

2010

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Recommended Citation

Akter, Shahriar; D'Ambra, John; and Ray, Pradeep, "User Perceived Service Quality of mHealth Services in Developing Countries" (2010). *ECIS 2010 Proceedings*. 134.

<http://aisel.aisnet.org/ecis2010/134>

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Journal:	<i>18th European Conference on Information Systems</i>
Manuscript ID:	ECIS2010-0087.R1
Submission Type:	Research Paper
Keyword:	IT to empower, E-health, User behavior, IT service management



USER PERCEIVED SERVICE QUALITY OF M-HEALTH SERVICES IN DEVELOPING COUNTRIES

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Abstract –

Health challenges present arguably the most significant barrier to sustainable global development. The introduction of ICT in healthcare, especially the application of mobile communications, has created the potential to transform healthcare delivery by making it more accessible, affordable and effective across the developing world. However, there is growing concerns about the quality of such services with regard to the robustness of the service delivery platform, knowledge and competence of the provider, privacy and security of information and above all, their effects on satisfaction, future use intentions and quality of life. The aim of this paper is to explore, analyze and critically assess the use of existing service quality theories in the light of evolving and ubiquitous healthcare services and their underlying technologies. The conceptual model of the study identifies that there are three primary quality dimensions (platform quality, interaction quality and outcome quality) and ten subdimensions (System reliability, system efficiency, system availability, system adaptability, system privacy, assurance, responsiveness, empathy, functional benefits and emotional benefits) which play a vital role in capturing users' overall perceptions of mobile health services. Finally, the study identifies future research directions and highlights the managerial implications in the context of developing countries.

Keywords: Perceived service quality, Satisfaction, Intention to continue using, Quality of life.

1. INTRODUCTION

Information and communication technologies (ICTs) have the potential to radically transform healthcare delivery in developing countries (Chatley 2006). The introduction of ICT in healthcare, especially the application of mobile technology based health care services (mHealth), has already transformed healthcare delivery by making it more accessible and affordable across the developing world (Mechael 2009, Ivatury et al 2009, UN foundation & Vodafone foundation 2009). However, there is growing concerns about the perceived quality of such services due to lack of reliability and efficiency of the service delivery platform, knowledge and competence of the provider, privacy and security of information and above all, their effects on satisfaction, future use intentions and quality of life (Kaplan & Litwka 2008, Angst & Agarwal 2009, Ahuwalia & Vershney 2009, Varshney 2005, Norris et al. 2008, Mechael 2009, Ivatury et al 2009, UN foundation & Vodafone foundation 2009). We define perceived quality in mHealth care as the user's judgment about the overall excellence or superiority of the service (Zeithaml 1987). It is noteworthy that perceptions of poor quality of care may dissuade patients from using the available services because health concerns are among the most salient of human concerns (Kaplan & Litwka 2008, Dagger et al. 2006, 2007). In developing countries, expanding access or low costs is not enough if one's confidence in the quality of health care services is low (Andaleeb 2001). If the system cannot be trusted to guarantee a threshold level of quality, it will remain underutilized, be bypassed, or used as a measure of last resort (Dagger et al. 2007, Andaleeb 2001). Overall, the importance of quality perceptions in mHealth environment has been evidenced in numerous studies (e.g., Kaplan & Litwka 2008, Ahuwalia & Vershney 2009, Vershney 2005, Norris et al. 2007, Mechael 2009, UN foundation & Vodafone foundation 2009) because of its strong effects on user satisfaction (Bailey & Pearson 1983; Baroudi and Orlikowski, 1988) future use intentions (DeLone & McLean 2003, Venkatesh et al. 2003) and quality of life (Dagger & Sweeny 2006, Choi et al. 2007, Kaplan & Litwka 2008). Despite this profound importance of perceived service quality in mHealth context, there is a paucity of research in health informatics which have developed metrics to analyze this relationship (e.g., Ahluwalia & Varshney 2009, Chatterjee et al. 2009, Dagger et al. 2007, Dagger & Sweeny 2006, Choi et al. 2007). A review of the literature reveals that it has been under-researched and still most of the literature remains largely fragmented and anecdotal (Chatterjee et al. 2009).

This study fills into these voids by aiming to conceptualize perceived service quality and its association with satisfaction, future use intentions and quality of life for mHealth services in the context of developing countries. To pursue this purpose, it focuses on a popular mHealth setting which is well known as 'mobile telemedicine' in developing countries. In recent years, it has become very popular in low income countries (e.g., India, Bangladesh, Mexico etc.) and serving more than 10 million people by delivering right time medical information, consultation, treatment, triage, diagnosis, and referral and counselling services (Ivatury et al. 2009) .

The rest of the paper is organized as follows: Section 2 focuses on the literature review; section 3 comes up with a conceptual model based on existing theories; Section 4 discusses the future research directions and finally, section 5 concludes the paper with both theoretical and practical contribution.

2. LITERATURE REVIEW

This chapter argues that it is necessary to develop a service quality model from the users' perspective to measure the performance of mHealth services in developing countries. It begins with the definitions of mobile telemedicine as an application of mHealth services, its implications in developing countries, the research platform of the study and finally, the theoretical background of perceived service quality to determine the gaps for the study.

2.1 Definitions: eHealth, mHealth and mobile telemedicine services

Electronic health (e-health) is defined the embryonic convergence of wide-reaching technologies like the Internet, computer telephony/interactive voice response, wireless communications, and direct access to healthcare providers, care management, education, and wellness (DeLuca & Enmark, 2000). It is also defined as the use of information and communications technologies (ICTs) to provide and support health care wherever the participants are located (Brommey 2003). We define ‘mobile health’ as a subset of e-Health and using mobile devices to deliver health services to the customers (Mechael, 2008). It describes the application of mobile telecommunication and multimedia technologies in mobile and wireless health care delivery systems (Istepanian & Lacal, 2003). In broad, it involves using wireless technologies to transmit and enable various data contents and services which are easily accessible by health workers through mobile devices such as mobile phones, smart phones, PDAs, laptops and Tablet PCs (UN foundation & Vodafone foundation 2009). However, this definition has targeted only health workers as the sole users of mobile health services, but in case of mobile telemedicine, the users are both patients and health workers, such as, HMRI in India, MedicallHome in Mexico, Teledoctor in Pakistan & Health Line in Bangladesh (Ivatury et al. 2009). Focusing on such services, this study defines mHealth service as a personalized and interactive service whose main goal is to provide ubiquitous and universal access to medical advice and information to any customers over any mobile device.

2.2 Necessity of mHealth Services in Developing Countries:

Health services are often inadequate in developing countries because they are neither accessible nor affordable and when they are accessible, they are often dysfunctional, low in quality, and unresponsive to the needs of clients (World Bank, 2004). The poor condition of health care in developing countries is widely documented. Table 1 outlines the dire situation of primary health care in developing countries in comparison with developed countries (Ivatury et al. 2009).

Countries	Infant Mortality rate (Per 1000) (2006)	Maternal Mortality (Per100,000) (2005)	Years of life lost due to communicable disease (%) (2002)	Births attended by skilled health personnel (%)	Hospital beds (per 10000)	Total Health workers (per 10000)
India	57	450	58	47 (2006)	9 (2003)	14 (2003)
Mexico	22	63	27	83 (2005)	11 (2002)	28 (2001)
Pakistan	78	320	70	54 (2006)	12 (2005)	12 (2003)
Bangladesh	52	570	60	20 (2006)	3 (2001)	5 (2001)
USA	5	8	10	100(2004)	32(2005)	125 (1999)
UK	7	11	9	99(1998)	39 (2004)	75 (2001)

Table 1: Healthcare indicators in developed and developing countries (Ivatury et al. 2009)

In addition to this, UN report (2008) on MDGs (Millennium Development Goals) represents a formidable picture showing that an estimated 2.5 million newly infected HIV users in 2007 and communicable diseases (Tuberculosis, Malaria etc.) continue to claim lives due to lack of knowledge or access to medication. According to WHO (2006), ‘57 countries have critical shortages in health care workers, with a total deficit of 2.4 million health professionals worldwide.’ Within this context, mHealth has emerged as a viable solution to serve the pressing healthcare needs through its high reach and low cost mechanism by making health care more accessible, affordable and effective across the

developing world (UNF 2008). M-Health is seen as an enabler of change in health care sector. For many years, the mobile phone was not considered powerful tool to reduce the digital divide in health, but the dramatic penetration rate of mobile phones in the low and middle income countries over the last decade has increased the potential of mHealth Services (Mechael 2008). According to Varshney and Vetter (2001) “the current and emerging wireless technologies could improve the overall quality of service for users in both cities and rural areas, reduce the stress and strain on healthcare providers while enhancing their productivity, retention, and quality of life, and reduce the overall cost of healthcare services in the long-term”.

2.3 Research Setting of the Study: Mobile Telemedicine Services in Developing Countries

“.....Afiya lives in the rural Sylhet region of Bangladesh. For two days, her youngest daughter Rubina has been complaining of fatigue and has felt warm to the touch. Taking the child to the nearest clinic would cost Afiya a day’s lost wages, round-trip bus fare, and clinic fees of Taka 200 (US\$ 3). Instead, Afiya and her husband use the family’s mobile phone to dial ‘7-8-9,’ the Healthline hotline service set up by TRCL, Ltd., a telemedicine firm, and GrameenPhone, the country’s largest mobile network operator. The family quickly reaches Dr. Quadri at Healthline’s call center and receives the desired medical information. For the three minute call, Afiya pays only Taka 15 (US\$ 0.21) from her family’s GrameenPhone pre-paid talk-time balance.”(Adapted from Ivatury et al. 2009)

Like Afiya, this telemedicine service is being sought by ten million people in developing countries for their essential medical advice and information (Ivatury et al. 2009). This study focuses on this mHealth platform which is well known as mobile telemedicine service or mHealth hotline service (see Figure 1) in developing countries; such as, HMRI in India, MedcallHome in Mexico, Teledoctor in Pakistan and Grameen Healthline in Bangladesh. In recent years, this service has been very popular in low and middle income countries for delivering right time medical information to a large number of people (Ivatury et al. 2009).

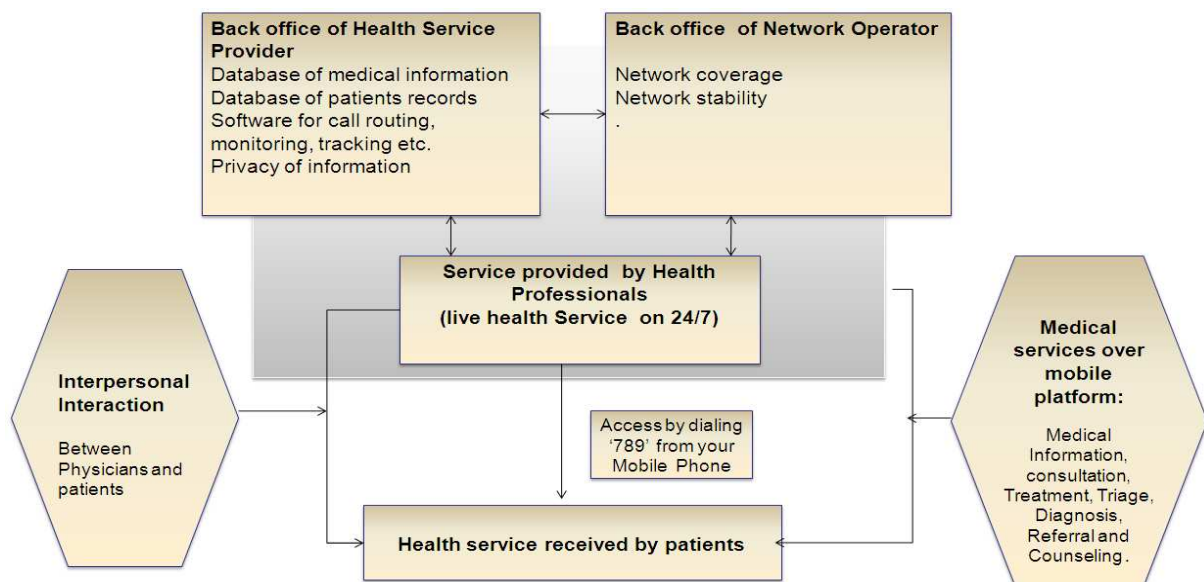


Figure 1: Mobile Telemedicine service platform

Under this platform, a user can easily access this service both in a non-emergency (headache, cold, cough, etc.) and an emergency situation (accident, burn, severe stomach pain, etc.) by simply dialing some unique digits (e.g. 789 in Bangladesh) from his or her mobile phone and can receive medical information, consultation, treatment, triage, diagnosis, referral and counseling from registered physicians (Ivatury et al. 2009). Such mHealth platform maintains a panel of physicians on 24/7 at the physical front office (physician’s interface) which is simultaneously backed by a physical back office

and a mobile network operator (for network management) to provide health information to the users (see Figure-1). Although these services have gained huge popularity in developing countries, however, there is growing concerns about the quality of such services. Quality perceptions have a strong influence on one's inclination to avail such health services.

Quality Dimensions in mHealth	Service Quality Challenges
Information Systems	Database of electronic health records for callers Database of facilities and standardized drug information Database interoperability Privacy of users' information Network management billing & revenue collection customer support
Interactive Services	Competence, credibility, courtesy, knowledge, customization, privacy etc.
Service Outcome	Service benefits

Table 2: Service Quality Challenges

The extant literature on wireless health care has identified that the major quality challenges (Table 2) are mainly related to service delivery platform (Information systems & related technology), service delivery personnel (Interaction between physicians and patients) and service outcome(service benefits) (Ivatury et al. 2009 & Vershney 2005). However, there are few studies which adequately articulated the quality dimension in mHealth settings (Ahluwalia & Varshney 2009, Varshney 2005, Chatterjee et al. 2009, Chetley et al. 2005, UN foundation & Vodafone foundation 2009, Michael 2009, Ivatury et al. 2009). Therefore, it is necessary to explore the existing theories of service quality in order to develop a comprehensive quality model for mHealth environment in developing countries.

2.4 Theories in Services Quality:

This section argues that service quality of mHealth services is an interdisciplinary domain which is necessary to be explored through generic theories from information systems, services marketing and healthcare literature (Kaplan & Litkwa 2008). At this stage, the study will discuss respectively the definitions of service quality, nature of generic service quality theories, service quality theories in IS and overall factors influencing quality perception in mHealth services.

According to Nelson et al. (2005), "Quality has evolved into a core business concept with multidisciplinary applications and dramatic implications for business value." It has been defined either as excellence or, value or, conformance with specifications or, meeting expectations (Reeves & Bednar 1994). In fact, all these notions of quality are interrelated and play crucial role to shape consumer's perceptions (Nelson et al. 2005). In our study, we are focusing on *perceived service quality of mHealthcare* which is absolutely focusing on users' judgment about overall excellence or superiority of service (Zeithaml 1987). A synthesis of quality parameters in generic service quality literature indicates that conceptualization and measurement of service quality should be based on users' perceptions based (Parasuraman et al. 1985), context specific, hierarchical and multi dimensional (Brady & Cronin 2001). Most of the research on traditional health service quality perceptions have initially focused on application of generic models which range from Gronross's (1984) two dimensional model (i.e., functional quality & technical quality) to Parasuraman et al.'s (1988) five dimensional (i.e., *reliability, responsiveness, assurance, empathy and tangibles*) SERVQUAL model. However, the complexity of service quality evaluations is evident in the many failed attempts to replicate the existing theory in new contexts (Brady & Cronin 2001).

The extant literature on service quality in Information Systems (IS) indicates that a good number of researchers (e.g., Kettinger & Lee, 1994, 1995, 1999, 2005; Pitt et al., 1995, 1997; Watson et al. 1998,

Jiang et al. 2000, 2002; Nelson et al. 2005, Wixom & Todd 2005, DeLone & McLean 2003) adapted quality dimensions in IS context. Because of the increasing importance of service quality in IS, DeLone & McLean (2003) incorporated it as a separate predictor in their modified IS success model in addition to system quality and information quality. In web services, Parasuraman et al. (2005) presented the E-S-QUAL model to capture users' quality perception of any virtual platform platform by integrating the front office (interaction quality) and back office dimensions (systems quality). Likewise, Sousa & Voss (2006) recommended using all front office and backing office dimensions to measure perceived service quality. In case of mobile information services, Chae and kim (2002) came up with a service quality model integrating the dimensions on connection quality, content quality, interaction quality and contextual information service quality. Koivisto (2008) found that when any service is provided over mobile network, the service quality is influenced by mobile device, the mobile network, information systems and information itself. Synthesis of all studies in Information Systems indicates that there is no study which directly measured service quality of health services over mobile platform.

Likewise, a review of the mobile healthcare literature revealed that there were no studies which directly measured the service quality in this setting. However, the extant literature has identified some predominant factors which might influence service quality. For instance, Varshney (2006) mentioned that coverage of wireless and mobile networks, reliability of wireless infrastructure, and general limitations of hand-held devices predominantly influence service quality in case of ubiquitous health services. Ivatury et al (2009) conducted a study on mobile telemedicine services in developing countries and found that service quality perceptions are influenced by *information systems, interaction between doctors and users* and *overall service outcome*. With regard to information systems, they mentioned the quality of automated decision support systems, database of medical information, call tracking and routing capacity, electronic health records for callers etc. It is noteworthy that a higher proportion of medical errors occur because of a lack of correct and complete information at the location and time it is needed, resulting in wrong diagnosis and drug interaction problems (IOM 2001). Recently, Mechael (2009) in her study on mHealth in developing countries mentioned that *cost, security, reliability of telephone systems* in health facilities influence quality perceptions. She explored that *literacy level, hierarchical access to technology, appropriate infrastructure* and cultural factors that influence service quality perceptions. She highlighted that direct two-way mHealth communication can significantly improve health care in rural settings. In another study on sustainability of wireless health services, Norris et al. (2008) mentioned some challenges with regard to quality perceptions, such as, *privacy and security* of information and *acceptability* of services to all users.

The extant literature on services quality found both a direct relationship between perceived service quality and satisfaction and an indirect relationship between service quality and intention to continue using through satisfaction (Mahmood et al. 2000, Zviran & Erlich 2003, Cronin and Taylor 1992; Dabholkar et al. 2000; Gotlieb et al. 1994). The similar relationship is also found between service quality, satisfaction and quality of life (Dagger & Sweeney 2006, Choi et al. 2007). The performance of traditional information systems (IS) is generally measured in terms of satisfaction or intention to use a particular tasks (e.g., Gefen et al., 2003, Bhattacharjee and premkumar 2004). However, Straub and Watson (2001) mentioned that one of the goals of any technology should be to increase the quality of its users' life.

Overall, the existing theories have clearly identified that service quality perception in mHealth environment takes place at multiple levels under multiple dimensions, so there is a challenge to develop a model which is hierarchical, context specific and multidimensional (Dabholkar 1996, Brady & Cronin 2001). Besides, there is a research call to capture user's perception in mobile healthcare taking into account all moments of contact (Sousa & Voss 2006). This study taps into this opportunity and offers a sizable potential for significant contribution to the advancement of this field by conceptualizing a perceived service quality model for mobile healthcare in developing countries.

3. PROPOSED CONCEPTUAL MODEL

In conceptualizing a service quality model for mHealth services, we propose that users perceive quality at three dimensions; first, *quality of service delivery systems*, such as, quality of mobile network, ease of access to the service, availability, privacy and security of information etc. second, *quality of interpersonal interaction* between physicians and users in terms of Competence, credibility, courtesy, knowledge, customization, assurance etc. and third, *quality of outcome* in terms of functional and emotional benefits. We also propose that service quality dimensions have a significant impact on satisfaction and satisfaction, in turn, positively influences future use intentions and quality of life. Therefore, focusing on user's perceptions, we propose a service quality model (Figure 2) which is hierarchical, multidimensional and context specific. We specify that our conceptual model is comprised of reflective constructs (Table 3) as Indicators are manifestations of construct (Petter et al. 2007, Jarvis, et al.2003; Parasuraman et al. 2005; Rossiter 2002).

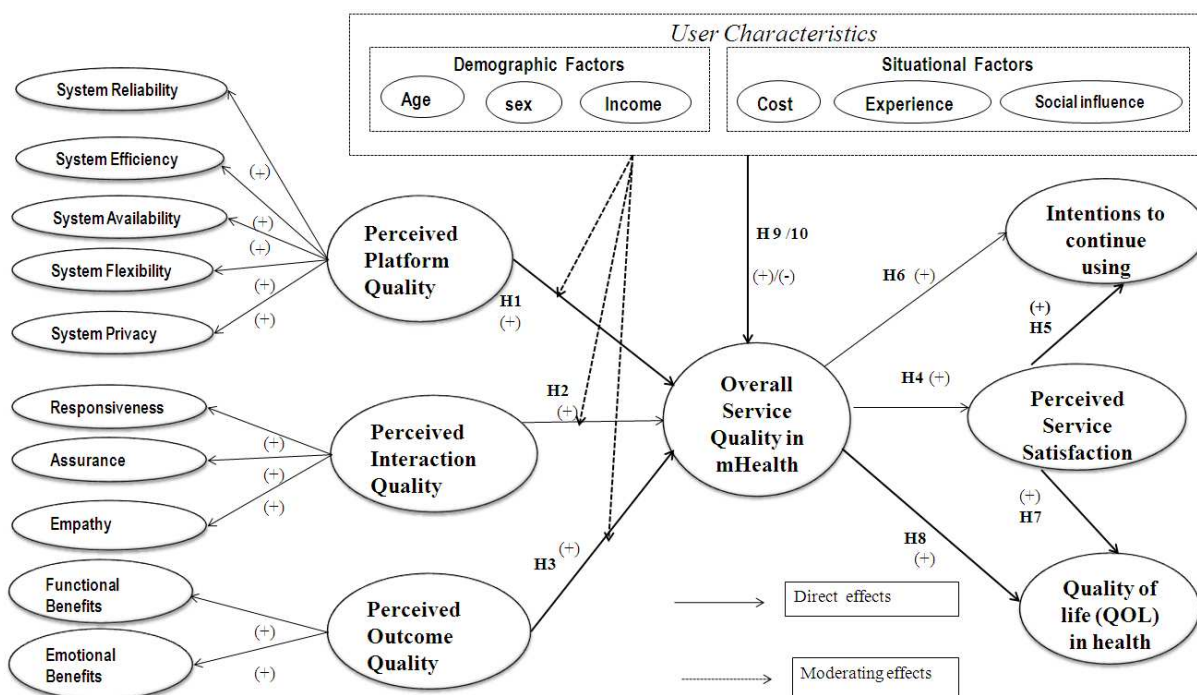


Figure 2: Proposed Conceptual Model on mHealth Quality

Mathematical Model of mHealth Quality	Reasons for Reflective Model
$Y_i = \beta_{i1} X_1 + \varepsilon_i$ <p>Where, Y_i = the i^{th} indicator (e.g., system reliability) β_{i1} = coefficient represents effect of latent variable on indicator X_1 = latent variable (or, reflective constructs) ε_i = measurement error for indicator i *Each indicator of a reflective construct is represented by its own equation.</p>	<ul style="list-style-type: none"> • Direction of causality is from construct to items & indicators are manifestations of the construct • Changes in the construct do cause changes in the indicators • Indicators are interchangeable, having a common theme and dropping of an indicator should not change the conceptual domain of construct. • Indicators are expected to covary with each other

Table 3: Nature of the conceptual model (Bollen & Lonex 1991, Petter et al 2007)

3.1 Platform Quality (Systems Quality or, Quality of Service Systems Delivery):

This study proposes *platform quality* as a construct of perceived service quality in mHealth (hotline) service which captures user's perceptions regarding technical level of communication (Petter & McLean 2009, DeLone & McLean 1992, 2003). In our case, it measures overall service delivery systems in terms of system reliability, system efficiency, system availability, system flexibility and privacy of medical information. This study observes that when a user encounters service from an mHealth (hotline) service provider, he/she perceives quality of the service platform (Information systems) in terms of ease of use, ease of access, availability, speed of response, network coverage, network stability etc. Thus, integrating all the technical quality dimensions, we posit that:

H1: Platform quality is positively associated with overall service quality in mHealth environment.

<i>Root constructs</i>	<i>Definitions</i>	<i>Measures</i>
System Reliability (Nelson et al. 2005; DeLone & McLean 2003; Parasuraman et al. 2005, Varshney 2005)	The degree to which a system is dependable over time.	It measures service service dependability and error free service.
Systems efficiency (DeLone & McLean 2003, Parasuraman et al. 2005, Chae & Kim 2002)	The degree to which a system provides easy and quick accessing and using the systems.	It measures ease of use, ease of access, service processing time, ubiquity, simplicity and structure.
System Availability (DeLone & McLean 2003, Parasuraman et al. 2005, Chae & Kim 2002)	The correct technical functioning of the platform.	It measures service availability, waiting time, network availability, network stability etc.
System flexibility (DeLone & McLean 2003, Nelson et al. 2005; Wixom & Todd 2005)	The degree to which a system can adapt to a variety of user needs and changing conditions.	It measures the ability to meet different needs at changing conditions. Also service recovery ability after failure.
Systems Privacy (DeLone & McLean 2003, Parasuraman et al. 2005, Varshney 2005)	The degree to which the site is safe and protects user information.	It measures information protection and sharing.

Table 4: Platform Quality

3.2 Interaction Quality (Quality of Interpersonal Interaction):

This study proposes Interaction quality (Fig. 1) as a construct because mHealth service involves intensive interaction between users and physicians in the form of consultation or referral. In this case, we are adopting the definition of Shostack (1985) which have been adopted by Bitner (1990) as ‘‘a period of time during which a consumer directly interacts with a service’’. To measure interpersonal interaction quality, SERVQUAL theory (Parasuraman 1985, 1988) is quite popular in marketing as well as in Information Systems (DeLone & McLean 2003). This study observes that when a patient or a community health worker interacts with a physician under over mobile telemedicine platform, he or she perceives quality in terms knowledge and competence of the provider, promptness in providing solutions and individual attention to the needs. Thus we posit that:

H2: Interaction quality is positively associated with overall service quality in mHealth environment.

<i>Root constructs</i>	<i>Definitions</i>	<i>Measures</i>
Responsiveness (Parasuraman et al. 1985,1988; DeLone & McLean 2003)	It refers to the wilinessness to help users and provide prompt service.	Willingness and promptness of the provider to provide service.
Assurance (Parasuraman et al. 1985,1988; DeLone & McLean 2003)	It measures knowledge and courtesy of the provider to inspire trust and confidence.	Knowledge, competence, courtesy and trust of the provider.
Empathy (Parasuraman et al. 1985,1988; DeLone & McLean 2003)	It measures caring, individualized attention the provider gives to its users.	Understandability of the user's needs and ability to provide individualized attention.

Table 5: Interaction Quality

3.3 Outcome Quality (Quality of service benefits):

Finally, this study proposes outcome quality which is viewed as what the user is left with after service delivery (Fassnact & Koese 2006). It refers to the characteristics of the output offered by the system in terms of accuracy, timeliness and completeness (DeLone & McLean 2003, Petter & McLean 2009). It is very important for health service to evaluate outcome quality (Dagger et al. 2007) in terms of functional and emotional benefits (Sheth et al. 1991, Fassnact & Koese 2006). This study observes that users perceive service quality of this service in terms of benefits derived from this. Benefits may appear in terms of complete & accurate information to their medical problems (functional) or any support to their mental health (emotional). Thus we hypothesize that:

H3: Outcome quality is positively associated with overall service quality in mHealth environment.

<i>Root Constructs</i>	<i>Definitions</i>	<i>Measures</i>
Functional benefits (Fassnact & Koese 2006; Nelson & Todd 2005; Davis 1989)	The extent to which the service serves its actual purpose.	It measures accuracy, completeness and currency of information. Also, it measures purpose fulfillment and convenience of the service.
Emotional or, Hedonic benefits (Fassnact & Koese 2006, Sweeney & Soutar 2001)	The extent to which using the service arouses positive feelings.	It measures enjoyment & encouragement of the service received.

Table 6: Outcome Quality

3.4 Perceived service quality and satisfaction:

The impact of service quality on patient satisfaction is a dominant concern in the health services (Andaleeb 2001). According to Wixom & Todd (2005) 'Satisfaction in a given situation refers to a person's feelings or attitudes toward a variety of factors affecting that situation'. IS researchers (e.g., Bailey & Pearson 1983; Baroudi and Orlikowski, 1988) used a quality based approach for measuring user satisfaction and suggests that it is an indispensable indicator to measure IS performance. In healthcare, service quality is increasingly used as an instrumental tool to satisfy users, identify target groups, clarify objectives, define measures of performance, and develop performance information systems (e.g., Mandl et al. 2002).

H4: Overall service quality is positively associated with service satisfaction in mHealth environment.

3.5 Service quality, Satisfaction and intention to continue using:

Both service quality and service satisfaction have profound impact on future use intentions (Wixom & Todd, 2005). Here we are using 'intention to continue use' instead of 'intention to use' as it is necessary for an IS to be truly able to measure net benefits (DeLone & McLean 2003, Teo et al. 2008). Intention to continue use is defined as a behavioral patterns reflecting continued use of a particular IS (Limayem 2007). In health services, quality perceptions and satisfaction have a strong influence on one's inclination to continue use such services (Andaleeb 2001). Thus we hypothesize that:

H5: User satisfaction is positively associated with the intention to continue to use mHealth service.

H6: Service quality is positively associated with the intention to continue to use mHealth service.

3.6 Service quality, Satisfaction and quality of life (QOL):

In health service context, prior studies found that there is a link between service quality, service satisfaction and quality of life (QOL) perceptions (Dagger & Sweeny 2006, Choi et al. 2007). Since satisfaction contributes to and enhances well-being, it is related to quality of life. (Donabedian 1988; Ferrans and Powers 1992; Oberst 1983). IS researchers have identified this association by modeling the impact of service quality and satisfaction on social levels (Myers et al., 1997; DeLone & McLean 2003). QOL refers to the degree of fulfillment of one's needs, goals and wishes (Campbell et al. 1976, Diener 1984). Given the healthcare context of the present study and the significance of healthcare as a vital component in quality of life (Giler 1987), we define QOL as a sense of overall well being in health (Dagger & Sweeny 2006; Choi et al. 2007). Thus we posit that:

H7: Service Satisfaction is positively associated with quality of life.

H8: Overall perceived service quality is positively associated with quality of life.

3.7 The role of demographic and situational factors (control variables):

In order to discern the impact of quality dimensions on overall service quality perceptions, this study has identified demographic characteristics and situational characteristics as control variables. The extant research has evidenced that *demographic factors* contribute to individual user differences in perceiving service quality (Venkatesh et al. 2003). Likewise, some studies have mentioned the critical role of *situational factors* on service quality perceptions (Kleijinen 2007). Here we define demographic characteristics as the attributes relating to individual user, such as, age, gender and income. As situational factors, we refer individual experience and social influence in evaluating service quality. Thus we posit that:

H9 (control hypothesis): Overall service quality perceptions vary as per the demographic characteristics (age, gender & income) of users.

H10 (control hypothesis): Overall service quality perceptions vary as per the situational characteristics of the user (cost, social influence and experience).

4. FUTURE RESEARCH DIRECTIONS

This study has contributed to consolidating the conceptual base in the field of service quality in mobile healthcare context. Specifically, it has determined *platform quality*, *interaction quality* and *outcome quality* as core constructs to explain overall service quality. It has also identified that *overall service quality* has positive association with *user satisfaction*, *intention to continue using* and *quality of life*, assuming *user characteristics* as control variables in a particular context. To validate the model, this study recommends quantitative-positivist research which assumes that the world of phenomena has an objective reality which can be expressed in causal relationships and captured in data in a representative and accurate manner (Straub 2004). In IS study, such research approach is confirmed as "*proxy view*" to capture the critical aspects of information technology through some *surrogate variables* (Orlikowski & Iacono 2001). In order to estimate the parameters for this model, this study also recommends Component based SEM (PLS) in order to avoid the limitations of

covariance based SEM with regard to *distributional properties, measurement level, sample size, model complexity, identification and factor indeterminacy* (Chin 1998; Fornell and Bookstein 1982, Wetzels et al. 2009). Since it is going to measure a causal network of relations in a particular mHealth context, a field study is recommended under cross sectional method in a natural setting to elicit specific information from the target respondents.

5. EXPECTED CONTRIBUTIONS

This study has several theoretical and practical implications for researchers as well as practitioners. From a theoretical perspective, one of the key contributions of this study is the context specific, multidimensional and hierarchical model that we have conceptualized to predict perceived service quality and its influence on satisfaction, future use intentions and quality of life within mHealth context. In practice, service providers in mobile healthcare are constantly struggling to implement meaningful quality assessment measures, so a comprehensive measure can help them to better understand and influence the level of user satisfaction, intention to continue using and overall quality of life.

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