Adoption of Mobile Health (m-Health) Services by Patients for Sustainable Healthcare Development: A Qualitative Exploration

Mr. Nikesh Kurhade, Sr.Manager Consumer, Research, Bajaj Electricals.
Dr. Rajiv Gupte, Associate Professor, MET Institute of Management.
Dr. Nirmala Joshi, Associate Professor, MET Institute of Management.

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ABSTRACT

Mobile health technology will enhance people's lives through raising healthcare awareness and knowledge, expanding the reach of healthcare services, and building a workforce of digitally competent healthcare workers. The adoption of mobile health is limited due to a lack of awareness, information, and interest among patients.

Objective: This study aimed to explore stages of adoption process and factors impacting adoption of mobile health applications

Methodology: The study was conducted in Mumbai. In total, 20 in-depth interviews were conducted. Respondents included users of fitness apps, people using mobile apps for online consultation and monitoring health parameters. Considering qualitative exploration, this study approached the investigation with three domains: stages in adoption process, hierarchy of involvement steps and various factors impacting adoption of mobile health applications.

Results: Patients expressed their interest in mobile health applications specially related to fitness. Mobile Health is considered to be good option for monitoring various health parameters. Patient's attitude towards health plays an important role in adoption of mobile health applications. Various critical factors like trust on healthcare application, facilitating conditions and usefulness are driving adoption of mobile health applications.

Contribution: This study will be useful for other researchers in the field of digital healthcare services. This will provide directional cues for developing m-health applications for enhancing adoption of such applications amongst patients which can be further validated through quantitative study.

Key words: m-Health, Mobile Health, Adoption, Qualitative, Digital Health

Introduction

Primary healthcare remains an important aspect of the health care system. Due to limited healthcare facilities, many times patients are forced to take inferior consultation and treatment for early-stage illnesses due to a lack of robust infrastructure. Limited primary healthcare results in delayed diagnosis and improper treatment. Also, delayed treatment increases the severity of the disease. A limited healthcare workforce is another concern for the healthcare industry. Due to facilities and opportunities in urban areas, most of the advanced healthcare facilities are concentrated in metro cities. Thus, primary healthcare should be taken on priority for better healthcare access and advanced care.

As per one of the reports from PwC, m-health service is likely one of India's top digital healthcare sectors with market size of 2,083 crore INR in 2015 and expected to grow to 5,184 crore INR by 2020. As a part of m-health services, information and expertise can be availed from cell phones, tablets, computers and wearable devices. Newly emerging wearable devices coupled with m-health applications and other sensor-based devices will enhance digital healthcare systems (Fagherazzi & Ravaud, 2019).

Lack of awareness, poor infrastructure, low expectations, and manual interventions are key barriers to the lower impact of digital health care services as per PwC. At the same time, some barriers like lack of information on m-health amongst professionals and low interest among users limit its usage. One of the most major non-technical failure factors is a lack of user acceptance. (Krebs & Duncan, 2015)

For technology-based services like m-health, it would be difficult to foresee the adoption processes in

which the interest can be triggered by health-related risks and added advantages of such services. Exploring this process to understand the adoption is critical (Kim, 2009). Positive attitudes toward system utilization are created by the notion that an individual will not feel uncomfortable when accepting innovation and will obtain higher practical benefits as a result (Venkatesh et al., n.d.)

This Study was aimed to understand the adoption process of mobile health services and various factors impacting adoption

Review of Literature

As per the research conducted in Burla, India, only 20% of medical professionals use computers on daily basis. The rest of the professionals refer to computers once a month on average. Even though students see computers as an important element of their medical education, they are rarely used (Maharana et al., n.d.). In a tertiary healthcare hospital in a metropolis like Mumbai, healthcare practitioners use and are aware of information technology at a low level. Considering the usage of health information by medical professionals, patients need to explore digital services for better reach.

According to Desai et al. (Desai, 2010), the prevalence of mild illnesses such as cough, fever, and diarrhea varies drastically depending on the socioeconomic status of the household. Poor and illiterate persons, as well as members of the scheduled tribe community, are more likely to have them. The prevalence appears to be decreasing as living conditions improve.

The expenditure ratio (health expenditure as a percentage of income) on health care in India, according to Barik et al. (Barik & Thorat, 2015), is 6% of monthly average income, which is greater than the standard criterion of affordability (5%) in developing nations. Furthermore, the burden of disease is disproportionately spread among different socioeconomic classes. Also. Indians have a relatively low level of health insurance coverage.

Fitness and nutrition were the most popular categories in m-health services, according to a poll of US mobile phone owners, with most respondents using them daily. However, Apps were not downloaded for several reasons, including a lack of interest, cost, and worries about third-party data collection. (Krebs & Duncan, 2015). Regarding theories and models applied to m-health adoption studies, the TAM model has been mostly used, followed by UTAUT. According to a meta-analysis, perceived usefulness, perceived danger, subjective norms, perceived ease of use, trust, and attitudes were all substantially and positively associated with behavioral intention (Zhao et al., 2018). A systematic literature review revealed seven key factors that were found to have a significant relationship with the actual adoption of health and wellness apps, according to (Aiman Azhar & Singh Dhillon, 2018): perceived usefulness, social influence, perceived privacy risk, perceived ease of use, self-efficacy, attitude, and behavioral intention.

Below is the summary of the major theories used for studying health and wellness m- health services

Author	Title	Country	Theory / Model tested	Variables tested
(Deng et al., 2018)	What Predicts Patients' Adoption Intention Toward mHealth Services in China: Empirical Study	China	TAM	Perceived usefulness Perceived ease of use Privacy risk Performance risk Legal concern Trust Adoption intention

(Alalwan et al., 2018)	Examining the Factors Affecting Behavioral In tention to Adopt Mobile Health in Jordan	Jorde n	TAM	Perceived usefulness Awareness, Social influence, Innovativeness Behavior intention
(Miao et al., 2017)	Factors that influence users' adoption intention of mobile health: a structural equation modelling approach	China	TAM	Perceived usefulness Perceived ease of use Technology Fear Subjective Norms Network Effect Cost Factor Existing degree of satisfaction Adoption intention
(Alloghani et al., 2016)	Technology Acceptance Model for the Use of M -Health Services among Health - Related Users in UAE	UAE	TAM	Usefulness Ease of Use Trust Security Overall Reliability
(Lee et al., 2018)	Factors Affecting User Acceptance in Overuse of Smartphones in Mobile Health Services: An Empirical Study Testing a Modified Integrated Model in South Korea	Korea	TAM	Perceived ease of use Perceived usefulness Perceived security Resistance to change Social norm Behavioral intention to use
(Alam, Hoque, et al., 2020)	Factors influencing the adoption of mHealth services in a developing country: A patient - centric study	Bangl adesh	UTAU T	Performance Expectancy Effort Expectancy Social Influence Facilitating Condition Perceived Reliability Behavioral Intention

(Dwivedi et al., 2016)	A generalized adoption model for services: A cross-country comparison of mobile health (m-health)	Bangl adesh	UTAU T2	Social influence Effort expectancy Waiting time Hedonic motivation Performance expectancy. Price-value. Facilitating conditions. Self-concept, Behavioral intention; Adoption behaviors

Methodology

The primary objective of this research was to explore the adoption process of m-health services and study various factors impacting the intention to adopt m-health services.

To analyze the behaviors of users of m-health services, an interpretative technique was used. The core focus of the research was on realizing the situation of m-health service usage from their experiences. The present research was intended to facilitate proper information sharing between researchers and users around the awareness of m-health services and the adoption journey. Considering the objective, a qualitative study was planned. In-depth interviews were conducted across Mumbai. With the metropolitan culture of Mumbai city, one can find people from different profiles in terms of language, culture, religion, and socioeconomic characteristics. Mumbai can be called as mini-India due to its diversity of the population.

As per 2011 census, Mumbai's population is 12.4 million. 20 in-depth interviews were conducted with m-health service users in Mumbai (Marshall et al., 2013). Sample selected purposively for this research. Participants' section criteria were on the usage of fitness or health maintenance services on regular basis as per the criteria given below in Table 1

Table 1: Sample size

Participant Category	**Profile**	**Sample size**	
		Male	**Female**
Fitness and Diet App Users	Using the Fitness app regularly for tracking health parameters and suggesting diet (At least 2-3 times a week)	5	5
Health maintenance App Users	Using Health apps at least once a quarter for consulting doctors virtually, booking appointments, Booking Lab tests, managing medicine schedules, Getting a health information	5	5
Total		**10**	**10**

A discussion guide was made as per the information areas of interest. This discussion guide was primary covering sections around awareness of m-health services, first exposure to such services, reasons for developing interest, desire for such services and the adoption process. The guide was also including various factors impacting the adoption process of m-health services.

Due to COVID 19 pandemic, all in-depth interviews were conducted through a virtual meeting platform i.e google meet. All these discussions were started with a warm-up section where participants were asked to introduce themselves followed by some generic pointers on their interest, hobbies, and their health-related routine practices. All in-depth interviews were recorded, and then important phrases were transcribed. Further data analysis was carried out with the help of qualitative analysis software Nvivo and Atlas ti.

Findings

m-health service adoption is an important aspect in improving healthcare access for sustainable health care initiatives. Faster access to healthcare services and convenience are found to be strong drivers of the adoption of m-health services. This research demonstrated various aspects of m-health service adoption from awareness to important factors driving the adoption of m-health services.

As per the word frequency count percentages across all in depth interviews, certain words
like Health, Google, online and personal and applications were coming multiple times. This indicates the interest levels of consumers in m- health digital services as given below.

Word	Weighted Percentage (%)
health	8%
google	3%
online	3%
personal	3%
applications	2%
digital	2%
doctor	2%
started	2%
doctors	2%
medication	2%
members	2%

Adoption process

Awareness and attention towards m-health services

Overall, awareness about m-health services has increased due to the seriousness of health and hygiene aspects because of the pandemic. COVID 19 has also helped in getting consumers' attention towards various m-health services. This includes services related to maintaining fitness, Yoga training and a diet for healthy weight. At the same time, various healthcare needs were answered on a virtual platform like teleconsultation. The primary source of awareness is digital media platforms like Facebook, Instagram, and YouTube. Few respondents have also received recommendations from their friends and family members. Users are aware of 2-3 different brands of fitness services like Healthyfyme, Google Fit, JEFIT, and Calorie counter.

Interest in m-health services

The primary motivation for generating interest in the health services is the need for good health and immunity that emerged due to COVID 19 pandemic. Many users have started using these services during lockdown when all other options of fitness and health were not accessible. Also, due to the unavailability of medical professionals and health care services, digital health services came up as a supportive hand in the emergency. Both external pandemic situations and an overall increase in smartphone users have resulted in generating consumer interest in various digital health services.

The Desire for m-health services

People have understood the importance of immunity and fitness in fighting against the pandemic of COVID 19. In the absence of proper medical facilities, most of the respondents have desired for m-health services for accessing medical facilities

Action for m-health services

Users have downloaded m-health services due to a strong desire to couple with the external pandemic situation. However, after downloading the applications and trying free services, most of the users liked the same and upgraded to a paid subscription. Getting paid subscriptions from branded players were driven by the discounts offered by the brands and the continence of getting multiple experts during multiple timeslots.

Factors influencing adoption of m-health services

The Usefulness of the services

Being a digital service and related to health, consumers evaluate the utility of the services. While evaluating new age m-health services in comparison with traditional services, the convenience of choosing service from multiple options, the convenience of using services as per the need, no waiting time, after sales service, 24X7 availability are some of the factors which drive the usefulness of m- health services as given below Chart 1

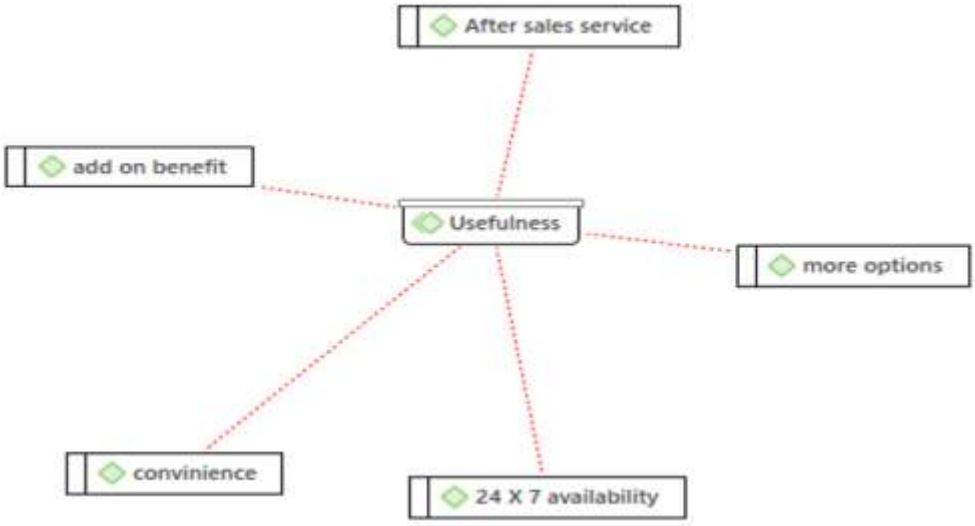

Chart 1: Network relationship between usefulness and other factors

The utility of m- health services is stated to be very high for vulnerable populations like patients with chronic ailments like diabetes and hypertension, Obesity, pregnant women etc. This group of the society needs closer monitoring of fitness, diet and medical parameters on the regular basis. m-health services can make their life easier by assisting them with their health goals. People are appreciating the utility of most of the m- health services

Ease of use

In the era of smartphones, all smartphone users keep multiple applications on their phones. Like other mobile applications which people use for

services like cab booking, and shopping, users find the layout and operations of the m-health service apps to be easy to use. Users have cited a few concerns for the geriatric population for whom managing such technology-related systems can be a challenge. However, operations are easy for getting information and attending online classes on fitness and diet. The use of m-health services for managing critical health parameters regularly is still considered to be challenging.

Social influence

Although people download m- health services for their purpose, friends and relatives from the society have influenced their usage, where they track daily fitness performance of each other and notify that on social media platforms like Facebook. In the world of social media, showcasing one's achievements on social media became a trend. Along with maintaining good health, people prefer to post their health-related achievements on social media to showcase to the external world. At the same time, they also track the health performance of their close friends

Price value

Some of the users are using paid subscriptions of the m-health services. The primary reason for a paid subscription is the economic cost of a subscription in comparison with the conventional alternatives. Also, the convenience of attending all health sessions as per your own schedule makes this a value for money proposition

Criticality of disease

Digital health services like online consultation with a doctor, booking doctors' appointments, booking lab tests etc are very useful services for minor health ailments like headaches, coughs and colds. However, when it comes to more severe/critical diseases, people prefer more in-person consultation and offline healthcare services. Criticality of the disease is based on the nature of disease i.e acute vs. chronic, high risk patient profiles where expert guidance needed in person as per the chart 2 given below

Chart 2: Network relationship between criticality of the disease and other factors

Data security

Data security is not mentioned as a concern by any of the respondents. People perceived that if they don't permit the app only when it's in use, the app will not interfere with other services and personal details on the phone. In addition to that, services coming up from good brands cannot afford to do such data breaches. Such data security breaches will impact their overall reputation. Although data privacy is mentioned as a concern in the literature review, users from Mumbai believe that the data security issues are taken care of by good brands.

Trust

Traditionally, most health and wellness services were offered through offline mode where the user used to interact with an expert personally. Considering the personal touch, doctors' awareness about family history and reliability of services has built confidence in traditional health services. While moving from traditional services to m-health services, trust in the m-health services becomes an important factor. However, branded players in the market, advances in technology and reviews from close friends and relatives have helped m-health services to gain trust amongst consumers at least for preventive fitness and diet-related services. Additionally, users can trust m-health services for acute ailments but are skeptical about critical illnesses. They trust more on the family doctor for managing their critical illnesses.

Health Belief

Overall, due to the severity of COVID 19, people were forced to think of a solution for maintaining their immunity and good health. For maintaining fitness and a good diet various m-health services have provided information, online classes, healthy food, monitoring health parameters as well as per chart 3 given below.

As the risk of getting COVID was very high, people were shifted to online health services. These online health services have helped people to consult doctors with a virtual platform. Due to the easy to operate layout and buzz on the social platforms, it was easy for consumers to learn about these health services and start operating them. When compared with m-health services for supporting health-related concerns, people are preferring their family doctor who knows their history, prior treatment, allergies etc. Familiarity with a doctor provides confidence to patients while receiving treatment.

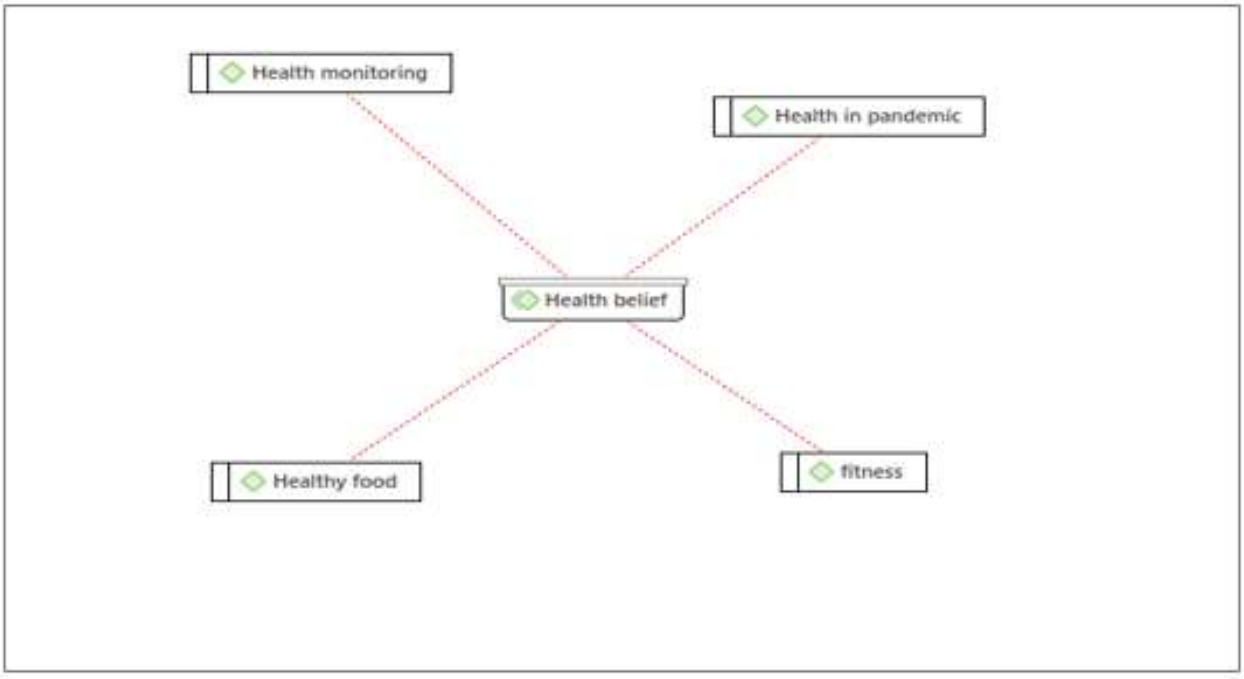

Chart 3: Network relationship between Health Belief and other factors

Facilitating conditions

An increasing number of smartphone users with the availability of internet data has helped users in accessing and using the services. Also, more options, personal attention, 24X7 availability time saving, good aftersales service are some of the facilitating conditions for generating interest in m-health service helped in getting paid subscription as given in chart 4 below.

Other factors

m-health services are very easy to use for young and middle-aged people. However, it would be sometimes very tedious for the geriatric population who are not well versed with such technical systems. Services are very easy to use for young and middle-aged people. However, it would be sometimes very tedious for geriatric population who are not well versed with such technical systems.

Discussion

The findings of the study revealed the adoption process of m-health services in brief and key factors influencing its adoption. Overall Adoption starts with getting awareness and attention towards these m-health services and proceed with generating interest due to the offers and utility of the services. The interest generation step is followed by an evaluation of m-health products and services. Post satisfactory perceived performance of the services, users feel a desire to get this service and encourage to download and try these services.

Perceived risk of getting health issues, benefits of using m-health services, especially during emergencies, relationships with the doctor, impact the

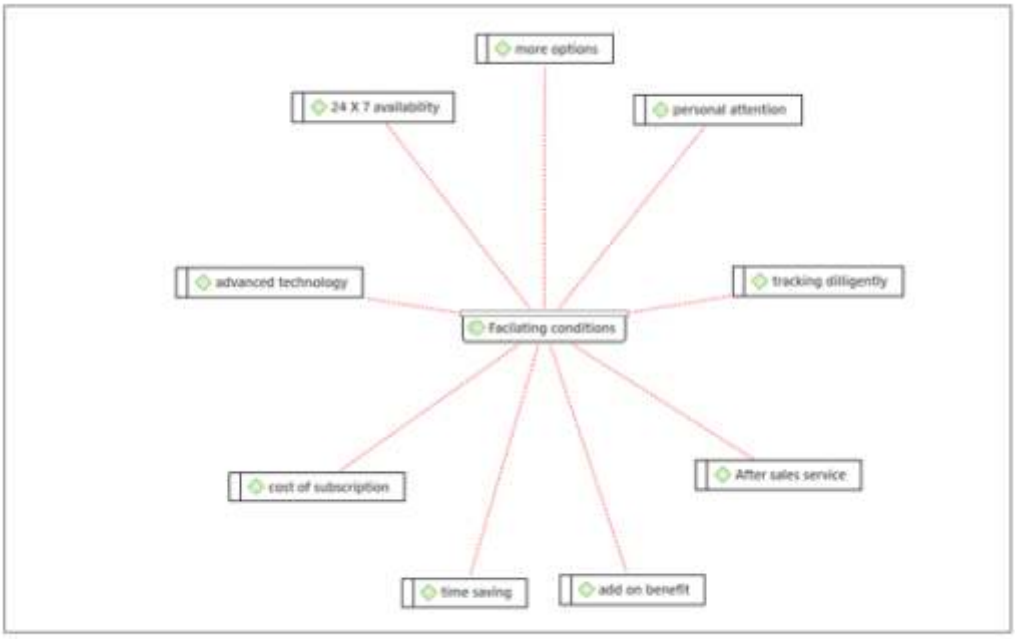

Chart 4: Network relationship between Facilitating conditions and other factors

acceptance of m-health services. People with higher vulnerability to lifestyle diseases are more precautious than healthy individuals. This indicates the findings are in line with the health belief model (HBM).

When we consider important factors impacting the adoption of m-health services, perceived usefulness had the strongest influence on adoption intention confirming the findings of previous studies that adopted perceived usefulness to explain adoption intention in the context of information technology products (Cheung et al., 2019). m-health services aid in the promotion of the concept of illness prevention, such as limiting continuing physical activity, consuming certain meals, and tracking the progress of potential and current patients which is in line with the previous study by Palos-Sachez et al.(Palos-Sanchez et al., 2021). Relative advantage versus traditional health services has a constructive effect on the adoption of m-health services as confirmed in a previous study by (Mehra et al., 2021). Social reputation and performance were seen to be important factors impacting adoption intention which was also reported by (Alam et al., 2018). Perceived usefulness added with easy to use the perception of m-health services confirms the Technology acceptance model (TAM) for the adoption of m-health services

Trust in m-health apps and doctors impact the adoption as it will help in the adoption of m-health services (Octavius & Antonio, 2021). Trust in the m-health services is also impacting the perceived risk of using services. Users who already have confidence in m-health services will have a lower level of privacy concern. Trust will provide a sense of security for users so that the perceived privacy risk will be lower. (Resti Fitriani et al., 2020). The current study also confirms a positive and significant relationship between price value with users' intentions to adopt smartphone fitness apps. (Dhiman et al., 2020). m-health services adoption process is faster amongst the younger consumers compared with older consumers primarily due to expertise in handling technology in line with the study conducted by (Deng et al., 2018)

Limitations of the study

The scope of this study is limited to m-health services users. Exploring the views of non-users, medical professionals etc. might help the project to make it better and develop a wider understanding of the issue. Moreover, the research was conducted with users in Mumbai. The findings do not represent the wider Indian population and thus cannot be generalized. Despite these limitations, the findings of the study are helpful to improve the understanding of the topic and highlight the importance of digital health adoption effectively.

Conclusion

The adoption process of m-health services starts with awareness and end up in product trial. M-health adoption follows the health belief model and

technology acceptance model. In addition to this, trust in the m-health services, relative advantages versus traditional health services, data privacy concerns and demographic factors like age impact the adoption of m-health services.

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