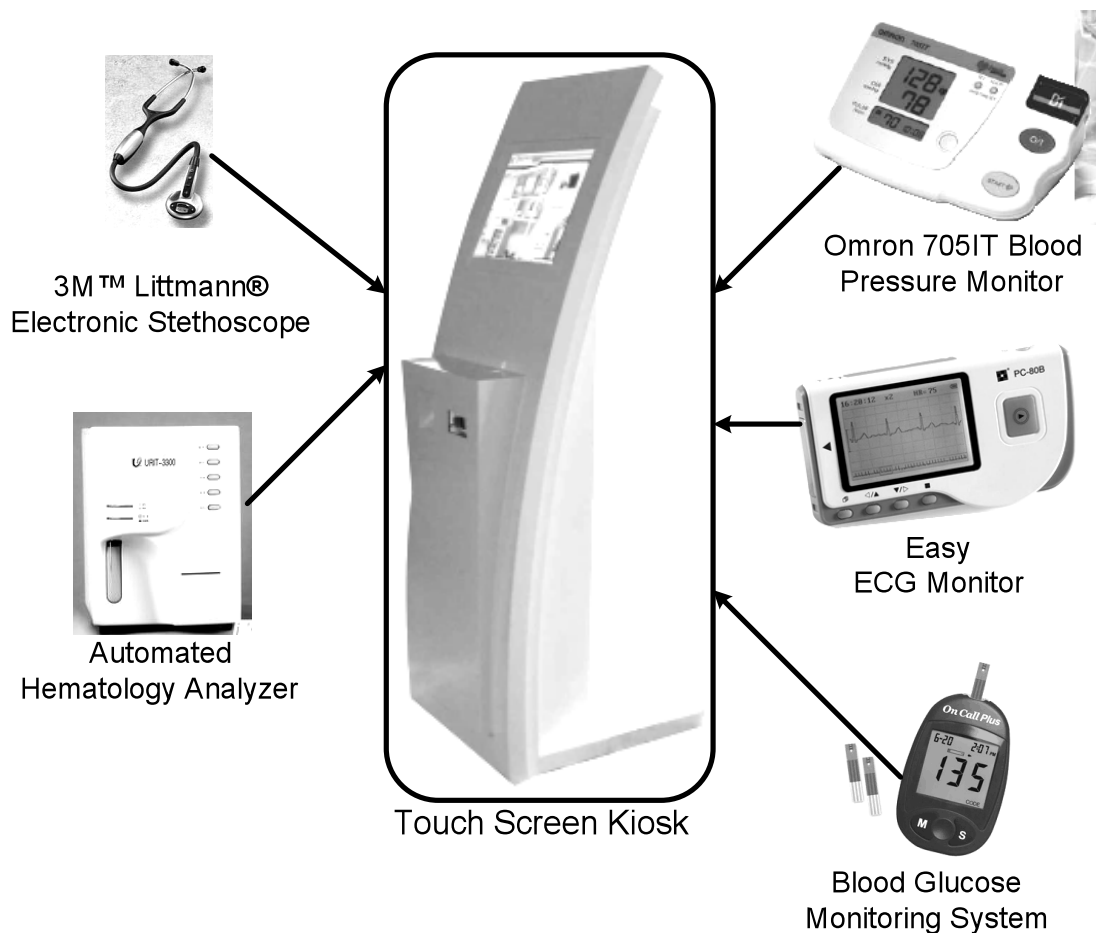


Figure 4: e-health care kiosk at second phase.

### **3.2.1 Task distribution**

The people will be able to utilize several auto-diagnosis devices. The devices in this stage would include:

- Blood pressure measurement and alert signal for extreme high or low pressure
- ECG monitor and alert
- Blood glucose monitor and individual record keeping facilities for diabetics
- Weight measurement and respective diet chart
- Height measurement
- Instant measurement printout
- Past record printout

### **3.2.2 Hardware requirement**

In this stage several extra devices would be added to the kiosk including:

#### *A) Stethoscope*

The stethoscope is an acoustic medical device for auscultation, or listening to, internal sounds in a human or animal body. It is most often used to listen to heart sounds and breathing. It is also used to listen to intestines and blood flow in arteries and veins. There are several types and models of stethoscope available in the market; we chose the 3M™ Littmann Electronic Stethoscope Model 4100WS. It has several useful features:

- Amplification and proprietary Ambient Noise Reduction (ANR) technology reduces ambient noise by an average of 75% (-12dB) without eliminating critical body sounds.
- Three frequency modes are available for listening to heart, lung, and other body sounds: Bell (20-200 Hz), Diaphragm (100-500 Hz), and Extended Range (20-1000 Hz).
- Digital signal processing offers recording, storage, and playback capabilities, as well as the ability to transfer recorded sounds via an infrared transmission to another Model 4100 or Model 4000 or IBM-compatible computer or hand-held device.

- When combined with the 3M™ Sound Analysis Software, an exquisite state-of-the-art auscultation system that provides images of what is being heard via visual display of a phonocardiogram.
- This “hardware” and “software” combination will serve as a diagnostic aid and allow for more effective use of e-healthcare and/or telemedicine.

#### *B) Blood Pressure Meter*

A sphygmomanometer, or blood pressure meter, is a device used to measure blood pressure. It is comprised of an inflatable cuff to restrict blood flow and a mercury, or mechanical, manometer to measure the pressure. It is always used in conjunction with a means to determine at what pressure blood flow is just starting, and at what pressure it is unimpeded. Manual sphygmomanometers are used in conjunction with a stethoscope. While digital wrist blood pressure monitors use automatic inflation.

For the e-health care project we propose the Omron 705IT blood pressure monitor complete with PC interface cables and computer software so that it can download the readings to the computer and the information can be viewed as a graph.

Omron 705IT Blood Pressure Monitor Includes:

- Omron 705IT blood pressure monitor.
- Storage case.
- Medium-cuff for arm circumference 22 - 32 cm.
- Batteries.
- Instruction manual.
- CD-ROM containing the computer program.
- USB connector is supplied with each monitor to connect the blood pressure monitor to computer.

#### *C) ECG Monitor*

An electrocardiogram or ECG is a graphical display produced by an electrocardiograph, which records the electrical activity of the heart over time. Electrical waves cause the heart muscles to pump. These waves pass through the body

and can be measured through electrodes (electrical contacts) attached to the skin. Electrodes on different sides of the heart measure the activity of different parts of the heart muscle. An ECG displays the voltage between pairs of these electrodes, and the muscle activity that they measure, from different directions. This display indicates the overall rhythm of the heart, and weaknesses in different parts of the heart muscle. It is the best way to measure and diagnose abnormal rhythms of the heart.

Easy ECG Monitor will be a suitable option for this e-healthcare project because it can analyze ECG waveform results displayed on high resolution LCD. This model is a great power saver because there is an automatic power-off option if there is no signal for 35 seconds. Measurement can be taken around 500 times with only two batteries. Data can be stored in an inserted SD card. It is small, portable and easy to operate.

Easy ECG Monitor Features:

- Measurement results transmittable to PC through serial port.
- Extended storage capacity by SD card, each record with 30-second ECG waveform and measurement result.
- Measurement of one channel ECG anytime, anywhere.
- Display of ECG waveform, heart rate, analysis results and battery status.
- ECG Viewer software for PC is available.
- Auto power-off while no key is pressed for 35 seconds.
- Analysis and presentation for 17 types of ECG waveform.
- BMI value calculation.

#### *D) Blood Glucose Monitor*

A glucose meter is a medical device for determining the approximate concentration of glucose in the blood. It is a key element of home blood glucose monitoring (HBGM) by people with diabetes mellitus or those prone to hypoglycemia. A small drop of blood obtained by pricking the skin (typically, on the finger tip) with a lancet is placed on a disposable test strip that the meter reads and uses to calculate the blood glucose level. The meter then displays the level of blood glucose in mg/dl or mmol/l.

On-Call® Plus Blood Glucose Monitor, which we have selected for our project has the following features:

- Convenient, reliable results— Capillary action strips allow a quick and simple application of blood. In only 10 seconds, the meter produces an accurate reading.
- Less painful results— Requires only 1uL of blood and allows testing on forearms and palms.
- Affordable results— Frequent testing helps improve control.
- Information to better manage diabetes— Memory feature stores up to 300 tests and provides 7, 14 and 30-day averaging. Results can also be downloaded to a PC.

### 3.2.3 Hardware Budget

The costs associated in the second phase include the followings:

SL	Item Name	FOB	Unit Price	Qty	Amount in BDT
01	Omron 705IT Blood Pressure Monitor with PC Interface Cable and Software	UK	£129.94	1	17,672
02	3M™ Littmann® Electronic Stethoscope Model 4100WS with PC interface Cable and Software	USA	\$520	1	35,880
03	PC-80B Easy ECG Monitor with ECG Lead Wire, PC Interface Cable and Software	China	\$245	1	16,905
04	On-Call® Plus Blood Glucose Monitor with PC Interface Cable and Software	Dhaka	Tk. 3500	1	3,500
05	Digital Weighing Machine	Dhaka	Tk. 5000	1	5,000
<b>Grand Total:</b>					<b>78,957</b>

*Money exchange rate:*  
£1= Tk. 136 on May 23, 2008  
\$1= Tk. 69 on May 23, 2008

### 3.3 Advanced phase

The advanced phase will take the proposed health care solution to a state-of-the-art level, where the physicians will be directly connected with the system. Patients will be able to consult with the doctors and also book appointments if required. The reports of patient diagnosis will also be transferable through the network to the doctors, allowing them to treat a patient without ever meeting them face to face.

#### 3.3.1 Task distribution

The options in this phase will include:

- Checking out the proper physician or specialist from a list of agreeing participants
- Booking an appointment and consulting the doctor over the WiMax connection
- Checking patient record and diagnosis report (from physician's terminal)
- Prescribing drugs and diagnosis
- Printing prescription
- Consulting available doctors for every day queries or emergency needs

In the last phase, costs are relatively negligible because all the equipment from the earlier two phases will be continuously used in this last phase. In this phase the kiosk will be linked with the doctors' chambers, so a reliable high speed connection will be the prime requirement.

#### 3.3.2 Hardware requirement and budget

SL	Item Name	FOB	Unit Price	Qty	Amount in BDT
01	Webcam	USA	Tk. 2000	1	2,000
02	Wireless LAN Card (for Wi-Fi or WiMAX)*	Dhaka	Tk. 2000	1	2,600
					4,600

Note:

\*This Item may not be needed if Wi-Fi Enable Laptop is used instead of Desktop PC.

### 3.4 Manpower Analysis

Proper and adequate human resources are a main issue in any innovative work. The proposed e-healthcare project is not an exception. In the developmental stage for the elementary and intermediate phases of the task, we shall require – people. They are

- ✓ Project manager:
  - Responsibilities: task distribution, supervision, time management, report to higher authority
  - Remuneration: 20 thousand taka per month
- ✓ Interface designer:
  - Responsibilities: graphic designing, animation, coding in Flash and Adobe
  - Remuneration: 15 thousand taka per month
- ✓ Hardware engineer:
  - Responsibilities: Hardware setup, installation and trouble shooting
  - Remuneration: 10 thousand taka per month
- ✓ Technician:
  - Responsibilities: assistant to the hardware engineer
  - Remuneration: 5 thousand taka per month
- ✓ Consultant doctor:
  - Responsibilities: disease analysis and assistance in design phase
  - Remuneration: on contact
- ✓ Content writer:
  - Responsibilities: translation and documentation
  - Remuneration: 5 thousand taka per phase

In the advanced phase, the kiosk booths setup all around the country will be brought into one network. In this phase a *group of doctors and specialists* have to be brought into a private network and given limited access to the system to consult the patients and view the diagnosis reports. Also, a regular *data entry operator* will be required to upgrade the current healthcare bulletin to all the kiosks set around the country through the network. In all the three phases the kiosks will each require one *full time operator* to assist the users and run a drug store alongside the kiosk.

The total project will run for about 12 months and after the first four months the phases will start working in parallel. The total manpower expense for this work is as follows:

<b>SL</b>	<b>Position of employee</b>	<b>Number of employees</b>	<b>Remuneration / month</b>	<b>Duration (in month)</b>	<b>Amount in BDT</b>
01	Project Manager	1	Tk. 20,000	12	2,40,000
02	Interface Designer	1	Tk. 15,000	10	1,50,000
03	Hardware Engineer	1	Tk. 10,000	10	1,00,000
04	Technician	1	Tk. 5,000	10	50,000
05	Consultant Doctor	1	-	10	-
06	Content Writer	1	Tk. 5,000 / phase	10	10,000
					6,50,000

Task distribution of the project is shown by the Gantt charts in the following page:

## 4. Report Generation

The kiosk will have a separate data base to keep the usage records for further analysis. Report on usage can be generated at fixed intervals and also on requirement basis.

Various types of reports can be generated including:

- user information: number of users, user details (sex, gender)
- usage pattern according to time variation: day, time
- type of usage: natal care, disease analysis, food chart etc.
- User comment: the kiosk will have a comment record option. Users can record their views, complaints or suggestions about the new system.

Generated reports can be analyzed later for problem detection and further improvement of the system.

## 5. Total Expense for One Year Pilot project

Total pilot project costing for one year:

SL	Item Name	Costing in BDT
01	Elementary Phase	1,40,500
02	Intermediate Phase	78,957
03	Advanced Phase	2,000
04	Manpower remuneration for one year	6,50,000
Grand Total:		8,71,457

## 6. Cost Reduction

The expense per kiosk can be reduced to some extent during mass production by using manual equipments for diagnosis. However, it should be kept in mind that using manual devices will reduce the expenditure only at the cost of decreased speed and accuracy. Economy Version of E-Health Care Touch Screen Kiosk for mass scale production will have the following features and cost:

SL	Item Name	FOB	Unit Price	Qty	Amount in BDT
01	17" LCD Touch Screen Monitor	Dhaka	Tk. 30000	1	30,000
02	ASUS EEE PC	Dhaka	Tk. 26000	1	26,000
03	EDGE/GPRS Modem	Dhaka	Tk. 6000	1	6,000
04	UPS	Dhaka	Tk. 4000	1	4,000
05	Printer	Dhaka	Tk. 11500	1	11,500
06	Kiosk Casing with Cooler and Cable	Dhaka	Tk. 15000	1	15,000
07	Speaker	Dhaka	Tk. 2000	1	2,000
08	Blood Pressure Meter (Manual)	Dhaka	Tk. 2000	1	2,000
09	3M™ Littmann® Electronic Stethoscope Model 4100WS with PC interface Cable and Software	USA	\$520	1	35,880
10	Plus Blood Glucose Monitor	Dhaka	Tk. 2000	1	2,000
11	Weighing Machine (Manual)	Dhaka	Tk. 1000	1	1,000
12	Webcam	Dhaka	Tk. 2000	1	2,000
13	Accessories	Dhaka	Tk. 5000		5,000
<b>Grand Total:</b>					<b>1,42,380</b>

## **7. Conclusion**

The proposed kiosk will not require highly skilled manpower or high cost. It will be an easy way to reach the poor, and least benefited portion of the population residing in the remotest areas of the country. In the long run, the kiosks will be self-sufficient because the drug store and the printer facility will be able to earn enough revenue to run the individual kiosks. In the advanced stage, when the doctors will be linked with the system, the patients will be charged based on the specialists' criteria and time of consultation. The last phase will not require any extra investment for the extra services.

Technology can be called a blessing to humans, but only when it is used for the greatest benefit of every one. A blessing does not only indicate the success of the event, rather it shines more light on the implementer himself. Therefore, the proposed touch screen kiosk based health care system should be promoted and implemented for the sake of the ignored and the mental peace of the advanced society.

## Appendix

Contact address of instrument suppliers:

SL	Product Name	Product Suppliers Address
01	<ol style="list-style-type: none"> <li>1. 17" LCD Touch Screen Monitor</li> <li>2. Kiosk Casing with Cooler and Cable</li> </ol>	Apollo Technologies Manzila Super Market (3rd Floor) Plot 6, Road 3, Section 7 Mirpur, Dhaka 1216 Tel: 8014310, 8021016 Webpage: <a href="http://www.apollotechs.com">www.apollotechs.com</a> Email: <a href="mailto:apollosar@yahoo.com">apollosar@yahoo.com</a>
02	<ol style="list-style-type: none"> <li>1. ASUS EEE PC**</li> <li>2. EDGE/GPRS Modem</li> <li>3. UPS</li> <li>4. Printer</li> <li>5. Speaker</li> <li>6. Accessories</li> </ol>	Ryans Computer 123/5 (1st Floor) BCS Computr City IDB Bhaban, Agargoon, Dhaka Tel: 8151389, 8118298 Email: <a href="mailto:ryans@agni.com">ryans@agni.com</a>
03	Omron 705IT Blood Pressure Monitor with PC Interface Cable and Software	SuperLiving Ltd 9 Philip House, Honiton Road, Exeter Devon, UK EX1 3RU Email: <a href="mailto:orders@superliving.co.uk">orders@superliving.co.uk</a> Tel: 86 1392 360125 Webpage: <a href="http://www.superliving.co.uk">www.superliving.co.uk</a>
04	3M™ Littmann® Electronic Stethoscope Model 4100WS with PC interface Cable and Software	AllHeart.com - Professional Appearances, Inc. PO Box 6810 Vernon Hills, IL. 60061-6810 Tel: 1 866 653 3626 Webpage: <a href="http://www.allheart.com/littmann4000.html">www.allheart.com/littmann4000.html</a> Email: <a href="mailto:customerserviceallheart.com">customerserviceallheart.com</a>
05	PC-80B Easy ECG Monitor with ECG Lead Wire, PC Interface Cable and Software	Creative Medical 2/F, Block 3, Nanyou Tian'an Industry Town Shenzhen, GD, 518054 P. R. China Tel☐ 86 755 2643 3514 Webpage: <a href="http://www.creative-sz.com">www.creative-sz.com</a> Email: <a href="mailto:market@creative-sz.com">market@creative-sz.com</a>

<b>SL</b>	<b>Product Name</b>	<b>Product Suppliers Address</b>
06	On-Call® Plus Blood Glucose Monitor with PC Interface Cable and Software	Bangladesh Medical Instruments 605 Rose View Plaza (5th Floor). 185 Elephant Road, Hatirpool, Dhaka 1205 Tel: 9660753