Challenge in Traditional Service Delivery for Diabetes Management: Mobile Health, a Technology Driven System, is the Alternative?

Mahmud Akhter Shareef
School of Business, North South University
Plot 15, Block B, Bashundhara, Dhaka 1229, Bangladesh
88 02 8852000, Ext. 1772; Fax: 8852016
mahmud_akh@yahoo.com

Vinod Kumar
Sprott School of Business, Carleton University
1711 Dunton Tower, 1125 Colonel by Drive, Ottawa ON K1S 5B6, Canada
Tel: 1 613 520 2379; Fax: 1 613 520 4427
vinod_kumar@carleton.ca

Yogesh K. Dwivedi*
School of Management,
Swansea University,
Swansea, SA2 8PP, Wales, UK
Tel: +44 (0) 1792 602340 ; Fax: +44 (0) 1792 295626
ykdwivedi@gmail.com
***Corresponding Author**

Uma Kumar
Sprott School of Business, Carleton University
707 Dunton Tower, 1125 Colonel by Drive, Ottawa ON K1S 5B6, Canada
Tel: 1 613 520 6601; Fax: 1 613 520 4427
uma_kumar@carleton.ca

Bhasker Mukerji
Gerald Schwartz School of Business and Information Systems
St. Francis Xavier University
P.O. 5000, Antigonish, Nova Scotia
B2G2W5, Canada
Ph: +1-902-867-5050
bmukerji@stfx.ca

Abstract: This case study is written on the Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders (BIRDEM). This is the largest diabetes management hospital in Asia. The newly appointed Executive Director, Mr. Habib, is attempting

to launch a new revolutionary mobile health service system driven by modern wireless technology for better service quality, higher efficiency, and patient convenience, which is ultimately targeted toward achieving a higher return on investment. This is a challenging issue as it is a complex concern based on users' technological, behavioral, and cognitive beliefs. Nevertheless, Mr. Habib has decided to take this challenge.

Keywords: M-Health; Diabetes Management; Service Delivery, Healthcare, Consumer attitude

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Biographical notes:

Mahmud A. Shareef is an Associate Professor of school of business, North South University, Bangladesh. He was a visiting faculty in DeGroote School of Business, McMaster University, Canada during his post doctorate research. He has done his PhD in Business Administration from Sprott School of Business, Carleton University, Canada. He received his graduate degree from both the Institute of Business Administration, University of Dhaka, Bangladesh in Business Administration and Carleton University, Ottawa, Canada in Civil Engineering. His research interest is focused on online consumer behavior and virtual organizational reformation. He has published more than 60 papers addressing consumers adoption behavior and quality issues of e-commerce and e-government in different refereed conference proceedings and international journals. He was the recipient of more than 10 academic awards including 3 Best Research Paper Awards in the UK and Canada.

Vinod Kumar is a Professor of Technology and Operations Management of the Sprott School of Business (Director of School, 1995–2005), Carleton University. He received his graduate education from the University of California, Berkeley and the University of Manitoba. Vinod is a well known expert sought in the field of technology and operations management. He has published over 150 papers in refereed journals and proceedings. He has won several Best Paper Awards in prestigious conferences, Scholarly Achievement Award of Carleton University for the academic years 1985–1986 and 1987–1988, and Research Achievement

Award for the year 1993 and 2001. Vinod has given invited lectures to professional and academic organizations in Australia, Brazil, China, Iran, and India among others.

Yogesh K Dwivedi is a Professor of Digital and Social Media and Head of Management and Systems Section in the School of Management at Swansea University, Wales, UK. He obtained his PhD and MSc in Information Systems from Brunel University, UK. He has co-authored several papers which have appeared in international refereed journals such as CACM, DATA BASE, EJIS, IJPR, ISJ, ISF, JCIS, JIT, JORS, TMR and IMDS. He is Associate Editor of *European Journal of Marketing, European Journal of Information Systems and Government Information Quarterly*, Assistant Editor of JEIM and TGPPP, Senior Editor of JECR and member of the editorial board/review board of several journals. He is a life member of the IFIP WG8.6 and 8.5.

Uma Kumar is a Full Professor of Management Science and Technology Management and Director of the Research Centre for Technology Management at Carleton University. She has published over 140 papers in journals and refereed proceedings. Ten papers have won best paper awards at prestigious conferences. She has won Carleton's prestigious Research Achievement Award and, twice, the Scholarly Achievement Award. Recently, she won the teaching excellence award at the Carleton University. She has been the Director of Sprott School's Graduate Programs. She has consulted DND, CIDA, the Federal partners of technology transfer, and the Canadian association of business incubators. Uma has taught in executive MBA program in Hong Kong and in Sprott MBA in Ottawa, Iran, and China. Over last twenty years, she has supervised more than 70 MBA, MMS and EMBA student's projects. She has also given invited lectures to academics and professionals in Brazil, China, Cuba and India.

Dr. Bhasker Mukerji is an Associate professor of Marketing at St. Francis Xavier University, Canada. He has received education in three continents - Asia, Europe and North America and has worked for a number of years in the private sector. He has also taught Marketing courses at Eric Sprott School of Business (Carleton University) and Telfer School of Management (University of Ottawa).

1 Introduction

It is widely believed that patients are frustrated about the traditional healthcare service system due to inefficiency, unavailability, and poor quality (Dwivedi et al., 2013; Shareef et al., 2014). Particularly diabetic patients need to seek physicians' guidance continuously; however, due to busy engagement in professional life, patients cannot find enough time to physically meet physicians regularly (Shareef et al., Forthcoming b). On the other hand, healthcare service is becoming insufficient day by day all over the world due to shortage of resource and escalation of cost (Ford, 2006). Consequently, medical professionals are recently striving to find ways to provide the right healthcare service to the right patients continuously at any time and any place without hampering their daily life. The proliferation of wireless communications as well as modern ICT-related technological equipment has created enormous opportunity for the medical professional to explore the feasibility of this new system in the delivery pattern of modern healthcare to the patients (Shareef et al., Forthcoming b). Recent proliferation and diffusion of technology has opened substantial opportunity for public and private organizations to provide efficient and better quality service to citizens to bring their satisfaction (Alryalat et al., 2013; Dasgupta and Sahay, 2011; Dwivedi et al., 2013; Gupta and Narain, 2012; Kapoor et al., 2014). However, in this regard, understanding citizens' online behaviour and reliability of ICT has potential merit to be explored (Nyangosi and Arora, 2011; Shareef et al., Forthcoming a).

This study has explored the feasibility of providing mobile health service to patients in Bangladesh. This mobile health service operated through modern information and communication technology (ICT) can be provided to remote patients. An advanced healthcare institute in Bangladesh is attempting to launch a new revolutionary mobile health service system driven by modern wireless technology to diabetic patients for better service quality, higher efficiency, and patient convenience, which is ultimately targeted toward achieving a higher return on investment. This study is based on this case study.

2 Organization Background

In Bangladesh, there are around five million diabetic patients who regularly take medical service from different hospitals and clinics. Among the different medical hospitals, clinics, and diabetes centers, BIRDEM, the Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders at Shahbag, Dhaka, Bangladesh, is the largest. It was designed with the collaboration of the World Health Organization (WHO), and is the largest institute in Asia for this kind of medical service. The philanthropic physician Dr. Mohammed Ibrahim was the first to think deeply about the necessity of such a service center in Bangladesh and, with the joint collaboration of a group of social workers, physicians and civil servants, he established the Diabetic Association of Bangladesh (then Pakistan) in 1956 in Dhaka city. In the beginning, this diabetes centre provided service to the out-door patients through a small semi-structure building. Over the years, under the enthusiastic vision of Dr. Mohammed Ibrahim, this small clinic turned into the largest diabetes center not only in Bangladesh but also in Asia with a world-wide reputation.

Now it is a 650-bed multidisciplinary hospital complex named BIRDEM that is operated under the supervision of the Diabetic Association of Bangladesh. After the death of its founder Dr. Mohammed Ibrahim in 1989, this hospital was renamed the Ibrahim Memorial Diabetes Centre.

From the very beginning, this hospital has been providing extended diabetes management service to all of the country's diabetic patients through several out-door patient centers with a very low service charge. As was mentioned, one of its important missions is to: "Provide total healthcare including rehabilitation for all diabetics irrespective of gender, economic and social status through different institutions of Diabetic Associations of Bangladesh" (BIRDEM General Hospital, 2013). At present this hospital has both out-patient and in-patient service constituting the largest health care service centre for diabetic patients in the world. It has extended its service system to some other related disciplines of medicine with about 650 beds for intensive care of In-Patient consumers with all modern amenities. This hospital has also launched several diabetes awareness and management training programs

all over the country. At present, this hospital is also equipped with a Medical College and is launching academic postgraduate courses. This hospital cum medical college is presently offering fourteen post graduate/diploma courses in different fundamental and clinical disciplines. The organization is also engaged in and promoting extensive research in different health-related disciplines.

BIRDEM has primarily two types of patients: namely registered and unregistered. It has in total around four million patients who are under registration taking regular diabetic examination and monitoring treatment through its central medical centre and 42 district level branches in the country. Medical professionals of BIRDEM keep medical records and provide diabetes care management service regularly on a daily or monthly basis to its registered patients. Around 3500 registered diabetic patients are taking this service every day through experienced doctors and nurses. This hospital has also related service for specialized disciplines like Cardiology, Gastroenterology, Surgery, Gynecology and Obstetrics, Nephrology, etc.

3 Setting the Stage

Although, the underlying principle of this privately funded hospital was fundamentally focused on promoting non-profit based health service to all patients in Bangladesh irrespective of their class, for its existence, extension, and quality of service, the hospital is suffering from a shortage of financial support. Board management of this hospital now feels that since Bangladesh is a developing country with a huge population, to provide availability of health service for all citizens, financial strengthening is imperative and essential. However, for a developing country, resource scarcity is a prevalent condition and dependence on external funds should be reduced for professional realization of actual status.

BIRDEM is the first hospital and health service provider to mass people in Bangladesh which adopted and implemented several applications of information and communication technology (ICT) in its different service systems for better service quality, efficiency, and cost

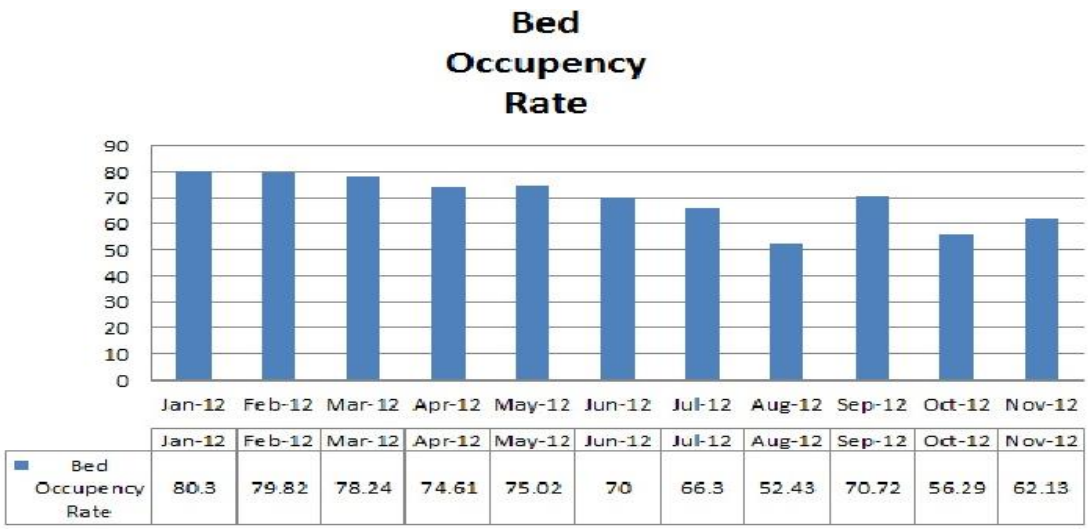
effectiveness. Among those applications, the most potential applications include electronic health record (EHR), patient admission and billing system, human resource management, ambulance monitoring, and procurement management system. A centralized database system is another milestone of this hospital in aid of introducing ICT in their service system. "The existing information in BIRDEM is partly computerized via databases only in patients' admissions, doctors' appointments and medical tests and reports sections" Khan and Saber (2010).

BIRDEM's recent concern is twofold: First, management authority of this hospital fully recognizes that financial support is a problem for this hospital to keep up its fundamental mission to provide low cost but high quality diabetes management service continuously to all its patients all over the country. However, in the absence of a sufficient external support, the hospital authority and concerned medical professionals should enhance its efficiency to lower cost while keeping the same standard of its quality service. The second concern is in serious difficulty in availability and accessibility of their service to patients, particularly those located in remote places, due to patients' financial inability and extreme traffic jams in Dhaka city in reaching any out-door health service center of BIRDEM. The authority also realizes that excellent congruence of a health service providing system with ICT could be able to solve both concerns. Under this circumstance, the management of BIRDEM is deeply concerned with introducing an alternative channel of service providing system to patients with the application of ICT in the core service system which will be less costly but high quality as well as effective in respect to compatibility with the patients daily professional life. Their deep consideration and assumption aided to enhance service quality, productivity, efficiency, and cost effectiveness is targeted in introducing a mobile health care service system to those patients who are engaged in professional life but need regular monitoring of blood-glucose, blood pressure, and cholesterol.

4 Case Description

Mr. Amir Habib has been the Executive Director of BIRDEM since 2012. Before joining here, he was working as the Director, Business Promotion Department, Bellevue Hospital Center, New York, USA. The Board of Directors of BIRDEM hired Mr. Habib to take drastic initiatives

to promote some business models that targeted certain trade offs between low cost service with higher return on investment. Mr. Habib had been very successful in his previous job to enhance the diabetes management program in Bellevue Hospital with excellent financial achievement. Mr. Habib, although he was a consultant physician at certain stage of his professional life, is now assumed to be a successful innovative speculator in formulating customer oriented health service management. After joining BIRDEM, Mr. Habib has been thinking deeply and considering ways to launch a radical change in providing health care service, particularly diabetes management, by introducing mobile health care. This question concerning reformation in the service distribution system came to his mind from at least three issues. First, most of the diabetic patients are engaged in different jobs, so it is extremely tedious for them to come regularly to any diabetes management center operated by BIRDEM due to difficulties in getting time off from the daily job as well as the extreme traffic congestion in Dhaka city. The scenario observed in the gradually low bed occupancy rate of BIRDEM as shown in Figure 1 raised this issue to his mind. So, for the proliferation of diabetes management all over Bangladesh and making the service available and accessible for all patients, as was the fundamental mission of establishing BIRDEM, and considering recent professional busyness of the patients as well as serious inhibitors arising from excessively time-consuming road traffic condition, a mobile health care system for diabetic patients could be an excellent alternative. The second reason was analysis of customer feedback, which clearly depicted that customers' recent perception regarding diabetes health care provided by BIRDEM's external health centers is going down as it is severely time consuming. So, quality should be enhanced. The third reason is related to business feasibility. As his prime responsibility, he has to introduce some initiatives to make the present business model of BIRDEM in providing health care to patients more cost effective and efficient. So, his challenging consideration was to promote application of ICT in the health care service distribution system.



	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12
Bed Occupency Rate	80.3	79.82	78.24	74.61	75.02	70	66.3	52.43	70.72	56.29	62.13

Figure 1 Recent Trend in Bed Occupancy Rate (Source: Ibrahim Cardiac Hospital & Research Institute, 2013)

After deliberating over a new health care service system through a new channel with the help of wireless technology for any remote patients located in their own places maintaining their daily professional life who seek repeated and continuous health monitoring for diabetes as well as blood pressure and cholesterol level monitoring, he understood that mobile health care is imperative to implement. Mobile health researchers Wu et al. (2007) proposed mobile health as a flexible health care system distributed through alternative channel by explaining "healthcare information processing system, including all relevant medical professional participants and the use of new IT/IS to deliver healthcare services and exchange healthcare information via mobile devices anytime and anywhere". The onus of service delivery system is to the patients located in remote places who are extremely dependents on wireless devices, like smart phones, data recording and assessing sensors, and different digital computing, monitoring, analyzing, and processing devices. According to conceptual clarity and explanation of mobile health, researchers conventionally set the paradigms of mobile health as keeping electronic health records (EHR) of patients which is available and accessible from any where and anytime by any authorized medical professionals. These professionals are delivering health care service to the patients at the right time on the spot from anywhere through any handheld mobile devices

such as a smart phone embedded with other health monitoring devices and scanners (Archer, 2007; Kotz et al., 2009; Kumar et al., 2013; Yu et al., 2006).

In his previous job, Mr. Habib had preliminary experience of experimenting certain mobile health recording and monitoring devices among remote patients. He also knew that the USA health care system had a challenge to implement electronic health recording for all patients by 2014 so that health information for any patients could be available and accessible by medical professionals from any where at any time under security authentication. For such a type of remote health care service, the essential devices include, but are not limited to, ICT-driven wireless systems, software, wireless phones like smart phones, and any hand held mobile Internet devices accompanied with health data monitoring devices like accelerometers, pedometers, electrocardiograms, pulse oximeters, blood-glucose meters, weight scales with body sensors. Recorded information from patients will be transmitted to the concerned medical professionals through personal data assistant (PDA), pocket PC, and laptop as well as a wireless network like the WiFi Internet network. Other important devices which should be included for patients physical location identification and communications are short messaging service (SMS), multimedia messaging service (MMS), radio frequency identification (RFID), global positioning system (GPS), etc.

Mr. Habib considered that, excluding traditional diabetes check up and monitoring service offered through all the external branches, BIRDEM will deliver mobile health service particularly to inhabitants of Chittagong hill tracts, like Rangamati, Bandarban, and Khagrachari, who need regular check up and monitoring for blood sugar, blood pressure, and cholesterol due to severe diabetes. He considered this an alternative health delivery system, because due to incompatibility and incongruence with regular in-patient health service system and due to a very difficult, insufficient, and broken road communication system, BIRDEM failed to realize its overarching mission in this region. The proposed business model of this mobile-health would be like this:

Diabetes patients of Chittagong hill tracts, comprising four districts who are professionally very busy or due to old age cannot come to a

nearby diabetes center crossing damaged and insufficient broken roads; these patients, however, who need repeated and continuous monitoring, would be target customers. Through a package deal, the hospital authority will provide them with smart phones with the necessary software to communicate with the respective medical professionals. These patients will wear a wrist band like RFID to identify the specific patient and location containing sensors which include accelerometers, pedometers, electrocardiograms, pulse oximeters, and blood-glucose meters to measure other physical conditions. The patients will be continuously in touch with the medical professionals through a WiFi-enabled laptop and will get feedback from physicians by SMS.

5 Conclusion

Before starting this revolutionary business model as a pilot program for diabetes management, Mr. Habib decided to conduct brainstorming with the director of the information system (IS) department, Mr. Gomez, and the Director of business promotion department, Ms. Gupta.

Mr. Habib is completely aware that this mobile health has at least three artifacts to be considered and analyzed. It is no doubt a technology driven system, so patients' technological belief is of utmost important for its adoption. Mobile health has financial aspects, as it is costly for primary investment. So, a private value analysis is essential from both the perspectives of service provider and service user. And, finally, since patients are habituated for long years with traditional health care service through direct face-to-face interactions with the medical professionals, this new distribution system of diabetes management needs a deep behavioral analysis of the consumers. He learned from the technology diffusion theory that the adoption process is the "mental and behavioral sequences through which the consumer progresses and which may result in acceptance and continued use of a product or brand" (Robertson, 1974). It includes four distinct stages: 1) an innovation, 2) communicated through certain social channels, 3) occurs over time, and 4) stakeholders of a social system (Rogers and Shoemaker, 1971).

Shedding light on technological beliefs, it is a serious challenge to create consumers attitudes for this new self-service technology,

particularly where the product like health service is a sensible item of the utmost importance. Improper usage of mobile health might provide misleading information which could necessitate serious health concerns. Security, privacy, reliability, and trust are several important issues which should be resolved before launching this remotely controlled, wireless driven monitoring system (Meingast et al., 2006; Kotz et al., 2009). It is actually unclear whether patients will develop their positive cognitive behavioral attitudes toward this system. Compatibility is also a serious challenge. Congruency of the product with professional life is always a marketing issue which needs thorough investigations. The primary concern of BIRDEM is to restructure their service system which must be aided to enhance service quality and efficiency but must be cost effective. As an exploratory item with complex technological, financial, behavioral, and marketing conjoint aspects, it is premature to explicitly conceptualize return on investment and consumers feedback on service upgrade. Researchers proclaimed that consumers will pursue their cognitive and affective attitude toward this type of complex technology, if they perceive it easy to use with the necessary controllability (Bandura, 1986; Hwang, 2005; Wu et al., 2011). But in Chittagong hill tracts, inhabitants' standard level of education is poor, so for them to become skilled and perceive self efficacy will be a challenge to be successful for this alternative health service delivery system. Nevertheless, Mr. Habib has no doubt that consumers will definitely perceive this system as providing a relative advantage and being useful. Another aspect which encourages Mr. Habib to exploit this challenging initiative is that since this service system depends significantly on modern technology, patient personal images in the society will be a driving force for them to accept this new health service system. After long discussions with the other two directors, Mr. Habib is now sanguine that in the presence of so many sensitive vulnerabilities, he will promote this new challenging diabetes health care monitoring system from 2013.

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