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A Review of Technology Acceptance of mHealth in India

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ABSTRACT

In developing economies especially facing significant resource limitations. delivering healthcare services poses a substantial challenge for governments. With the potential to considerably mitigate health-related issues in the long run the utilization of mHealth (mobile health) emerges as a promising solution providing a proactive tool for preventive healthcare. However, comprehensive studies are scarce on the mHealth technology adoption, particularly in India.

In mobile health (mHealth) literature, the purpose of this review is to investigate how technology acceptance is measured and understood. The objective is to identify potential gaps, compare with existing models and definitions of how acceptance is the treated in mHealth research, and clarify the process of technology acceptance.

To evaluate the logical implementation of mobile health services and to identify appropriate research domains, a conscientious literature review was conducted, leading to the selection of the framework Technology Acceptance Model (TAM). Performance Expectancy (PE), Social Influencer (SI), Effort Expectancy (EE), Facilitating Conditions (FC), Perceived Reliability, Attitude towards Behavior (ATB), and Privacy and Security (P&S) are the seven additional variables that this study adds to the TAM that Davis first proposed.

Various viewpoints are connected to the acceptance of technology, and only a limited number align with existing definitions. Published definitions in the literature were presented separately, potentially contributing to incompatible usage. Establishing a framework for definitions would bring adherence to the reporting of results making it easier to replicate and compare studies. Technology Acceptance consolidates existing definitions, outlines distinct phases of technology acceptance, and provides definitive terminology.

As the culmination of this investigation, the research not only adds theoretical value by extending the Technology Acceptance Model (TAM) but also provides practical insights into the adoption of mHealth services in India, guiding policymakers and academics in comprehending and addressing the opportunities and challenges associated with mHealth adoption.

INTRODUCTION

Indian mHealth Scenario

Through the years, India's health scenario has always been a stride in improving. The
hindrance in achieving good quality healthcare impediments were high Populationdensity, large geographical size, inadequate nutrition, lack of preferable transport facilities, illiteracy, and poverty.

Rapid development in mobile technology, vast network coverage, a fall in the market price of the product, and increasing user rates off a cell phone are enabling the rising opportunity and driving factors of healthcare delivery which has developed into mHealth, or mobile health, a new area of e-health. The face of Global Health systems has completely changed with the pertinence of mobile technology in the healthsector.

The mHealth provides new opportunities for improving healthcare services building on the ubiquity of mobile phone accessibility and affordability around the world. Due to its high potential and convenience, a new concept of delivery through a mobile app is gradually likely to be inculcated in the healthcare delivery system. In suburban and rural areas of India, there is a very serious scarcity of healthcare infrastructure and trained health workers.

However, in the lexicon of developing countries, novel developments in the field of the healthcare sector have led to an improved interest in examining the factors inthe adoption of mHealth. Furthermore, in diverse settings across multiple nations, the elements that effect the uptake of mHealth services have been discussed in a considerable number of studies (e.g. Sun et al.(2013) in France; Nematollahi et al. (2017) inThailand; Cajita et al., (2018) in Iran; Boontarig (2012) Munyua et al. (2015) in India; in China; Moores (2012) in the USA; Hoerbst et al.(2010) in Australia; Wu et al. (2011) in Taiwan; Lim et al. (2011) in Singapore; Zhang et al., (2014) in Hurbin, China; Kim et al.(2014) in Korea; Dunnbeil et al., (2012) in Germany; Sultan and Mohan (2013) in Trinidad and Tobago; Aggelidis & Chatzoglou (2009) in Greece; & German; Schuster et al.(2017); Iwaya et al. (2013) in Brazil; McDonald et al. (2005) in India; Ifinedo (2012) in Canada; Okazaki et al. (2012) in Japan. in France;Sharif et al. (2013) in Iran.

Objective of the study

i. To determine technology acceptance definition by researchers.
ii. To know the terminology used to describe the technology acceptance.
iii. To determine how technology acceptance is measured and interpreted in mobile health (mHealth)
iv. To identify the factors influencing usage intention by subsequent use of potential usefulness, reliability, perceived ease of use, and privacy and security
v. To identify and suggest a broad model with constructs

to realize the Current Status and Future Directions of mHealth Interventions for Health System mending in India.

CHAPTER 2: LITERATURE SURVEY

CRM in ICT

Gartner (2009) defined CRM as a vast term that is principally used for customer services such as sales and marketing activities. IT CRM is used to invoke a strategy for managing communication with customers & integrating business processes. CRM from the point of view of Rogers 2006 is a technology-enabled blueprint to convert data-driven into business in response to and in foresight of actual customer behavior. The most of articles cited the dominion of CRM on service quality, patient loyalty, patient satisfaction, and hospital performance. The researcher recognized that none of the selected articles have identified the e-CRM acceptance or mobile CRM (m-CRM). Based on the Research review there is no article discussing the implementation of CRM in terms of how a healthcare organization can implement the system and issues such as mobile CRM have not been studied much. So, the Researcher suggests future research to focus more on these areas. Market shareholders need to identify knowledge of consumer behavior, why and which consumers accept technology since ICT is a fast-changing market and its possible to foresee better, according to the research of Karangenic and Granick (2015) user's technological acceptance is included as the main factors driving the improvement of new technologies? Researchers worldwide have identified why users are either willing or unwilling to accept health technologies, because of the significant benefits of mHealth technologies when it comes to the mHealth industry.

Technology acceptance models

Researchers have employed a number of technology acceptance theories and models (such as the TAM, the UTAUT, and the UTAUT2) to explain user acceptance and the use of innovations.

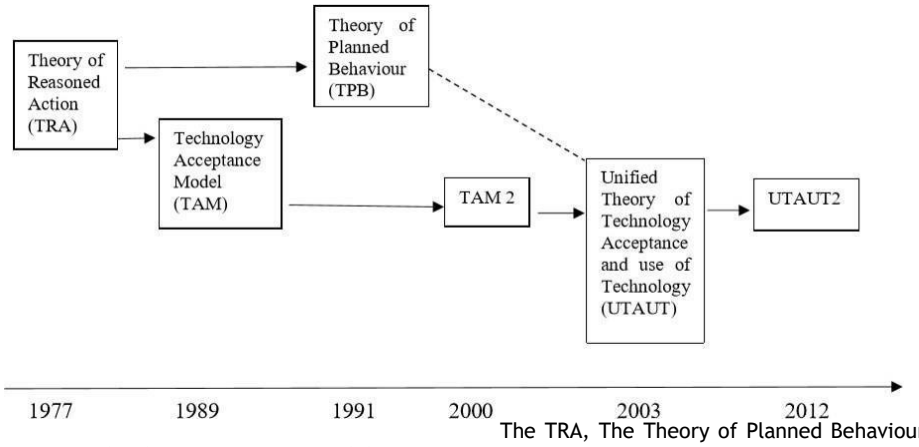
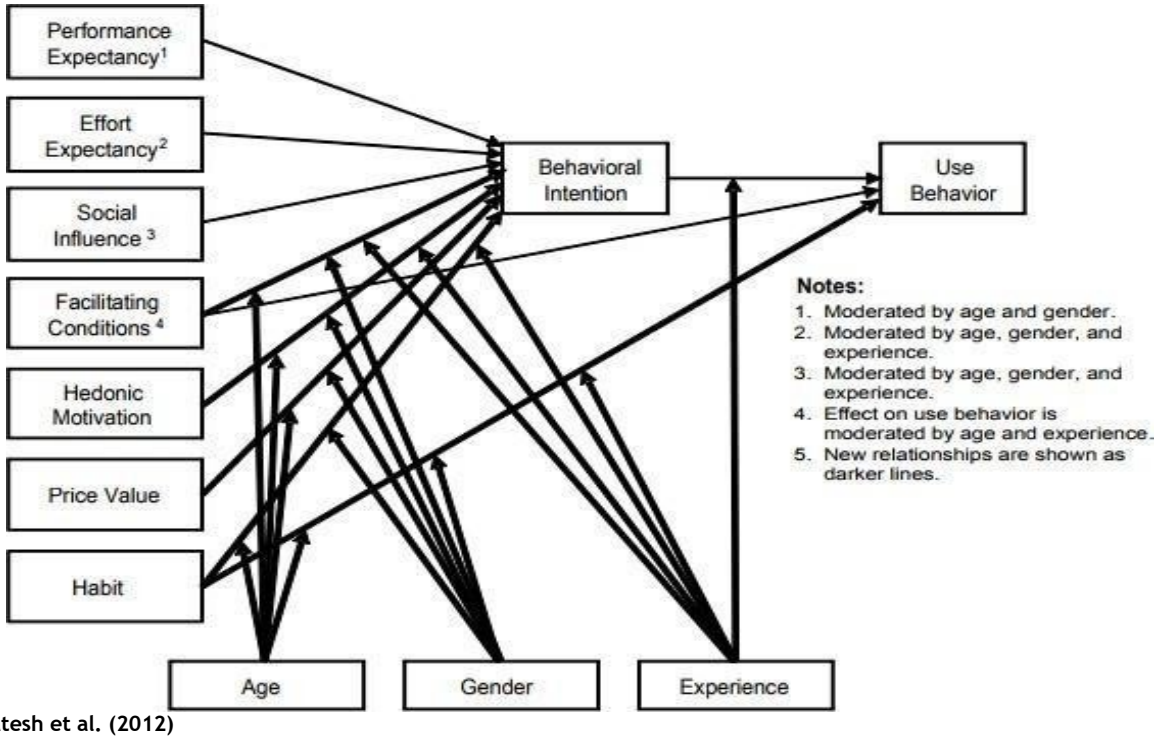


Figure 1: the development of technology acceptance models

Davis introduced TAM in 1986 which was one of the most inferential models, which was derived from Fred D Davis (1985) Theory of reasoned action (TRA.According to TAM the two primary constructs perceived ease of use (PEOU) and perceived usefulness (PU) determine user attitude towards innovations. The TAM posits that the main factor influencing the user behavior is an intention which is the catalyst of user acceptance (FD Davis, RP Bagozzi, PR Warshaw - Management Science, 1989). The two primary constructs can be impacted by external factors pertaining tothe innovation under investigation. According to Google scholar, the TAM has been cited more than 54000 times (as of September 23, 2020) by Fred D Davis (1989). However, the TAM has been criticized by researchers for its low explanatory power (MS Abbasi, A Tarhini, T Elyas, F Sha (2015; C Claar, L Portolese Dias, R

Shields 2014; B Rahmi, B Birgoren, A Aktepe 2018) and lack of moderating variables (SS Al-Gahtani,2008; V.Venkatesh, MG Morris, GB Davis, FD Davis,2003). This criticism might justify the emergence of the UTAUT, which was developed based on the examination of eight technology acceptance theories and models: The TRA, The Theory of Planned Behaviour (TPB) the TAM, The augmented TAM, the motivation model, The innovation diffusion theory (IDT), the model of PC utilization (MPCU) and social cognitive theory (SCT) (Venkatesh, V, Morris, MG, Davis, GB, et al. 2003) The UTUAT posits that user intention and actual behavior (AB) are determined by four independent factors namely performance expectancy, effort expectancy, social influence and facilitating conditions, as well as four moderating variables, namely age, gender, experience and voluntaries of use. In an organizational context, the UTAUT model focuses on technology acceptance which reduces its rangeof application. The UTAUT was recently further extended to explain consumer behavior (V Venkatesh, JYL Thong, X Xu, 2012). In the UTAUT2, the developed model, three more independent variables namely hedonic motivation, price value, and habit, and three moderating variables, namely age, gender, and experience were added. Because of this, Venkatesh et al. (2012) made an update and developed the new UTAUT2, shown in Figure 2

Figure 2 UTAUT2 model



Source: Venkatesh et al. (2012)

In the model, they comprehensively considered various factors that affect users' technological acceptance within a consumption context. Performance expectancy, effort expectancy, social influence, and facilitating conditions are similar constructs toPU, PEOU, subjective norm, and PBC suggested by previous technology acceptance theories (Williams et al., 2015; Venkatesh et al., 2012). Additionally, Venkatesh et al. (2012) considered the roles of demographics, hedonic motivation, habit, and price value. However, both the UTAUT and the UTAUT2 have been criticized for result bias across cultures (e.g. - El-Masri and Tarhini). It is evident from this brief review that each model has its limitations therefore proposing a general model is perhaps an appropriate solution to overcome these limitations.

mHealth Technology

Literature related to mHealth acceptance is scarce, despite the plenty of user acceptance studies in the realm of information systems (R Hoque, G Sorwar,2017; JM Tsai, MJ Cheng, HH Tsai, SW Hung,2019). However, the existing literature is associated with several constraints. First, most of the studies only adopted technical factors (such as performance expectancy, mobile anxiety, and effort expectancy) from the above-mentioned technology acceptance models (e.g. Dwivedi et al; Hoque & Sorwar; Sezgin, Cho, et al) but the acceptance of mHealth is also considered a health-related behavior, which entail the investigation of health-related aspects. Secondly, there have been inconsistent findings that can cause perplexity among researchers and hinder the acceptance of mHealth. For example, it has been empirically demonstrated that the relationship between effort expectancy and user intention is significant (YK Dwivedi, MA Shareef, AC Simintiras, 2016; Hoque, R, Sorwar, 2017). However, the results of a study organized in Turkey found an insignificant effect (Sezgin, E, Özkan-Yildirim, S, Yildirim, S, 2017). Hence most of these studies that have used traditional technology acceptance models such as the TAM, the UTAUT, and the UTAUT2, produced inconsistent results. The underlying reason for these contradicting results can be attributed to differences in study contexts, samples, culture, and statistical techniques. Finally, the number of quantitative research studies that have been aimed at obtaining an extensive understanding of the relationships between the proposed variables and the behavioral intention to use mHealth is severely limited. (Zhao, Y, Nia, Q, Zhou, R, 2018)

Table 1: analysis of mHealth stakeholder

Stakeholders	needs Information
Consumer/ patient	can save time and money, and improve satisfaction and health outcomes
Health-care providers/ physicians and other clinicians	mHealth can help physicians do their work more efficiently andenhance quality outcomes
Health-care providers/ institutions (hospitals, physician practices)	the patient and identify incentives for physicians and patients

Source adapted from Malvey, & Slovensky, (2014).

In this research, the specified group is only for patients. According to Ventola, (2014), mHealth applications giving beneficial services to patients can be divided into five categories: health status recording and acquisition, health

education, time and information management consultation and communication, and medical information acquisition. The elaborate information can be found in

Figure 3: Uses for mHealth apps

Source: Ventola, (2014).

This literature review emphasizes the importance of proposing a general model that can be helpful for discussing the acceptance of mHealth. The above literature review analyzed how technology acceptance is explored and measured in mHealth literature. The researcher wants to compare the treatment of acceptance in mHealth research with modern definitions and models, identify potential gaps, and include clarifications of the process of technology acceptance.

Technology Acceptance (mHealth)

mHealth market has great potential and because of the significant benefits of mHealth technology, researchers facilitate the development of these technologies and have searched why users are willing or reluctance to adopt mHealth technologies worldwide. Many empirical studies examined the factors that influence users' acceptance of mobile health. Among them, pertinent, and high-quality empirical studies published after 2015 are chosen because early studies may not adequately reflect innovation and the current development of mobile health, which is evolving swiftly in modern years.

The key components in the theories are provided in Table 2 and these studies provide the following implications. First, prior researchers have utilized various technological acceptance models, and using different models leads to different hypothesized factors. Generally, compared with other theories, the acceptance of the UTAUT2 theory covers more drivers of technological acceptance, which leads to the maximized number of hypothesized and confirmed factors. Second, previous studies have drawn inconsistent conclusions, even for the same or similar factor, For example, Guo et al. identified the prominent effects of demographics whereas Dou et al. (2017) did not; Gao et al. (2015) documented a negative effect of privacy concern, whereas Choi et al. (2018) and Chen & Lin (2018) explored that the effect of insecurity (or perceived security) is insignificant; Gao et al. (2015) and Zhang et al. (2017) postulated the positive effect of effort expectancy (or PEOU), although Cilliers et al. (2018) reported an insignificant effect of perceived effort and Choi et al. (2018) even propounded a negative effect of PEOU. Hence, technological acceptance of various types of mobile health users and technologies may not be a generalized law. Further probing is still needed. Third, very limited studies (such as Chen & Lin (2018) probed into the technology acceptance of mHealth apps and few factors were explored, leaving a large room for the present study.

Table 2: An overview of empirical studies regarding service users'

Authors	Theories	Sample	Dependent Variables	Hypothesized Factors[1]	Confirmed Factors[2]
Guo et al. (2015)	Protection Motivation Theory	428 mobile health target consumers	Intention to adopt mobile health services	Perceived vulnerability, age, gender, attitude, perceived severity, self-efficacy,	Age, gender, attitude, perceived severity, self-efficacy,

	(PMT)			response efficacy	response efficacy
Gao et al. (2015)	PMT and UTAUT 2	462 actual users of healthcare wearable devices in China	Intention to adopt healthcare wearable devices	Effort expectancy, performance expectancy, functional congruence, hedonic motivation, self-efficacy, social influence, perceived vulnerability, privacy concern, perceived severity,	Effort expectancy, performance expectancy, functional congruence, hedonic motivation, self-efficacy, social influence, perceived vulnerability,

				product type	privacy concern, perceived severity, product type
Dwivedi et al. (2016)	UTAUT 2	Citizens from USA (n= 387), Canada (n = 359), and Bangladesh (n = 375)	Intention to adopt mobile health services	Hedonic motivation, effort expectancy, self-concept, performance expectancy, waiting time, facilitating conditions, price value, social influence	Effort expectancy, self-concept, performance expectancy, waiting time, facilitating conditions, price value, social influence
Zhang et al. (2017)	TAM	650 service users from Hong Kong, China	Intention to adopt mobile health services	Self-efficacy, PEOU, PU, response efficacy	Self-efficacy, PEOU, PU, response efficacy

Dou et al. (2017)	TAM and Dual-Factor Model	57 hypertensive patients in China	Intention to use mobile technology for chronic disease management	Demographics, perceived health threat, relationship with doctor, self-efficacy, social influence, usage experience, resistance to change, PEOU, PU	Perceived health threat, relationship with doctor, self-efficacy, social influence, usage experience, resistance to change, PEOU, PU
Chen & Lin(2018)	TAM, Technology Readiness, Technology Readiness and Acceptance Model (TRAM)	1104 individual from a fitness community in Taiwan, China	Intention to download and use health Apps	Insecurity, discomfort, optimism, health consciousness, PEOU, PU	Optimism, health consciousness, PEOU, PU
Cilliers et al.	UTAUT	202 university	Intention to use mobile	Perceived PU, effort, social	PU, social influence,

(2018)		students in SouthAfrica	technology to collect health-relatedinformation	influence, mobileexperience, attitude towa rds technology	mobile experience, attitude toward technology
oi et al.(2018)	TAM and UTAUT	400 smartphone users from Korea	Intention to use mobile healthfor intervening smartphone overuse	Perceivedsecurity, PEOU, PU, resistance to change, social norm	PEOU, PU, resistance to change, social norm

Behavioral Change Theories

Behavioral Change Theories explain behavioral changes. Nutbeam (1998) defined health behavior as regardless of perceived or actual health status any activity undertaken by an individual for the reason of protecting, maintaining, or promoting health, whether or not such behavior is objectively beneficial towards that end. Thus, in behavioral change theories, to maintain or improve a health status, adoption is an undertaking that relates to m-health technologies. Hence Munro, et al., 2007 discussed the Social Cognitive Theory (SCT), Protection Motivation Theory (PMT), Theory of Reasoned Action (TRA), Theory of Planned Behaviour, and the Health Belief Model (HBM) while reviewing health behavior theories. These theories triggered behavioral change as behavior is the result of an interplay of assessments of future happenings, attitudes, and cognitive variables (Munro, et al., 2007). From these behavioral theories, did especially TRA, TPB, and SCT contribute to the formulation of the UTAUT model (Venkatesh, et al., 2003). The five behavioral change theories present the ideas and constructs.

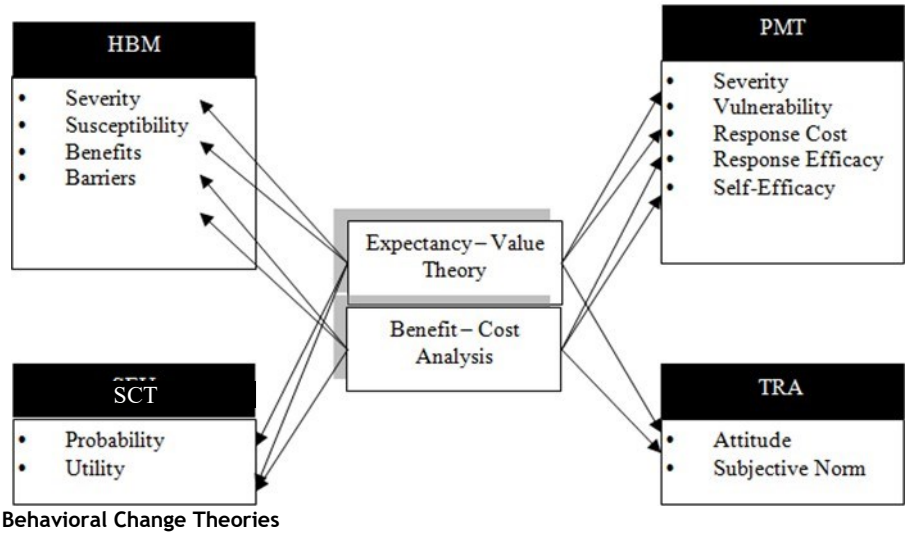


Figure 4: An Overview of Behavioral Change Theories

The Health Belief Model (HBM) suggests that a subject will undertake preventive measures under the lack of symptoms, only if it is initiated to act which is decided by the perceived seriousness of a given health deterioration and the person 's susceptibility to the potential (threatening) condition. Perceived benefits of initiating an action as well as the perceived barriers

to take action will impact a person If susceptibility is accepted. Ultimately a person's health behavior action will be determined by cues to action (Rosenstock, 1974).

Social Cognitive Theory believes that an individual's behavior is an outcome of person's behavior, environment, and interaction with other people and is influenced by its social environment, (LaMorte, 2016). The theory was established as the Social Learning Theory by Bandura in the 1960s.

Protection Motivation Theory (PMT) includes the factors of perceived response efficacy, perceived vulnerability, perceived self-efficacy, and perceived severity as introduced by Rogers (1975). The postulation presumes that triggering behavioral change is the result of weighing the costs and profits of the status quo and appealing to an individual fears, compared to the recommended behavioral change (Munro, et al.,2007). Sun, et al., (2013) studied technology acceptance in the m-health factors by condensing TAM, UTAUT and PMT in conjunction with TPB.

The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) is based on behavioral intention and is influenced by attitude and subjective norm. An attitude is a person's good or negative thoughts (evaluative affect) about carrying out the desired conduct, and a subjective norm is the person's perception of what the majority of those involved believe about him. TRA may explain almost any human behavior, according to Ajzen and Fishbein (1980, p. 4). One that has proven successful in predicting and explaining behavior in a variety of domains is an incredibly well-researched intention model.

The theory has thus contributed to the postulation of UTAUT since it has been integrated into a large number of studies about technological adoption.

Research Methodology:

We explored the PubMed database with Medical Subject heading phrases particularly, "Patient Acceptance of Health Care" and "Mobile Applications." Inclusion criteria includes article that used at least one of the terms " adoption," acceptability," " acceptance," "accept," or "adopt" and providing a clear definition of the term. The final dataset comprised 69 relevant studies. This research aimed to explore the interrelationships among various factors influencing mHealth adoption, modifying the traditional Technology Acceptance Model (TAM) and incorporating different elements. Given the paucity of mHealth adoption in the context of India, the present study seeks to address gaps in existing research through a primary survey across the country.

Important conclusions revealed that two main models TAM and UTAUT are the predominant models manifesting factors influencing healthcare technology acceptance across diverse user groups, settings, and countries. This review contributes theoretically and practically, enhancing our understanding of healthcare technology adoption and suggesting avenues for future study directions.

Identifying the Research Question: Our interest focused on understanding and reporting how technology acceptance is conceptualized in mHealth studies.

Findings: There were several ways to define technology acceptability, some of which did not fit the definitions that were previously in use. Although the literature had an impact on how the idea was interpreted, usage varied and models weren't customised for populations with particular requirements. The phrases "acceptance," " adoption," and " acceptability " were used in the sample of mHealth literature, and

each has a different connotation.

This review noted some drawbacks and opportunities for enhancement in current models in addition to outlining research procedures for evaluating adoption. The methodological development for addressing technological adoption in the creation of mHealth applications is aided by a deeper comprehension of these components

Limitations and Future Research: Because this systematic review was restricted to a few digital libraries and databases (Google Scholar, PubMed, IEEE Xplore, Springer, ACM, and Science Direct), it may have overlooked papers from other sources. It is recommended that future studies expand the review to incorporate more digital resources, including Web of Science, CINAHL, Cochrane, Scopus, and Sage. The review also only looked at empirical quantitative studies, which suggests that qualitative studies should be included in future reviews.

CONCLUSION

Literature definitions were dispersed, contributing to inconsistent usage. Proposing a Technology Acceptance framework, consolidating definitions, and outlining phases, aims to provide consistency in the reporting of results, enabling study comparability and reproducibility. Our results highlight the need for a standard definition that sees adoption of technology as a phased process.Theoretical Contributions: The study's thorough classification analysis allowed it to make several theoretical additions to models and theories of technological acceptability, especially in the healthcare industry. We examined all technology acceptance models, including only those that have been empirically tested, as well as their extensions and integrations, in contrast to research that concentrate on a particular model or theory. The review provided a new summary of the literature produced in the last ten years (2010–2019) and covered a range of information technologies, venues, and user types.

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