

A Six Cell Services Comparison Model for Healthcare

Saradhi Motamarri^(✉)

School of Information Systems, Technology and Management,
Australian School of Business, University of New South Wales,
Sydney, NSW, Australia
saradhi.motamarri@unsw.edu.au

Abstract. Healthcare services delivery is particularly complex. Understanding patients' perception and channeling those factors into services design and operation enhances sustainability. For its survival, a service must perform better than competition. Comparison with competition is a core element of House-of-Quality. There are isolated studies focused on single service systems, and very few studies on inter-system comparison. In the quest to identify the distinguishing factors of mHealth from other conventional services, the author realized the pressing need for a systematic model to relatively position comparison studies. Services comparison vis-à-vis competition is vital for services innovation. To fill this gap in literature, a *Six Cell Services Comparison Model* (SCSCM) is proposed and is applied to a few studies related to healthcare. The outcomes of services comparison, provides vital measures for improved and efficient design of services that meet and fulfill patients' needs, and hence contribute to quality healthcare.

Keywords: Healthcare · (SCSCM) · House of Quality (HoQ) · Services design · Mobile health (mHealth)

1 Introduction

In the quest to address healthcare challenges of the developing world [1, 2], the author has identified that there are three significant research opportunities for services science and in healthcare sector. These broad themes can be summarized as:

1. Services Life Cycle Model
2. Services Design; and
3. Services Comparison.

In manufacturing, finance and other services industries, continual innovation has brought newer forms of delivery giving rise to newer forms of services [3]. Competition in healthcare delivery has led to the evolution of services like: outpatient surgery centers, executive wellness programs, independent nursing group practices, hospitals, nursing homes, intermediate care facilities and home healthcare programs [4]. Mobile Health (mHealth) is one of the emerging alternatives to this range of healthcare services [1]. Motamarri [1] has analyzed mHealth with respect to conventional healthcare

services, i.e., general practitioner (GP), public hospital (PH), and traditional medicine (TM). Motamarri et al. [2] provides a quantitative comparison of mHealth and conventional services from patients' perspective. The study extracted the distinguishing factors of mHealth with the aid of *multiple discriminant analysis* (MDA). In due course of these investigations, the author has identified the need for a model to relatively position comparison studies. Furthermore, the model must span the comprehensive spectrum of comparisons to comprehend extant literature and establish avenues for future research. If the model happens to be domain independent, then this as well can be applied to other domains, and becomes a valuable artifact for services science. This paper focuses on the development and brief application of such a model, termed as, a *Six Cell Services Comparison Model* (SCSCM).

2 Methods

A literature search has been made in various sources like PubMed, Google Scholar, and SciVerse databases for studies devoted to healthcare services design or comparison (*patient-service provider interaction*). A reconnaissance of the results has not pointed to any suitable artifacts relating to healthcare services design or comparison. The author has noted that the *Agency for Healthcare Research and Quality* (AHRQ) of the US Department of Health and Human Services has made significant contributions to improve quality, safety, efficiency and effectiveness of healthcare for the Americans. The AHRQ supports research that helps people make more informed decisions and improves the quality of healthcare services. The School of Design and Carnegie Mellon University has contributed towards design research pertaining to healthcare facilities to improve the patient flows and the patients' experience of healthcare environments [5].

Services design, provision and operation are essentially multi-disciplinary in nature [6]. Considering the complexity and inter-disciplinary nature of this endeavor, the research calls for the assimilation of knowledge from several disciplines. Following this multi-disciplinary search in terms of healthcare services in developing countries converging to healthcare services comparison, spanning the knowledge domains of ICT, Quality of Service, *IT Infrastructure Library* (ITIL) and *House of Quality* (HoQ) has provided interesting insights. As this is a significant opportunity that can benefit healthcare service providers as well as researchers, these insights will be reviewed towards developing a framework for services comparison.

The study of the extant literature revealed that three distinct streams play a pivotal role in addressing the significant shortcomings of the developing world, i.e. the provision of healthcare to the underserved and unserved segments across the globe [1]. The three aspects are: ICT/Mobile Communications, healthcare services quality in the developing world and services science. The finer elements of individual disciplinary streams are portrayed in Fig. 1. A detailed discussion of these elements is beyond the scope of this paper, and interested readers can refer to [1].

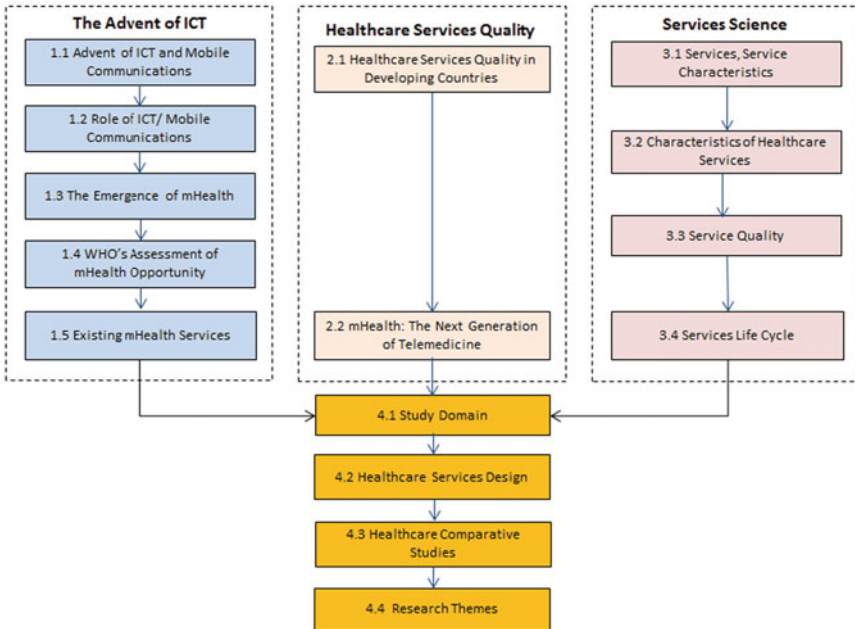


Fig. 1. Healthcare services comparison – a multi-disciplinary investigation, source: [1]

3 The Need for Healthcare Services Design Framework

Considering the broad agenda of better healthcare for all and the dire situation of healthcare status in developing countries [2, 7] there is a significant opportunity for the research community to direct attention toward services design and services operation. However, there is a paucity of studies on how to bring the patients’ perspective to the service providers and guide them in devising healthcare services. Our multi-disciplinary search pointed us to *House of Quality* (HoQ) and *IT Infrastructure Library* (ITIL) as potential tools to this end. ITIL [8] provides a systematic framework to address the services operation phase. While ITIL focuses on the operational aspect of Services Management, HoQ essentially deals with the design of products and services.

Deming’s famous PDCA Cycle is the underlying foundation for QFD and ITIL. HoQ is a basic design tool and part of the management approach *Quality Function Deployment* (QFD). Hauser and Clausing’s [9] classic paper on HoQ, has brought its significance to the worldwide community. With its wide spread success in bringing together various functional divisions of manufacturing, HoQ has been applied in various forms and to various degrees of sophistication in manufacturing, engineering and subsequently in the design of services [10, 11]. HoQ inter-links customer requirements, their rankings, engineering characteristics, performance measures, competitive products/services and thereby elicits in a single diagram the areas of improvements required to win in the market.

The HoQ Matrix consists of eight rooms, each room exemplifying a stage of service design [10, 12]. HoQ not only helps in the design of products/services but also in drawing conclusions about their *competitive position in the market*. This comparative evaluation of the market helps in examining the strengths and weaknesses and thereby helps in product/services positioning. It also directs in devising an action plan to bridge any of the identified deficiencies [12]. In the event, a service provider ignores these competitive insights; Keaveney's model [13] suggests that the customers may switch providers thereby either leading to the eventual decline or disappearance of a product/service from the market. In either case, both HoQ and Keaveney's models emphasize the importance of comparative analysis of services. A good service design and consistent operation of the service are essential to raise the bar of user satisfaction [8].

Within the healthcare realm, scholars have investigated patient perceptions of service quality in general [14–20] and mHealth in particular [21]. While there has been research on the aspects of service quality of mHealth from patients' perspective [21–24], they have not addressed how mHealth is different from other healthcare services. These lessons provided motivation to search the literature for comparative analysis of healthcare services. In the extant literature there are very few studies devoted to the comparison of healthcare services. And there are hardly any studies devoted to a comparative analysis of mHealth with respect to other healthcare alternatives.

4 A Six Cell Services Comparison Model (SCSCM)

Services delivery is challenging. Services marketing and management pose special challenges because services deal with 'processes rather than things, with performances more than physical objects' [25]. Three management functions – marketing, operations and human resources – are intimately joined in what Lovelock has dubbed the '*service trinity*,' to create and deliver services. Healthcare services are even more complex due to the inherent nature of their dealing with people's health and survival. As noted before, service providers shall constantly need to understand their value proposition vis-à-vis competition. It is essential for both healthcare service providers as well as regulators to understand and measure the perceptions of the patients with respect to the services they receive in the market place. To fill this gap in the extant literature, the author proposes a *Six Cell Services Comparison Model* (SCSCM) as shown in Fig. 2.

In the broadest sense, patients' perceptions and comparison of competing services can be performed both at qualitative and quantitative levels. So the model considers this as vertical axis. On the other hand, the studies can be devoted into:

- (i) A sole service (GP, PH, TM or mHealth);
- (ii) A set of services within a system (intra-system i.e., hospital vs. hospital); or
- (iii) Services across a broad spectrum of inter-systems (GP vs. mHealth).

So there is a possibility for three categories of comparison along the horizontal axis, namely: *single system*, *intra-system* and *inter-system*. Thus, the combination of

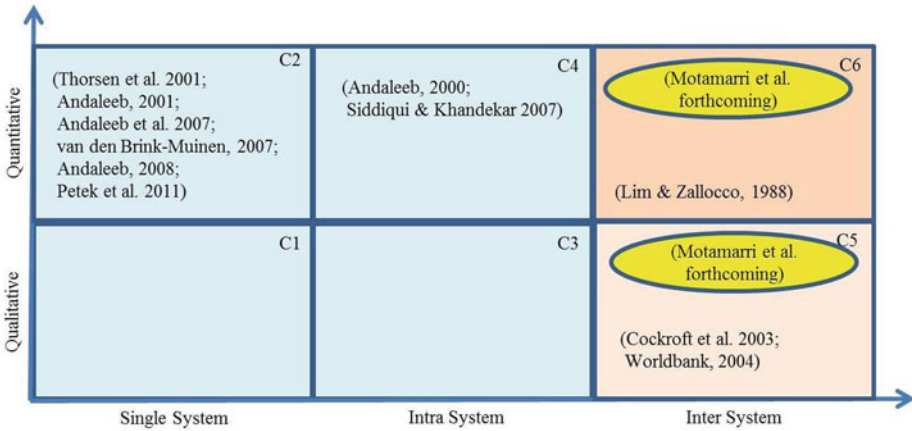


Fig. 2. Six cell services comparison model (SCSCM)

three categories along the horizontal and two divisions on the vertical axis, gives rise to six cells as shown in the Fig. 2. The cells are numbered from C1 to C6. The model also highlights the original investigation, i.e., *Quantitative Inter-System Comparison* (C6) that has led the author to the formulation of this model. In the extant literature, there are very few studies devoted to inter-system comparison (C5 and C6). Furthermore, researchers have considered many aspects of mHealth, but it is scarce to see a comparative study of mHealth vis-à-vis conventional services.

Historically, physicians are used to act as surrogate decision makers for the patient. However, with drastic changes in healthcare this model is replaced by a consumer centric model which recognizes the patient’s increasing role in both influence and selection stages of the healthcare decision process [4, 26, 27]. The next sub-sections will look into a couple of studies devoted to general practice, hospitals and then move on to inter-system studies. Figure 2 also plots some of these studies on the SCSCM classification scale. These comparison studies facilitate in finding distinguishing characteristics of different services that separate them from each other.

4.1 Patients’ Evaluation of General Practice

Ascertaining and promotion of quality in general practice (GP) and primary care is not only a necessity but also essential in retaining the service portfolio. The continual assessment helps to alter and tailor the services to suit to the consumers [18]. Similar motivations have driven Thorsen et al. [19] to study the purpose of GP consultation from the patients’ perspective. Other researchers like van den Brink-Muinen et al. [28] have explored the basic question of whether doctors’ talks with patients meet the patients’ expectations. They observe that patients want an attentive, friendly, frank, and empathetic doctor who listens well of their bio-medical concerns and advises and tries to alleviate their issues. As these studies primarily devoted to a particular healthcare service, i.e. GP and they are quantitative in nature, these studies belong to Cell-2 of SCSCM.

Petek et al. [17] have performed a longitudinal survey (n = 7472) in which they have collected patients' evaluations of European General Practice. The respondents are chronic care illness patients. The research objective is to compare patients' evaluation of the current study of 2009 with a previous similar study done in 1998. They have used EUROPEP questionnaire consisting of 23-items. Petek et al. have not found any major changes between the 1998 and 2009 for all the countries combined. More than 80 % of the patients rated GPs most positively (4 or 5 on the Likert scale). However, they are not happy on the factors: waiting time (72.1 %), telephone accessibility (82.7 %), and dealing with emotional problems (83.2 %). Petek et al. found accessibility over phone to GP and waiting time are important determinants of the healthcare system satisfaction. Incidentally, mHealth can alleviate accessibility, availability and waiting time issues.

The other important conclusion which comes out of the Petek et al. study is that there is no good correlation between patients' assessments of the quality of care and the respective biomedical outcomes. Similar observations are also made by other researchers based on their patient satisfaction studies in relation to total hip arthroplasty [29]. Finally, Petek et al. conclude that service providers must aim for complete patient satisfaction; else there is a chance that patients change their physician. This conclusion affirms that of the Keaveney's model that the consumers may switch providers if a better service alternative is available.

4.2 Intra-System Comparisons

Andaleeb [30] has studied quality of services provided by public and private hospitals in Bangladesh. He notes that large segments of the population in developing countries are deprived of a fundamental right: access to basic health care. Quoting a World Bank 1987 study, he observes that the situation is acute in Bangladesh as only 30 % of the population has access to primary health care. Due to the Bangladesh government's regulatory reforms during 1982–1996, there was an increase of 346 private hospitals and 5,500 beds. Though there are signs of improvement in numbers in capacity, there is dearth of information with regard to quality of the services offered by hospitals. Public hospitals being subsidized by the government have marginal tendency to improve their services, while private hospitals which primarily run on patients' patronage are obligated to improve their services and be competitive among peers. As these quantitative studies focus on hospital systems, these studies are classified as Cell-4 of SCSCM.

To gauge patients' assessments of the hospital services they have received in the past, Andaleeb has used a modified framework to that of SERVQUAL of Parasuraman et al. [31]. Through qualitative interviews, Andaleeb established that a prominent cultural concept, *baksheesh* (facilitation payments) was prevalent in Bangladesh and needs to be included in the modified framework. He applied 2 group discriminant analysis (DA) to determine whether: service quality ratings (along with education and income) predicted choice of hospitals; and which factors accounted most for the differences in the scores; and how reliably the patients could be grouped into public or private hospital users.

The DA identified one significant discriminant function that produced a classification accuracy of 70.16 %. The accuracy is 25 % greater than that obtained by chance [32, 33] confirming a satisfactory predictive power of the model. Private hospitals were evaluated better on responsiveness, communication and discipline. The outcomes supported Andaleeb's premise that market incentives would explain differences in perceived quality of services provided by public and private hospitals. He observes that as the private hospitals' level of service has not measured up to the satisfaction of some of the affordable patients, they are switching to services in foreign countries thus costing the economy on the foreign exchange front. This implies that there is vast opportunity to improve healthcare services in Bangladesh. It can be noted that the emergence of mHealth service as a favorable alternative in Bangladesh [34] is not a major surprise due to the prevailing structural failure of the healthcare delivery in Bangladesh. This conclusion is well supported by a detailed study undertaken by the World Bank on the status of health services in developing countries [35].

Moving forward on the works of Andaleeb, Siddiqui and Khandaker [36] compared services of public and private hospitals of Bangladesh and then compared private hospitals with foreign counterparts from the perspective Bangladesh patients. They have quoted several prior studies that essentially concluded that public hospitals are used 30 % or lower due to the facts of unavailability of doctors and nurses, their attitudes and behavior, lack of drugs, waiting time, travel time etc. Their analysis showed that private hospitals were doing better in terms of availability of drugs, tangibility, perceived costs, empathy of nurses and responsiveness. It has also been derived that foreign hospitals are doing even better on these dimensions compared to private hospitals. Public hospitals also fared lower in the aspects of tangibility compounded by the factors of cleanliness, water supply, and availability of equipment. The cost has been treated as the patients' perception of costs that includes consultation, diagnostics, accommodation etc. Based on their analysis they concluded that the overall quality of service was better in foreign hospitals than the private hospitals in Bangladesh in all the factors, including 'perceived cost' factor.

4.3 Inter-System Comparisons

Lim and Zallocco [4] for the first time studied inter-system competition by analyzing the consumer attitudes toward divergent healthcare systems, namely: hospitals, home healthcare, nursing homes, and outpatient clinics. Their research objectives are:

- to determine consumer attitudes toward the four healthcare delivery systems;
- to determine how consumers' perceptions of these systems vary on specific attributes; and
- to identify dimensions that most clearly discriminate the four systems.

Lim and Zallocco conducted a survey in which respondents were questioned about their attitudes toward four healthcare delivery systems along 10 attributes: quality of medical care, safety, speed of recovery, quality of medical personnel, risk of complications, cleanliness, convenience, comfort, privacy provided, and cost. As this

quantitative study focuses on different healthcare services, it belongs to Cell-6 of the SCSCM model.

Overall mean scores put hospitals as more safe, clean and of better quality. However, hospitals are perceived as more expensive. Nursing homes have the most negative image with respondents. In terms of lowest cost, outpatient clinics are rated more positively. On the dimensions of convenience, comfort, privacy and likelihood of speedy recovery, home health care is most positively rated. They performed MDA to classify the services. Lim and Zallocco found that the three dimensions: personalized care, quality of medical care and value distinguish the four healthcare services. MDA provided insights on which dimensions a particular service was positively viewed thereby providing useful inputs for service providers, healthcare researchers and policy makers. For example, home healthcare service providers can highlight their strengths as perceived by consumers in comfort, privacy, medical quality and likelihood of speedy recovery as differentiating factors to offer better services.

Motamarri et al. [2] have analyzed the distinguishing factors of mHealth in developing countries vis-à-vis three other conventional services: GPs, public hospitals and traditional medicine. To begin they have analyzed these services on a qualitative scale, conforming to Cell-5 of SCSCM. They conducted a quantitative survey and gathered patients' perceptions about mHealth and conventional services, conforming to Cell-6. They applied MDA to classify these services. Their analysis provided interesting comparative advantages of mHealth along three distinct attribute directions, namely, *ubiquity, information-quality and value*. The three attribute bundles extracted by MDA consisted of 11 sub-elements. This investigation not only filled a substantial gap in the literature on inter-system comparative studies, but also demonstrated for the first time, how mHealth is perceived significantly better than other alternatives in a developing country, i.e., Bangladesh.

5 Discussion

The review of healthcare services in developing countries, mHealth and HoQ has brought to fore the importance of services comparison and design. It is possible to draw a comparative analysis of existing healthcare services from both qualitative and quantitative perspectives. As the patients are the ultimate consumers of these services, it is essential to understand how patients perceive different healthcare services. Such research endeavors can answer from the patients' perspective:

1. Are different healthcare services distinguishable from each other?
2. Is mHealth (or for any service) distinct from other existing services? and
3. If so, what factors contribute to the service differentiation?

The answers to these questions are crucial for services design. Furthermore, it is also essential to understand the scope of this comparison and how it fits into the overall comparison spectrum. To this end the proposed SCSCM is a significant contribution not only to healthcare services but also to services in general.

5.1 Limitations/Future Research

This study has some limitations. There are opportunities to perform a comprehensive review of the literature to identify qualitative and quantitative studies pertaining to Cells-1, 2, 3 & 5. However, the main thrust has been Cell-6, i.e. quantitative studies devoted to inter-system comparison. Future research can be directed to consider this broad and impactful opportunity.

5.2 Conclusions/Research Contribution

The discussion emphasized the need for a robust healthcare services design framework. One of the key aspects of HoQ services design is *evaluation of competing services*. There is a vast research opportunity for comparative assessment of healthcare services. With this motivation the current investigation proposed a *Six Cell Services Comparison Model (SCSCM)*. The application of SCSCM is briefly discussed for the set of studies, identified in a multi-disciplinary search (Fig. 1). Though the application of the proposed model focused on healthcare services, the model itself does not make any domain specific assumptions. Thus, the SCSCM model is generic and is of significant value for other service domains as well. The author thus hopes that the model generates interest and motivation and which in turn, shall pave way for better services.

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