

Understanding the Diversity of User Requirements for Interactive Online Health Services

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Abstract

The purpose of the study presented in this paper is to develop our understanding of the diversity of user requirements for interactive online health services in order to inform improvements to their design leading to better health outcomes. Data collected in Australia was analyzed following the established but unfamiliar regime of Q methodology that enables the subjectivities of a diverse set of respondents to be studied systematically. This analysis produced three significant groupings of respondents referred to as: 'Service-Oriented Users', 'Collaborative Interactive Users' and 'Health Information Seekers'. Among these groups we identify and discuss a range of elements indicative of the variety of users' experiences and subjective views on the content, design, functionality and usability of systems for the development of effective interactive online health service provision.

Keywords: online health, information systems, interactive healthcare, Q methodology

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Pre-publication version

This is a pre-publication version of the paper which is not yet available in journal form.

Introduction

The healthcare industry is experiencing unprecedented challenges in countries across the globe with the increasing demands of an ageing population, the continuous rise of healthcare expenditure, increased legal accountability for medical errors, and better informed consumers (Tsiknakis and Kouroubali, 2009; Scheon et al., 2007; Nolte and McKee, 2008; Dor et al., 2007; Aaron, 2003; Chandra, Gruber and McKnight, 2007; Rothschild and Lapidos, 2003). As a result health care providers, both public and private, need to find ways to limit the rise of healthcare costs without compromising quality, equity, and access to information and services (Garber and Skinner, 2008; Dor et al., 2007). In this complex and information-intensive environment one promising approach is to make greater use of Internet-based information and communication technologies (ICT) to re-organize the healthcare sector (Bosa, 2008; Tsiknakis and Kouroubali, 2009; Spil et al. 2011). The application of interactive technologies and tools on the Internet is emerging as a way of overcoming the limited capacity of the healthcare system, raising productivity, controlling costs, and improving the provision of healthcare services (Ahern et al., 2006; Hernandez, 2009).

Our research recognizes that the effective development of Internet-based services that provide interactive health services to people is complex. The users of online healthcare services are highly diverse, belonging to a range of different stakeholder groups such as medical practitioners, service providers, administrators, medical students, carers, patients and interested members of the general public. Moreover, within each stakeholder group there may be a variety of needs and user requirements that are constantly evolving in the online health environment. Different levels of computer literacy, the types of interaction and service provision, the breadth and depth of information required by users, and the access and variety in use of such systems, all come into play in providing an interactive environment that is able to meet the diverse needs and requirements of potential users. It is clear that better informed consumers can lead to more effective health outcomes as people are given more responsibility in the management of their own health which in turn brings about sustained improvements in healthy behavior (Tsiknakis and Kouroubali, 2009). In the interest of better health outcome it is therefore important to realise the potential of low-cost innovative online systems to provide quality health information to the diversity of user needs and capabilities (Isomursu et al., 2010).

Our research aims to explore the range of needs and views of potential users of online healthcare systems. Because of the diversity and complexity a Q methodology was utilized for the purpose of identifying and categorizing the variety of user's experiences and subjective preferences for the content, design, functionality and usability of online healthcare services. The approach of Q methodology is not well known; essentially it provides a method for dealing with subjective material by using quantitative techniques for data categorization. It is a suitable exploratory approach for uncovering the diversity of opinions in complex domain areas where simple one dimensional approaches are limited and not particularly useful (see, Brown, 1993; Stephenson 1953). Through using this approach we identify three different sets of users comprising: first, those who want high levels of easy access to patient-focused sites who we characterize as service-oriented users; second, those who seek more collaborative forms online engagement which enables them to share and compare experiences and knowledge through forming communities of practice that support decision-making, these we characterize as collaborative interactive users; third, those people who seek to clarify, confirm or question advice from health professionals through their search and assessment of online health information sites that can inform decision-making on their own health care needs and trajectories, who we characterize as health information seekers.

Information technology and the public provision of health information

Developments in information technology have major implications for health care (Glasser and Salzberg, 2011; Heathfield et al., 1998). In an edited collection, Zielinski and colleagues (2011) examine a number of ways in which information technology is transforming health care provision in terms of the cost and the quality of care. They note how 'applying information technologies to health care promises fundamental change in existing models of care delivery and system performance' (Zielinski et al., 2011: ix). Nelly Oudshoorn (2011) also examines changes in health care brought about by developments in ICT. She argues that urgent attention and further research is required into issues that arise in redefining the relationships and responsibilities for healthcare among existing healthcare professionals, patients and the emergence of new categories of healthcare workers (Oudshoorn, 2011). These and other works (Wu, Chen, and Greenes 2009, Propp et al. 2010, Hesse and Shneiderman 2007, Neuhauser and Kreps 2003, Ahern 2007) all draw attention to transformation and change in health care resulting from the enabling characteristics of new ICT and the need for studies on how public interactive healthcare services through the use of the Internet can improve people's understanding and

management of health issues whilst at the same time accommodating to the different range of needs of individuals and groups in society.

Hernandez (2009) highlights how the evolving interventions of IT capabilities have provided opportunities to deliver evidence-based programs via the Internet in ways that are both cost-effective and individualized (Hernandez, 2009). The growing availability of health information via the Internet also provides the public with access to information and services that were previously only available through health professionals. These new Internet gateways not only provide a diversity of information sources, they also enable users to remain anonymous. For example, patients may seek medical advice for a second opinion or they may search the Internet to become better informed about their condition, especially if their general practitioner seems unwilling to provide such information (Ellis and Thomson, 2003). As a result, general practitioners are no longer the only or even the primary source of health information and/or may indeed have little knowledge of rare conditions or areas of specialization. Various studies confirm that the Internet plays an increasingly vital role in disseminating health information and has become the most effective medium for facilitating communication to accommodate the public's needs for health information (McGrath et al., 2007, Hernandez, 2009) and is able to overcome some of communication barriers that may exist between patients and their medical practitioners. The Internet can also provide a more interactive environment in which people can share knowledge and ideas, no longer relying on the privileged expert knowledge of medical professionals to enhance their general health and well-being (Neuhauser and Kreps, 2003). This movement away from the 'traditional' model of the expert doctor in charge of patient health management towards a 'patient empowerment' model marks a significant shift in healthcare provision. In moving towards this new model, the Internet offers the potential to improve knowledge transfer between health professionals and the general public, and to act as a vehicle to help patients improve their health and general well-being. However, there are also user engagement issues with online health services arising from factors, such as: age, health, availability and accessibility of IT, and technology literacy. For example, an early study by Hill, Beynon-Davies and Williams (2008) noted how patterns of disengagement are most pronounced amongst older people. The different factors that may prevent public use and the variety of user requirements is the focus of our research that seeks to explore the perceptions and evaluations of users (including their general views, their evaluation of particular sites they have used, and their reflections on what they would ideally like). In investigating these issues our study uses a less well-known approach – Q Study - that is useful for generating and sorting statements and using the centroid method of factor analysis with the varimax mode of factor rotation (adopted by the PCQ software) to support characterization of divergent subjective data.

Q methodology

Q methodology is an approach that has not been widely used but is gaining increasing recognition from a number of research fields (see for example, Akhtar-Danesh et al., 2008; Baker et al., 2006; Brownlie, 2006). It originates from the early work of Stephenson (1953) who developed a structured method for the systematic study of human subjectivity (people's perceptions, attitudes, beliefs, evaluations). Sample statements about the topic under investigation are presented to people (this is known as a Q-set) from which they (respondents are often referred to as the P-set) rank-order their preferences and in so doing reveal their subjective viewpoint (Brown, 1993). These viewpoints then undergo factor analysis in which a small number of people provide data on a large number of test-items (the inversion of conventional factor analysis). In this way it is possible to identify significant clusters of correlations that can be described as common viewpoints. As van Exel and de Graf (2005: 1-2) point out these clusters of subjectivity represent operant rather than logical distinctions as they are communicated and hence, Q methods can be used to capture a population of viewpoints (tastes, values, preferences, motives, sentiments) that greatly influence behavior rather than in conventional approaches that impose categories on a population of people (in for example, the use of survey questionnaires).

The basic sequences of activities of a Q study commence with the extraction of a wide range of subjective views (or *statements*) from representative participants, who then each rank the set of statements (the *sorts*). A factor analysis of the sorts is then performed systematically to reveal sets of diverse views held in common by different groups of people (the *Factors*). Where significant cluster of correlations exist among participant they can be factorized and the emergent Factors can be used to gain further insight into the topic under study.

In our study of user opinions of online health services, participants (P-set) included a variety of medical practitioners, medical students and members of the public. In the first phase, a *concourse* (see Stephenson 1978) was held where a representative group of users were encouraged to produce as many statements as they could on the main elements, content and function, they would want on a health website based on their experience and

knowledge. A concourse, that collects all the views and opinions (not facts) on the subject at hand, provides the raw material for setting up a Q study (McKeown & Thomas 1988). Once all the statements are collected they are then refined and clarified, duplicates are removed by combining some and some are eliminated because of their lack of relevancy to the topic. In addition to statements collected during the concourse, statements were also obtained by the researchers from secondary sources in the literature. In all, a total of 50 items made up the final set of statements, which is known as the Q-sample.

In the second phase of a Q study, participants were asked to sort the Q-sample based on their personal preferences. Unlike the concourse, the Q-sort is conducted on an individual basis. This Q-sort involved a group of relevant potential stakeholders and users of online health services in Australia, and was composed of medical practitioners, medical students, other university students, academics, and the general public, most of who were involved in the concourse. Unlike conventional approaches, the aim is not to identify certain populations or groups of similar respondents but rather, to draw on a small number of diverse stakeholders to identify clusters of subjectivities that are operant where possible.

Seventy participants successfully sorted the 50 statements that covered elements they would want on a health website. The participants took on average one hour to complete the sort with many respondents, such as nurses and general practitioners, taking time away from their duties to do so. The majority of participants were male (nearly 59 % or 41 males). Their ages ranged from 21 to 48 years. There were 29 or 41% female participants and their ages ranged from 21 to 55 years. Each participant was given a Q-sample as a set of 50 numbered cards on which the statements were written. They were required to make choices on the statements by sorting them from most agree (+5) to most disagree (-5). A demographic section was also provided to collect basic information about the participants.

Under the instruction of the researcher, participants were asked to make an initial reading through the Q-sample to get an impression of the wide range of opinions and then roughly sort the statement cards into three approximately equal sets: those statements selected to be positive statements, neutral, and negative based on their individual perceptions. After ranking each set, participants would start with the positive set at the +5 column on the Q sort scale and work down the ranking until all of the numbers of each card (statement) in that category had been placed in a cell on the data sheet. A similar process occurs for the remaining categories with statements from the negative category being placed in the cells from the -5 column on the left and the remaining neutral ones filling in the middle columns of the inverted pyramid on the datasheet. The consequence of the sorting process is a forced decision making process, where the participants must decide amongst the statements and produce a result where there is a number in each cell on the grid that reflects their decisions (Cottle and McKeown 1980).

The study: data analysis and results

The participants' responses were statistically analyzed to find correlations between the Q-sorts in order to identify Factors that are common to the sorts of several individuals (Stephenson 1953). The difficulty of the analysis depends on the relative clarity of the Factors that are produced. Once a suitable simple Factor structure is identified, the analysis turns to an examination of loadings to identify who loaded significantly on each Factor to determine what similarities their rankings share (Brown, 2002). It should be noted that the Factors are not necessarily mutually exclusive in that a given statement or a given individual may appear on more than one Factor.

'PCQ' software¹, a program designed specifically for analysing data derived from a Q study (Stricklin & Almeida 2000), was used to assist with the mechanics of the analysis. The list of statements and the data in all the sorts are entered into the software and the factor analysis application is run. This produces solutions for any number

¹ Available at <http://www.pcqsoft.com>

of Factors, however a 1 Factor solution is not useful for projects designed to elucidate a variety of views and solutions with more than 6 or 7 Factors rarely produce distinctive groups and are usually discarded.

Each Factor should consist of more than one person (the selection of the Factors is a result of the correlation that determines the *Factors*). The number of Factors identified depends in part upon the degree of agreement amongst subjects, and in part on how much detail the researcher feels is useful to analyze. Factor analysis enables selection of Factors that involved the greatest number of participants from which the loading of the Factors can be examined to determine what similarities their rankings share.

In this study, a 3-Factor solution was selected for further analysis and interpretation based upon several attributes of data. The 3-Factor solution explained 36 percent of the variation and accounted for the respondent set with a total of 50 out of 70 sorts loading significantly on the Factors. The remaining 20 sorts were either insignificant or were confounded correlations within the Factors, i.e. many sorts loaded significantly on more than one Factor. Each of these Factors was used to identify common views, evaluations and expectations among this population of viewpoints. Six participants, two representatives on each of the three Factors, were chosen at random and asked for their comments on the set statements contributing to their Factor. Using their responses, we characterized the Factors as comprising: *service-oriented users* (Factor 1); *collaborative interactive users* (Factor 2); and *health information seekers* (Factor 3).

In Tables 1-3 we present the statements with the high agree (positive) and high disagree (negative) rankings for each of the three Factors. The order of statements in these Tables depict the relative importance of each statement.

Factor 1 (*service-oriented users*) consists of a total of 22 participants. The statements in Table 1a were given the highest weightings (i.e. the strongest agreement statements). It is clear that from the top strongly positive statements that Factor 1 presents service as a highly regarded website function. Their most positive statements mention the importance of ‘...immediate access when using the website’ with ‘no broken links’ and having supportive features (statements 20, 18, 11, 3). The people on this Factor welcome the Internet as a means of improvement in the ‘...quality of healthcare’, and the ‘...relationship between patients and health care providers’. This Factor recognizes the benefit that online health may bring to all including both parties in the society including patients and health care providers (supported by their disagreement with Statement 12 in Table 1b).

Insert Table 1a

The 12 negative statements in Table 1b expand this view further by listing the main statements with which the participants on Factor 1 strongly disagree. They were not concerned with issues of risk or trust as reflected in their disagreement with statements 41 and 43. This Factor does not like health websites to be fully interactive (statements 30, 33, 35) and implies a preference for information that was more targeted.

Insert Table 1b

Factor 2 (*collaborative interactive users*) consists of 22 participants. The majority of the people within this Factor were females (73%) and only 6 males (27%). The strongest positive statements ranked by those on Factor 2 contain issues of communication and interaction reflecting their view of work practices and roles. These participants have collaborative work practices which allow them to share information and knowledge (statement 31). There is an increased sense of community belonging and involvement, (statements 21 and 14), and increased self-empowerment through participative roles in being active members of society (statement 30). So this Factor views collaborative and interactive ways of working as valuable but a challenge that requires a great deal of communication. Respondents would want these items to be supported by health websites.

Insert Table 2a

The strong disagreement statements on Factor 2 support this view further by explaining what the participants do not want. For instance, they are not concerned about the need for health information, nor does the website need to be ‘accessible’ or have ‘extensive informatics’.

Insert Table 2b

Factor 3 (*health information seekers*) consists of only 6 participants (4 males and 2 females). The selected positive statements show that participants see health websites as a source of information on delivery, quality and services (statements 28, 1, 49). They place strong emphasis on the content of information, such as language simplicity as in statement 26. It is interesting to note that one of the attributes of the health information seeker is the use of the search engine to seek usable health information sources (statement 11). More interestingly, this Factor sees health websites as information-intensive portals that should target a variety of users so that they can make better health choices and decisions (statements 36, 44, and 46). The health information seeker is often the main focus in existing studies (for example, Fox and Rainie, 2002, Crespo, 2004), whilst in our study this type of user forms the smallest of the Factors. This finding is somewhat unusual and unexpected, questioning the current focus on information provision in the design and development of interactive public health services. However, as Q is not well equipped to make demographic projections the small number of persons associated Factor 3 could be a distortion of the proportion that exists outside this study as noted by Brown (2002). Further consideration is required of other Factors that are central to users' subjective evaluations of the usefulness and support that such systems have the potential to provide. Consequently, considerable potential in the development of online health services remain unrealized and at present, are hidden behind the dominant assumption that information is the key.

Insert Table 3a

The negative statements in Table 3b expand this view dismissing any disadvantages of having health websites (statement 12). They were not concerned with issues of password security or too many graphics slowing down the response (statements 43 and 6). It is also worth noting that this Factor does not see online health as providing interactive environments with the provision of downloading tools (statements 21, 31, 17, 14, 3).

Insert Table 3b

Discussion of the findings from the Q study

This research explores and analyses the views, evaluations and expectations of a diverse set of users of online health websites. The cohort of participants who took part in the Q study consisted of medical practitioners, students (international and domestics) as well as the general public. The three Factors emerging from the Q-Study represented different subjective perspectives of online health use.

Factor 1: Service-oriented users

Accessibility is particularly important for Factor 1 as specified in statement 4 and among service-oriented users because they view online health websites as a potential way to extend healthcare systems to meet the service needs of its end-users as in statement 18. The benefits of ICTs are to empower consumers to access pertinent health information directly by cutting out the intermediary such as health professional and make consumer health information more accessible (Eysenbach, 2008). More importantly, by facilitating and enhancing accessibility, these individuals are able to make informed healthcare decisions and thus improve the quality of service and users' satisfaction while reducing health care costs as specified in statement 1. This finding is in line with previous studies including Heeter (1989, 2000), Nazi (2003), Brailer (2008), Hill and Powell (2009), and others. However, despite the ever-increasing spread of Internet access, several studies report the existence of a persistent digital divide both in Internet access and its use (Renahy et al., 2008).

The preference variation among individuals accessing health related information cannot be solely attributed to lack of Internet access but may be caused by other factors, including lack of interest in health information as well as education level, income status, and content barriers, such as literacy (Bansil et al., 2006 and Renahy et al., 2008). As such, individuals having difficulties understanding the content related to health informatics could find this to be a barrier to Internet use as indicated in statement 26 (Gilmour, 2007, Renahy et al., 2008). It is interesting to note that whilst most of the participants in this Factor are well educated, they feel that health informatics should be simple, clear and easy to understand and use non-technical terms rather than scientific language. This finding points out the importance of assessing other segments of society with low online health website literacy. Limited online literacy has been shown to be associated with less knowledge of health conditions and hence lower self-management, and higher health care costs, which may adversely affect health care outcomes (McCray, 2005). As a result, consumers who need this support may be the least able to take advantage of new health technologies. This particular finding suggests that government authorities should be

aware of the existence of this problem. One way to tackle this dilemma is by promoting educational programs to elevate the level of health literacy among the general public (Hernandez, 2009).

Service-oriented users in Factor 1 use health-related sites because of several favorable features: smooth and simple direct navigation for health information at any time as well as language and print options as indicated by their choice of statements (2, 11, 10, and 15). The availability of such ease of use and friendly features is central to users to avoid user's exhaustion in retrieving and reading online health information. This finding is in line with the research of Bansil et al. (2006). Service-oriented users also expect to access the health websites with no delays. As technology advances, multimedia may become faster to load with fewer broken links being encountered as in statement 3.

Many studies find that patients regard their physicians as the most reliable source of information compared to the Internet. Over the past years, the position has changed significantly from a more authoritarian model to more of a mutual partnership approach, where the physician is still ranked as holding the most important relationship after family members (Henwood et al., 2003, Ishii and Ullmer, 1997, and Hillgren and Linde, 2006). Online health websites may enhance the traditional model of physician-patient relationship and the communication among healthcare providers where users would move beyond simple information collection to integrated interactive health care systems (carers, family members, relatives, physicians, friends and significant others) as indicated in statements 20 and 18, and supported by the work of Nazi (2003). Consequently, there may be the potential through online health websites to maximize healthcare providers' limited time and contact with patients (Gibbons, 2005).

Factor 2: Collaborative interactive users

The basic tenet behind online health services is to access not only quantities of health information, but to access quality of electronic health informatics that empowers the public by increasing their knowledge and improving decision-making (statements 31, 17, 23). Perceived usefulness and benefits of using emerging interactive health information technologies (often referred to as online health websites) not only include improvement in well-being and quality of life, and reduced stress, but also in developing communication and information sharing among patients with similar conditions, supporting the notion of 'knowledgeable patients'. Hence, this can enhance patient empowerment, autonomy, and satisfaction with health care. Not only can patients enjoy the benefits of health ICTs but also health care providers can discuss health issues and share their experience with others in communities of practice.

The interactive users in Factor 2 also anticipate that online health services can increase the capacity to provide consumer tailored and customized services (Ahern et al. 2006). The emphasis is on collaboration and sharing as specified in statements 21, 14, and 30 indicating that these online sites should include more than content and images. They should have consumer directed electronic tools to facilitate wider participation, including factors such as blogs, wikis, and other communication tools that allow people to post information on line, collaborate, and share their thoughts with other users. Online services need to be developed that allow a community to participate in social networking and openness within and between user groups rather than operating a closed technology-based system that is controlled by an expert (Hernandez, 2009). Hence, community members will be able to create, assemble, organize, locate, and share information to meet their own needs and those of their community. In online communities, consumers can access and share stories of fellow consumers' experiences to help them understand and manage their conditions, and this may also enable them to maintain hope and keep a positive attitude to their health condition. This group also seeks self-care information from others and answers to questions that would assist them in decision-making. This finding is further demonstrated in the studies of Bath (2008), Akesson, Saveman, and Nilsson (2007), Harland and Bath (2008), and Lau and Kwok (2009).

As shown in Factor 2, the language option is one of the main concerns as indicated in statement 15. The availability of such an option may overcome the anxiety when searching and retrieving health informatics among non-English speakers and individuals whose first language is not English language. There is also a desire to improve collaborative and communicable activities that would enable people to share knowledge and further their understanding and expertise. This has become one of the biggest challenges for knowledge-based economies where improving skill acquisition among is essential for success of emerging health ICTs. Interestingly, our findings also indicate that participants in this Factor strongly believe that interactive technologies can make more work for health care workers as revealed in statement 47. As a result, physicians may find it difficult to adopt and embrace these technologies due to concerns over disruptions to workflow, financial costs and a

concomitant decline in the amount of interaction they are able to have with their patients. These issues would need to be resolved to prevent negative expectations and alleviate adoption concerns that physicians may have about the use of online health services (Gibbons, 2005). This countervailing view would seem to contradict our earlier finding in Factor 1 which considers online sites as a vehicle for maximizing health care providers' limited time and contact with patients. Clearly, further investigation is required to explore these different perceptions and consider possible pathways of resolution.

Factor 3: Health information seekers

In Factor 3 the emphasis is more on basic health information via the usage of non-technical language and readable formats as shown in statements 26 and 28. These findings suggest that there is considerable room for improvement if the health literacy of the public can be improved. One possible route to overcoming this issue is to design online health systems that incorporate online communities for social networking as implied in statement 36. By creating such an environment, users would be more likely to seek and discuss concerns with other people with similar personal experiences.

The popularity of the Web as a source of information raises concerns both about the perceived credibility of the information provided and the overall quality of health informatics (Impicciatore et al., 1997). The quality of health informatics is an essential component to any developments that seek to improve health care delivery (as specified in statement 28). It remains a significant challenge, as judging the quality of health information is not always easy and there is a risk that if inaccurate, outdated, or low quality health information is accessed then the credibility of systems will be further undermined. Due to the existence of such a problem, organizations having developed and considered some criteria, such as website content, form, accessibility, credibility, that should be considered when evaluating health information (Eysenbach et al., 2000). Until now, the impact of these criteria on the design, form, usefulness, and the use of health information has been relatively weak and users are largely unaware of their existence (Benigeri and Pluye, 2003). This implies that although healthcare professionals are recognized as the most reliable source of health information, consumers retain responsibility for critically evaluating the information source posted on health websites, especially when using the Internet as a secondary source of health information (Nsungani and Perez, 2006).

Critical thinking is another essential skill of health literacy. It is composed of the ability to analyze and judge value-based choices when presented with alternative possibilities. This skill will be increasingly important as people move into home-based self-care management and community-based care (Hernandez, 2009). Evaluating health information should also be supported by the development of quality control systems for online health services via, for example, a rating system to test, rank, and distinguish legitimate online sites from others (Bomba 2005, Ahern et al., 2006). Moreover, these quality control evaluations could be conducted by third parties (Eysenbach et al., 2000)

Locating health information is one of the most common activities on the Web. The information seekers ascribed to Factor 3 seek information on a variety of health topics that are offered by online health services and as implied by statement 46. This is not surprising, as research indicates that most people want to have detailed health information (Charles, Gafni, & Whelan, 1997). The findings here also highlight the importance of providing a 'a-one-stop-shop' as this can reduce consumer anxiety and facilitate the decision-making process (Sillence et al., 2007). Information seekers also stress the importance of targeting all users and stakeholders as indicated in statement 44. With widespread computer use, the knowledge, skill and experience of using computers has become far more diverse and widespread. This indicates a need to develop a central yet universally accessible online health service that can accommodate users with different skills and knowledge, who are of varying ages, and who may have various disabilities. In practice, although there may be a limit to what can be achieved when trying to accommodate age related health issues, such as, dementia, visionary constraints and deafness, the notion of developing a system for wider access provides a sound starting point. In the health context, this paves the way for future developments such as improved health care systems and expanded government services. It may also address issues of user diversity and develop innovative ways of bridging the gap between what users know and what they need to know (Lazar, 2007). Among other things, this indicates the importance of including a universal utility design that is able to target different users of web-based health services.

With the continuous evolution of the Web, health information becomes more available on the Internet as a secondary source of information (Pereira et al., 2000). People who seek health information may increasingly look to online health sites in order to get a second opinion or verify information they have already obtained from

health care professionals about their illnesses and available treatments and in so doing, participate more in their own decision-making process (McGrath et al., 2007). Information seekers as depicted in Factor 3 perceive the benefits of online health services as in statement 1. The availability of web-based health saves time and effort in retrieving health information when compared with paper-based systems. They also limit users' exhaustion, thereby reducing the costs of health care whilst improving quality.

Similar to previous Factors, the information seekers group prefer having a choice of language as a utility in online health websites as in statement 15. The availability of such an option may assist this group in achieving simple and smooth retrieval of health informatics to match their needs given different cultural and language backgrounds.

Conclusion

Our study has set out to explore the ways in which the Internet can be used to improve the public provision of health information and advice. In collecting data on general perceptions and subjective evaluations of interactive online health services three different sets of users have been identified: first, *service-oriented users* who seek easy to use, patient-focused sites with high levels of accessibility; second, *collaborative interactive users* who wish to share information and collaborate with others in forming communities of practice that support their decision-making abilities through extending their knowledge and understanding of health issues; third, *health information seekers* who use online health sites to compare or verify information they have secured from health professionals in order to be in a better position to make decisions about their own health care needs. These users are not groups in the normal sense of representing a certain segment of society (students, the disabled, pensioners and so forth) but rather, represent a population of viewpoints from collecting data on the needs of a diverse range of respondents (for example, an individual may have expectations in each of our user groupings). As such, the research takes us beyond conventional approaches in opening up important issues in the development of online health services that supplements and adds to our current understanding. In analyzing data across these three groupings, the importance of developing consumers-oriented tools to ensure the appropriate content, design, functionality and usability of interactive public health services has been highlighted. This research identifies and recognizes the potential health benefits of interactive online health services for the general public and the need to tackle issues of diversity in accommodating diverse requirements of users.

In building on the mainstream literature, we illustrate how disparities in access to health information, healthcare services, and technology make it hard for diverse consumers to achieve desired public health goals. Consistent with other government initiatives, participation of the public sector is necessary to harness current consumer trends and to ensure alignment with the multiple interests of stakeholders. The way forward for consumer online health sites is to use these partnerships and interests to create and sustain a diverse user-centric strategy that results in effective online health services being available on a much wider scale than is currently possible. From a practical standpoint, an interactive user-focused IT system must be structured in a way that meets the different needs that we have identified whilst also tackling the requirements of certain population groups, for example, in terms of its friendly features for those with low health literacy, with language facilities for those who struggle with written English and with visual support for those with failing eyesight. The system can also be used to encourage networking and the development of communities of practice, so that individuals and groups can share experiences and knowledge.

Developing online health systems is one of the most important keys to meaningfully addressing issues in the healthcare sector and tackling issues, such as, high expenditures, poor disease management and prevention, and reduced quality of life and public health. To the best of our knowledge, this is the first research that has been conducted in this healthcare area using a Q study approach to capture a diverse set of respondents in examining subjective perspectives, attitudes, and sentiments of people in their expectations and use of interactive online IT-based health services. Our research provides a systematic analysis of subjectivities across a diverse range of stakeholders that goes beyond population groups to include clusters of viewpoints generated from personal experiences and evaluations of using such systems. The different tastes, preferences and expectations were analyzed and clustered to help guide the development of online health services through highlighting the need to accommodate information seekers, service-oriented users and users that are looking for more collaborative interactive sites. Whilst further research is required to analyze why online health care users make certain choices and how website information is used to support, enhance or defer health care decisions, we would contend that online interactive health services are here to stay and mark a broad shift toward a digital culture in which healthcare, as a sector, has been slow to adapt user-centric Internet-based strategies that cuts across

socioeconomic barriers. We conclude that the provision of interactive online IT-based health service systems that can take into account the variety of different stakeholder needs as well as the particular needs of certain individuals and groups, will enable better health outcomes and in the process promote significant social benefits to people in society.

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TABLES

Table 1a: Factor 1- Strongly Agree	
No.	Statement
4	I prefer immediate (fast) access when I am using a website.
1	I believe that health websites can improve the overall quality of healthcare
20	I think interactive health features (emails, chat rooms, forums, and bulletin boards) can improve relationships between patients and health care providers
2	I find health websites reliable - I rarely encounter any broken links when I navigate through the website.
18	I believe that interactive health features (emails, chat rooms, forums, and bulletin boards) do improve the delivery of health care
11	I expect health websites to provide me with useful features such as search engine, help page, and site map.
16	I believe that I can get the depth of information that I need from health websites
10	I want to be able to print the information needed from online health
3	I like to be able to download Audio, Video, and Podcast from health websites
26	I feel that the language used must be easy to understand (i.e. medical terms simplified to non-technical language and if not, there is a glossary or online medical dictionary
15	I want Health websites to offer me a choice of language.

Table 1b: Factor 1- Strongly Disagree	
No	Statement
43	Even with a password, a website cannot be trusted to keep information confidential
41	Interactive features such as online diagnosis and 'ask a doctor' are risky for the user and the professional
30	I like the opportunity to participate by using facilities such as surveys, polls, and games.
12	I do not believe that health websites improve the delivery of healthcare
33	I think the public should be able to make online donations to support healthcare and research
50	Fully interactive media can create a situation in which the roles of senders and receivers are interchangeable
35	I like to see practical features such as request an appointment and refill prescriptions
38	Health websites are responsive because of the availability of 'about us' and 'contact us' sections and help options they contain
46	I like to see variety of topics covered within one single health website (one-stop- and-shop health portal)
48	Interactive health websites are time consuming
45	Public forums on websites can be abused by malicious contributors and so cannot be used in Healthcare
49	The health care profession should make more use of the Internet to improve services.

Table 2a : Factor 2- Strongly Agree	
No	Statement
31	I would like to be able to share my story on a health website
21	I like to be highly involved in online discussions and feel like I am part of the community
14	I like to be involved in online discussions such as chat rooms, forums, and bulletin boards.
30	I like the opportunity to participate by using facilities such as surveys, polls, and games.
15	I want Health websites to offer me a choice of language
17	I feel empowered because I can add and contribute my idea through useful features such as a public bulletin board.
47	An interactive website would make more work for healthcare workers
23	I like to see a Weblog/Blog in a health website because I can read and add my comments.

Table 2b: Factor 2- Strongly Disagree	
No	Statement
28	I feel that it is important that the quality of information provided on this website is scientifically correct
4	I prefer immediate (fast) access when I am using a website
5	I want to be able to get extensive information through links and related links of that specific information.
10	I want to be able to print the information needed from online health
8	I focus on the health information posted, rather than the website design
32	I want to see the date when the website was created and the date of the last updated
27	I find it easy to access online health information from home and anywhere else.
36	Website should enable the public to ask more questions so that they are informed and can make better health decisions
24	I prefer a Health Website that is fully open to public scrutiny and evaluation (i.e. no registration, logins, passwords, or closed section requiring fees to access additional feature and information).
41	Interactive features such as online diagnosis and 'ask a doctor' are risky for the user and the professional

Table 3a: Factor 3- Strongly Agree	
No	Statement
26	I feel that the language used must be easy to understand (i.e. medical terms simplified to non-technical language and if not, there is a glossary or online medical dictionary
28	I feel that it is important that the quality of information provided on this website is scientifically correct
1	I believe that health websites can improve the quality of healthcare
36	Website should enable the public to ask more questions so that they are informed and can make better health decisions
44	Health websites should target a variety of users (patients, healthcare providers, community...etc.)
15	I want Health websites to offer me a choice of language.
46	I like to see variety of topics covered within one single health website (one-stop- and-shop health portal)
11	I expect Health websites to provide me with useful features such as search engine, help page, and site map.
49	The health care profession should make more use of the Internet to improve services.
35	I like to see practical features such as request an appointment and refill prescriptions

Table 3b : Factor 3- Strongly Disagree	
No.	Statement
12	I do not believe that health websites improve the delivery of healthcare
43	Even with a password, a website cannot be trusted to keep information confidential
6	I dislike too much graphics/visual as it slows down my access to the health website
21	I like to be highly involved in online discussions and feel like I am part of the community
31	I would like to be able to share my story on a health website
45	Public forums on websites can be abused by malicious contributors and so cannot be used in Healthcare
32	I want to see the date when the website was created and the date of the last updated
17	I feel empowered because I can add and contribute my idea through useful features such as a public bulletin board.
14	I like to be involved in online discussions such as chat rooms, forums, and bulletin boards.
3	I like to be able to download Audio, Video, and Podcast from health websites