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CONCEPTUAL FRAMEWORK FOR EXPLORING THE INTENTION AND USAGE OF MOBILE HEALTH APPLICATIONS

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ABSTRACT

Mobile Health Application is one of the most promising technologies make people more self-sufficient with their health in relation to their lifestyle management for health promotion and protection. mHealth services have been widely implemented worldwide, their adoption is slow. Hence adoption of mHealth is influenced by many factors which must be addressed by mHealth services providers. The aim of this study is to identify the factors and propose a model for adoption of mHealth applications for lifestyle management by extending the Unified Theory of Acceptance and Use of Technology (UTAUT) model to include health consciousness. Therefore, this study attempts to bridge the gap in the literature by identifying the factors that influence people to adopt and use mobile health applications. The study addresses the adoption factors from UTAUT perspectives. The proposed conceptual framework determinants are from UTAUT: performance expectancy, effort expectancy, social influence, facilitating condition and health consciousness. The findings of this study reveal that the antecedents affect behavioural usage of mobile health applications. And also the UTAUT factors along with health consciousness significantly influences behavioural intention to use mHealth services. The findings of this study help both users and application developers to design evidence-based mHealth interventions that meet consumers' needs and interests. The results of this study will be useful for government organizations, mobile phone carriers, decision-makers in the fields of policy and healthcare, as well as NGOs in developing nations.

Keywords*: UTAUT, Mobile Health Applications, Behavioral Usage*

1. Introduction

The use of applications in the delivery of healthcare is changing as a result of Information Technology developments in the industry, particularly in mobile health applications and services. Maintaining patient health data, video conferencing, online consultations, remote patient monitoring, clinical decision assistance, forecasting potential diseases, and prescribing treatments and medications are just a few examples of these. (The Digital India Healthcare Summit, 2015)
Mobile health services have received more attention recently as a result of the healthcare industry's rapid expansion. Modifying one's lifestyle to improve one's health and well-being has been found to be successful with mobile phone-based health treatments (mHealth). A newly developed concept known as "mobile health" (or "mHealth") describes the integration of mobile computer, communication, and medical sensor technologies for healthcare. The delivery of health services via mobile technologies is known as mHealth . The goal of mHealth is to use wireless and mobile technology to enhance health outcomes. Its scope includes more active applications including disease management, medical prognosis, diagnosis, and even therapy in addition to the passive dissemination of health-related information via mobile platforms. According to census data, there is a widespread, significant, and long-lasting ageing of the global population. By 2050, there will be about two billion senior people on the planet (WHO, 2011). The next generation of wearable and implantable sensors is expected to change as a result of the development of flexible and stretchable electronics.

The penetration of health services will continue to be aided by mobile apps, making them a necessary component of daily activities. The successful promotion of personal health management will contribute to improvements in both general health and the efficient administration of healthcare resources. In India, there is a large potential for using mHealth as an alternative delivery channel. This considerable behavioural shift is crucial for the adoption of health. From 2016 to 2021, both globally and in India, mobile traffic is predicted to increase seven-fold, expanding extremely quickly every year. Indians are starting to use their mobile devices more frequently. According to the Mobile Marketing Association, the average Indian uses their smartphone for about three hours each day. Every area of our lives—including our physical and mental well-being—can be impacted by mobile technology. Rapid growth in mobile phone ownership in India is a result of dropping device prices and expanding network coverage. In India, there are already over 1 billion mobile connections, with 42% of users residing in rural regions (Iyengar, 2017).

The Indian healthcare industry, which is now dealing with numerous problems with service delivery, is encouraging the usage of cell phones or smartphones. Additionally, it has applications to lower the price and increase accessibility for rural residents. Mobile technology use is thought to be pervasive and is supplying medical treatment to doctors in underdeveloped nations like India. As a result, employing a mobile phone and its applications to supply healthcare services can be one potential approach for managing these situations and achieving the desired result.

Mobile Health Applications (mHealth)

MHealth is described as "medical and public health practice supported by handheld devices such as mobile phones, monitoring for patients devices, personal digital assistants, and other wireless devices" by the World Health Organization's Global Observatory for eHealth. (WHO, 2011)

According to the Fogarty International Centre of the National Institutes of Health, mHealth "makes use of mobile technologies as platforms and tools for health research and healthcare service." (NIH, 2022)

There are numerous mHealth app classifications in the healthcare industry. The IMS Institute for Healthcare Informatics states that there are two general categories of mHealth apps: those that promote overall wellbeing and those that focus on illness management. Four main categories of mobile health apps are listed by (Boulos et al., 2014): a) Apps for healthcare professionals, b) Apps tailored to certain conditions or specialties, c) Apps for instruction and education, and d) Apps for the general public and patients. While categories (b) and (d) are patient-focused, categories (a) and (c) are intended for healthcare professionals..

Need for the study

A component of sustainable development includes improved access, affordability, and quality healthcare for all populations. India requires advanced and innovative ways of healthcare delivery, such mobile health, to make up for the shortcomings in its healthcare professionals and infrastructure. The nation does not adhere to the WHO's minimum workforce and bed density requirements. The percentages are significantly worse in rural areas, where a significant percentage of the population is concentrated. The low-income population, in particular, does not have access to high-quality healthcare. In fact, a significant portion of the population lacks access to even basic healthcare facilities. (PwC, 2015). The pandemic's effects have increased the importance of mental and physical health. By offering a comprehensive model that meticulously describes the usage of mHealth services from the perspective of Indian users, the gap in the mHealth literature in the Indian context can be closed (Ala, et al., 2018).

Research Gap

The adoption of mobile health care is currently driven by a number of factors that have not been adequately explored in developing nations like India. In addition, not enough study has been done to establish how each of these elements influences the effectiveness of mHealth activities and the interaction with them. This investigation fills a significant research gap by identifying the factors that affect customer intention and the relation between that intention and their decision to use mobile health applications, as well as conducting a thorough study that accounts for the key determinants in the UTAUT model. The factors influencing the adoption of mobile health applications in the Indian setting have only received limited research. This study adds significantly to both theory and practise by examining the barriers to the adoption of mHealth and their interrelationships. Developed countries discovered the value of mHealth practises during the current epidemic. A comprehensive framework to comprehend the impact of the adoption and use behaviour of mHealth applications is provided by the inclusion of the health consciousness into the UTAUT model. (Barua and Barua, 2021)

The findings from studies addressing the interpretation of mHealth adoption are inconsistent notwithstanding the maturity of these theoretical frameworks. For instance, whereas Alam et al. discovered that effort expectancy did not affect behaviour intention (Alam et al., 2020), Macedo's study of 278 senior Portuguese persons discovered that effort expectancy was an important component influencing behaviour intention [(Macedo, 2017)]. Quaosar et al.'s questionnaire study of 245 Bengali people revealed no significant impact of facilitating conditions on the intention to use health services (Quaosar et al., 2018). By include health consciousness as a moderating variable and extending it to the mHealth domain, Guo et al. enhanced the elaboration likelihood model (ELM), a fine-grained mimetic model that is commonly used in e-commerce (Guo et al., 2020).

Objectives of the study

The major objective of the study is to understand the factors influencing the intention and usage of mobile health applications. The study also aims to identify the mobile health applications used by an individual for health promotion and protection

2. Methodology

In order to create a theoretical model for the study, associated investigation is carried out to identify the relevant articles for adoption of mobile health technology. These articles were gathered using a combination of keywords and phrases, including "mobile health," "m-health," "smartphone health apps," and other terms like "health promotion," "lifestyle," "acceptance," "adoption," and "usage" in all possible combinations. The article is selected based on the associated factors related to the study. This study proposed a conceptual model for exploring the intention and usage of mobile health applications and the literature review for this study includes both conceptual (non-empirical) and empirical study. Several previous mobile health adoption models were analyzed to select applicable factors as well as their relationship.

3. Literature Review

Adoption to new technology and its usage is an important research topic. Several models and theories have been developed to examine end-users new technology adoption and its continuous usage (Hsiao et al, 2015). Researchers have widely applied TAM and UTAUT models for measuring users' behavioural intention and acceptance to use new technology (Alalwan et al, 2018); (Tan, 2013). Mobile health apps support health behaviour changes and helps in tracking the health data. (Murnane et al, 2015). It is also used for notifications, reminders and for accessing health information (Murnane et al, 2015). It is considered to be a self management tool which is of low cost and it is easily accessible. (Tajudeen et al, 2022); (Wang et al, 2021). People initially use mobile health apps but later they abandon using the application. People who regularly use the mobile health application show overall health improvement. (Kim et al, 2021), (Murnane et al, 2015)

As a theoretical framework for examining the continuous use of mHealth apps, UTAUT suggests antecedent elements that affect users' intentions to continue using mHealth apps. Compared with UTAUT, UTAUT2 greatly improves the interpretation of individuals' usage behaviour and is developed to illuminate users' continued usage behaviour of mHealth apps (Venkatesh et al 2012); Alalwan et al, 2017). (lan et al., 2018) observed that user adoption of mHealth in Bangladesh was influenced by the role of performance expectancy, effort expectancy, social influence, facilitating conditions, and perceived reliability. (Deng et al, 2018) applied TAM and found that trust, perceived usefulness, and perceived ease of use positively impact health-seeking behaviours on mHealth apps.

(Hoque et al, 2015) confirmed that the UTAUT model is applicable to studying the adoption factors of mHealth services in developing countries. (Venkatesh et al, 2016) proposed the UTAUT model to examine user intentions to use new technology and the consequent usage behaviour of the system. The UTAUT model has four constructs, namely, effort expectancy, performance expectancy, facilitating conditions, and social influence (Venkatesh et al, 2016). Additionally, the UTAUT model's performance expectancy and effort expectancy components are comparable to the TAM model's perceived usefulness and perceived ease of use elements (Lee et al., 2013).

Governments and health authorities have called for self-quarantine as one of the preventive measures since COVID-19, a new infectious disease, started spreading over the world in December 2019 (Bodas et al., 2020). Self quarantine is the restriction of people who are thought to have been exposed to a contagious disease but are not yet unwell, either because they have not yet contracted the illness or because they are still in the incubation period (Smith et al., 2020). Depression, frustration, and constant stress are linked to self-isolation and self-quarantine (Mattioli et al., 2020). Those who are in quarantine may therefore find it helpful to use mHealth to search for health services related to this. Additionally, as a result of the COVID-19 pandemic, which has put people in self-quarantine around the globe, the use of mobile apps and the internet, has significantly expanded. People who intend to utilise mHealth services are therefore anticipated to display higher real usage behaviour in a pandemic event like COVID-19, given the situational impact of self quarantine.

To identify the factors that influence mHealth intention and usage the conceptual model of this study combines the core constructs of the UTAUT model with health consciousness.

4. Conceptual Framework

Based on a literature survey and recent relevant work, this study suggests a conceptual framework. The suggested framework combines health awareness with the Unified Theory of Acceptance and Use of Technology (UTAUT). The definitions of each construct and examples of their use in literature about mobile health technology are provided below. The conceptual framework that is provided is shown in Figure 1.

Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT has been used widely to explain people acceptance of new technologies. (Arshia Khan et al., 2011) evaluated a number of technological adoption models. TAM and DOI are primarily subjective elements, whereas both subjective and objective factors are present in the UTAUT. The UTAUT will undoubtedly offer a thorough and effective framework for technology adoption in healthcare, according to the literature (Hennington & Janz, 2007; Tung et al., 2008; Venkatesh et al., 2003; Ward et al., 2008; Yen, 2010). Due to UTAUT's limitations, it is necessary to identify variables that can be used to enhance the model, measure the various facets of technology adoption, and assess the influence of externAal variables on the model (Lee et al., 2003).In

A. Performance Expectancy

The degree to which a person expects to improve their job performance by utilising the system is known as performance expectancy. Performance expectancy has a significant effect on usage of mobile phones and services (Carlsson et al., 2006; Lu et al., 2009). Furthermore, (Chong 2013) observed that one of the important aspects influencing consumers' behavioural intention to embrace mHealth services is performance expectancy. (Sun et al., 2013) discovered that when performance expectancy are high, mHealth services are more likely to be embraced and utilised. As a result, the following hypothesis is made:

H1. Performance expectancy significantly influences behavioural intention to use mHealth services.

B. Effort Expectancy

According to Venkatesh et al. (2003), effort expectancy is referred to as the system's ease of use level. The adoption of new technologies is significantly influenced by effort expectations (Chong et al., 2013). Before deciding to use a system, users frequently think about the required effort (Venkatesh et al., 2012). Users often connect more readily and easily to convenient and user-friendly technology (Alalwan et al., 2017; Shareef et al., 2017). According to Sun et al. (2013) and Venkatesh et al. (2012), effort expectancy has a substantial impact on user intention to embrace and use mHealth services via smartphones. Thus, the following hypothesis is formulated:

H2. Effort expectancy significantly influences behavioural intention to use mHealth services.

C. Social Influence

According to Venkatesh et al. (2003), social influence is the extent to which a person believes that influential others think they should utilise the new system. According to (Lu et al., 2005), social influence has a big impact on whether people accept new technologies. Communities near the user environment can significantly influence user intention towards technology by educating and

energising them (Alalwan et al., 2016; Rana et al., 2015). Mobile app adoption is significantly influenced by users' social connections (Taylor et al., 2011). Social influence has a favourable impact on users' behavioural intention to use mHealth services, according to (Sun et al., 2013). Thus, the following hypothesis is asserted:

H3. Social influence significantly influences behavioural intention to use mHealth services.

D. Facilitating Conditions

The extent to which a person thinks that a technological and organisational infrastructure exists to facilitate use of the system is known as the "facilitating conditions" (Venkatesh et al., 2003). According to (Yi et al., 2006), facilitating conditions have a beneficial impact on users' behavioural intention and, consequently, their usage of new technologies. The use of information systems is significantly influenced by confirmed infrastructure support. According to (Venkatesh et al., 2012), facilitating conditions influence users' intentions to utilise smartphones for mHealth services. According to Dwivedi et al. (2015), users' behavioural intentions for adopting mHealth are dominated by facilitating conditions. Thus, the following hypothesis is asserted:

H4. Facilitating conditions significantly influences behavioural intention to use mHealth services.

F. Health Consciousness:

The degree to which a person tends to engage in healthy behaviours is referred to as their health consciousness (Todd et al., 1995). The desire to utilize mHealth apps is influenced by one's level of health consciousness. Self-awareness of one's health and a willingness to engage in actions that promote health and wellness are both indicators of health consciousness (Gould, 1988).People who care about their health actively seek out information about adhering and following it (Iversen, 2006). As a result, those with high health consciousness have healthier lifestyles than those with low health consciousness (Hollis et al., 1986). They also have favourable attitudes towards nutrition, self-care, and exercise.

H5. Health Consciousness significantly influences behavioural intention to use mHealth services.

G. Behavioural Intention

The degree to which consumers believe they are willing to employ mHealth services is known as behavioural intention (Yu et al., 2011). The correlation between behavioural intention and actual use conduct is highly significant (Dwivedi et al., 2015; Turner et al., 2009). According to Todd et al. (1995), behavioural intention is the best predictor of present usages in the healthcare environment. Therefore, the following hypothesis is proposed:

H6. Behavioural intention positively significantly influences behavioural intention to use mHealth services.

H. Actual Usage Behaviour

Actual Usage behaviour is defined as continuous compliance to the product (Black 1982), and it is just as significant as the degree of initial adoption. It is therefore anticipated that in a pandemic situation like COVID-19, people who intend to utilise mHealth services will demonstrate more real usage behaviour when taking into account the situational impact of self quarantine.

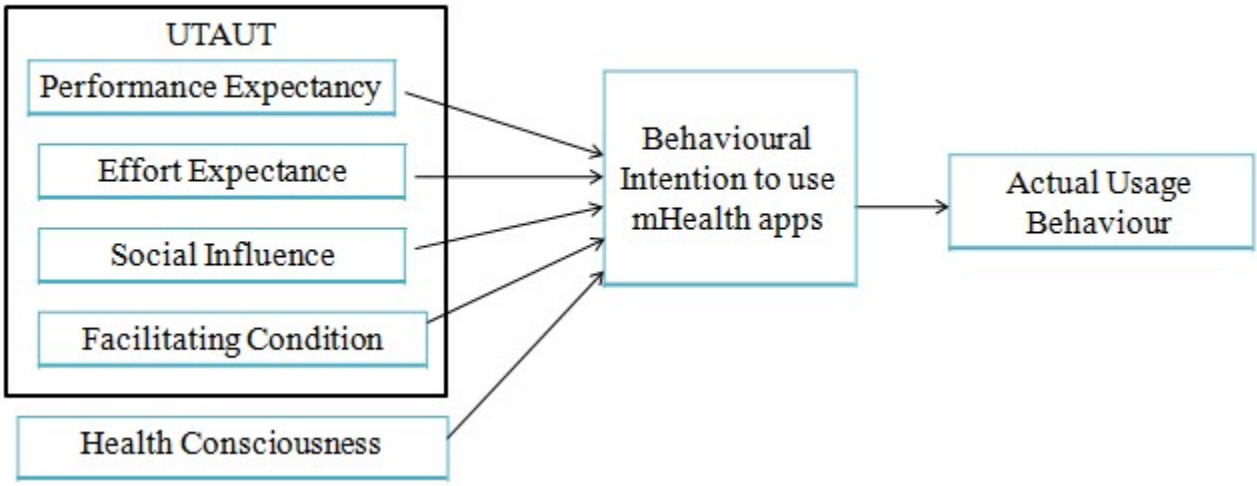

Fig 1: Conceptual Framework for Exploring the Intention and Usage of Mobile Health Applications

5. Scope

Mobile technology provides developing nations like India with a huge chance to improve the delivery of healthcare by efficiently using limited resources. Smartphone use is made more convenient by the availability of devices that can show fonts in regional languages in addition to English (such as Hindi, Bengali, Tamil, Kannada, etc.). Indians are utilizing smartphones quicker than Japanese users, according to a recent British Broadcasting Corporation (BBC) news report from August 2013, and this is helping India become the third largest smartphone market in the world. Customized mobile health applications and financially sound business models that could interact with the regional healthcare delivery systems already in place would produce positive results.

6. Discussions and implications

UTAUT is extensively utilized across a variety of technology adoption domains, including mHealth and eHealth. It is generally acknowledged that up to 70% of the diversity in intention might be explained by the UTAUT model. In order to address the intention of adopting mobile health technology, the study also takes into account health consciousness. Policymakers and mobile health app developers must be aware of the elements that affect customers' intentions and adoption of this technology for the successful implementation of mHealth applications. The current study offers insights for application developers into understanding the characteristics and behaviour change strategies that should be taken into account when building and implementing into practise context-aware mobile health interventions.

7. Conclusion

Wellness and health are essential to all individuals so health interventions through mHealth applications support in promoting health. On the basis of the review and associated studies, a list of variables that are likely to affect consumer acceptance and use of mobile health technology was developed. The COVID-19 pandemic's enormous impact on mHealth acceptance is also shown by research. The COVID-19 pandemic and the significant prevalence of mobile phone use in the nation provided tremendous economic opportunities for offering dependable mHealth at a competitive price. The results of this work will assist both application developers and policymakers in the workplace to deploy an easy and cost-effective way to better monitor the workers' health and to address the drop in productivity and performance. Future research is necessary to evaluate and statistically validate the suggested framework and to comprehend the interrelationships between the various components.

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