

PAPER

Influence of Health Interests and Technological Trends on the Acceptance of Wearable Technologies and Their Applications in Saudi Arabia

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ABSTRACT

Wearable technologies have developed relatively quickly in the modern years. This development has impacted the management of personal health and wellness to a considerable extent. The purpose of this study is to understand to what extent the interest of individuals in health and fitness, coupled with their general orientation towards technology, affects the acceptance of wearable technologies and related applications in the Saudi Arabian environment. Utilizing the UTAUT model, the research examines six hypotheses, revealing that health information-seeking behavior ($\beta = 0.316$, $p < 0.001$) and personal innovativeness in IT ($\beta = 0.273$, $p < 0.001$) are strong predictors of behavioral intention (BI) to adopt wearables. Performance expectancy ($\beta = 0.186$, $p = 0.030$) also significantly influences BI, while facilitating conditions ($\beta = 0.267$, $p < 0.001$) and BI ($\beta = 0.528$, $p < 0.001$) are crucial for actual use behavior (UB). These findings provide valuable insights for healthcare practitioners promoting wearable fitness devices, as they underscore the importance of enhancing public understanding of exercise benefits and active living. These would have significant implications for healthcare practitioners when promoting wearable fitness gadgets to the general population. In that respect, healthcare professionals could play significant roles in enhancing the general population's understanding of physical exercise benefits and an active life by disseminating information and knowledge gained from these equipment and gadgets. Wearable technology companies can subsequently learn from and integrate such valuable inputs. At the same time, designers and marketing strategists design plans to satisfy the unique needs and tastes of the Saudi market. The results may further explain how personal health concerns and technical trends interact in embracing new, creative, health-focused solutions.

KEYWORDS

health, technological, acceptance, wearable, Saudi Arabia

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1 INTRODUCTION

Advances in wearable technology have enormously changed personal health and wellness management. All these new disruptive technologies give the individual the ability to monitor and take care of different health attributes, such as tracking the activity of the body, sleep patterns, and pulse [1]. Wearable technologies incorporate some auspicious benefits that can change the very fabric of society and businesses dramatically. Technologies can change persons' health for the better and thus help people make more optimal, informed decisions. Adopting wearables in medical centers can improve the accuracy of collecting health data and, therefore, increase the effectiveness of medical treatment and patient safety [2].

The use of equipment related to health and wellness consequently encourages better behaviors, ultimately saving massive healthcare costs. Sports is one field where wearables are used to improve performance through a technique known as physiologic. This is the integration of wearable gadgets with data analytics, which provide athletes with quantified, accurate input to the extent that they can monitor and improve their performance [2].

However, recent research estimated that physical inactivity costs economies while deteriorating public health, and it was estimated that over 1.4 billion people were at risk of getting physical inactivity-related diseases [3]. Research conducted in Saudi Arabia has continuously shown low physical activity among the population. However, since 2016, there have been many efforts concerning physical activity promotion from various industries in Saudi Arabia [4]. However, the Saudi government promotes it enthusiastically for its economic gain, health benefits, and cultural value. Sports policy, therefore, is paramount to the Saudi government's Vision 2030 as part of the national Quality of Life Program [3].

In Saudi Arabia, with increasing healthy lifestyles, the opportunity of wearable devices and their apps is coming up, through which user acceptance and use of these technologies can be understood [5]. The fact that the Saudi population has shown enormous interest in adopting recent technological advances sheds light on the probability of acceptance of wearable devices related not only to users' interests in health and wellness but also to the general interest in new technological solutions [6].

This study will investigate the possible effect of users' interest in health, more precisely in health information-seeking, on their acceptance of wearable devices and associated technologies within the Saudi Arabian context. More importantly, the level of users' motivation toward practicing a healthy life will be discussed as a prime predictor of the acceptance of wearable devices alongside health-related applications. The study will be beneficial as investigating these critical factors will shed light on the determinants lying at the back of wearable device acceptance in the Saudi Arabian context. These findings would, therefore, have significant implications for healthcare providers' popularization of wearable fitness devices among the general population. Healthcare providers can thus play a vital role in educating the general population on the benefits of physical activity and, therefore, encourage active lifestyles by availing data and insights that can be acquired through such devices. Such insights might then be considered also by the designers and marketing strategists of the wearable technology companies so that strategies can be chalked out to cater to the specific needs and preferences of the Saudi market. The results may also help with a more general understanding of how personal health concerns and technological trends interact toward accepting innovative health-focused solutions.

Therefore, this present study was dedicated to answering the following research questions:

1. Does the interest of the Saudis in matters of health-related activities and technology considerably lead to the acceptance of wearable devices and related technologies?
2. What do these factors contribute to their acceptance of wearable devices and their technologies?

2 LITERATURE REVIEW

2.1 Wearable devices and their applications

The rapid growth of modern information wearable technologies impregnates personal health and wellness monitoring with new dimensions. Over time, wearable devices of different designs, such as fitness trackers, smartwatches, or health-centric sensors, have become a commonplace element in modern human life, thereby allowing people to continue tracking and managing different parameters of health and lifestyle [1]. These systems can collect a myriad of physiological data, such as physical activity, heart rate, sleep patterns, and caloric intake, among others, making a significant contribution toward self-health management [7]. Wearable devices, therefore, empower their users with real-time health and well-being insights and feedback.

Introducing artificial intelligence (AI) and data science into wearables empowered these mechanisms for highly personalized, intelligent monitoring and management [8] [46]. The data mined by the wearable device, interpreted by AI algorithms, is such that identifying patterns and trends becomes possible, teaching and encouraging the user dynamically through recommendations and interventions being doled out to support health and wellness goals [8]. For instance, AI-powered wearable devices might make personalized exercise regimens, diet recommendations, and optimal sleep strategies available to users [9].

2.2 Predictive analytics and health risk identification

One of the strong capabilities released with an integrated AI and data science approach is the predictive analytics capability to detect potential health risks and make such advice personalized. AI analysis of user data in relation to large datasets at the population level enables the identification of patterns and anomalies by AI algorithms, which could indicate an increased risk of certain health conditions. This may be linked to risks of developing heart disease, diabetes, or mental disorders [1]. Such predictive analytics can be further used to enable appropriate interventions and recommendations to reduce such risks through preventive care. These can be recommendations for lifestyle or connections to care, alerting users as thresholds are surpassed. This proactive approach to risks associated with health can change the game's name by helping users take a truly active role in managing health and well-being [1].

Another important aspect of personalization in device recommendations is the allowance for adaptability and evolution over time due to the dynamics of user needs and behaviors. With a large amount of user data being available, the algorithms can learn in real-time to adjust their recommendations accordingly, making the guidance from AI-powered recommendations ever more personalized over time [7]. For instance, such a wearable device could begin with a general level of recommendations for training but would change it over time regarding the progress, level of fitness, and personal preferences of the user; by the same token, it will take environmental stimuli associated with this site where the person is located, schedule, and circumstances surrounding a user into consideration, to provide the most suitable

exercises or recuperation activities [10]. This flexibility and context incorporated in the approach of recommendation systems will ensure that a pretty relevant and engaging guideline is followed by the user of wearable devices to help an individual improve adherence, thus attaining better health outcomes [11].

2.3 Integration of wearable devices with healthcare systems

A personalization of such suggestions could also be introduced by embedding wearable devices within larger healthcare systems and services. Ideally, through the safe sharing of such data with service providers, it should be possible for the devices to collaborate in close working for more personalized and coordinated care [9]. For example, an individual's wearable device may relay to their primary care physician the details of their physical activity, sleep, and medication adherence [12]. This is something that the physician can use along with their wisdom regarding data, medical history, and health records in creating treatment plans and suggesting lifestyle changes [13]. This integration may very well be the missing piece that will help close the growing gap between consumers' health information about themselves and professional medical care.

That could then be extrapolated to wearable devices integrated within healthcare systems, which, in allowing personalized wellness programs, can be tailored to the personal needs and preferences of their users.

2.4 User acceptance of wearable devices

Long-term success and wide acceptance of wearable devices and associated technologies will come through the acceptance and adoption of their use. Studies have suggested that factors that may influence user acceptance include perceived usefulness, ease of use, and compatibility of usage with the lifestyle and value system of the user [14]. The other important factors that were determined to influence the user's acceptance of wearable devices included interest in the device and motivational levels for the need to live a healthy life [15].

The Kingdom of Saudi Arabia has been participating actively in the control of the escalating burden of non-communicable diseases and spreading an agenda of healthier living among the citizens. It was shown, for example, in an article published in the *Saudi Medical Journal*, that the prevalence of overweight and obesity is high among Saudi children and adults and increases with age, becoming alarmingly high; approximately 70% of the adult population is considered to be overweight and obese [16] [47]. This has added to the already existing burden of chronic diseases such as diabetes, cardiovascular diseases, and hypertension, which have become major public health concerns in the country.

In fact, out of this challenge, the Saudi government has had different projects to motivate the citizens to conduct physical activity and healthy feeding. As part of the 2030 Vision program, there is a specific goal of raising the quality of life of citizens by leading a healthy and active lifestyle [17]. This set a favorable platform that could facilitate wearables and related mobile applications to support one's health and general well-being while working toward actualizing personal goals.

More recently, research results have brought an implication that wearable technologies and their applications can play a significant role in helping behavior change and improving health outcomes within Saudi Arabia. One such research is that using activity trackers and mobile health apps improved physical activity levels, sleep quality, and better management of chronic conditions among Saudi adults [18]. The acceptance and

engagement of the user are some of the core elements that can guarantee that the technology is well-integrated into daily life and that users will find it helpful in the long term.

Another study focuses on determinants of adoption for wearable fitness tracking devices within Saudi Arabia, where they found perceived usefulness, perceived ease of use, and social influence to be significant predictors for the technology users' intention to adopt [19]. They further emphasized that wearable devices must be designed so that features incorporated should be able to customize their application to the particular needs and preferences of the Saudi populace, which could be a user-acceptance booster and make the usage sustainable.

Apart from this, a systematic review by the *Journal of Medical Internet Research* appraised the prospective usefulness of mobile health applications in promoting healthy lifestyles and self-management of chronic conditions within the Middle East, more so in Saudi Arabia [20]. That review emphasized the interest and opportunities related to harnessing the potential of expanding technologies for addressing health-care challenges in the region. Commentaries simultaneously arose about addressing barriers based on cultural, social, and technological factors for successful implementation and long-term adoption.

Therefore, the case of Saudi Arabia may indicate that some new technologies and a population's urge toward healthy lifestyles may mean acceptance of wearables and related technologies within the interests of the health and wellness of the user, as well as general technological advancements of the gadget. The knowledge of these factors can help develop and market wearable technology companies with an understanding of the needs and preferences of the Saudi Arabian market. For a better understanding, the comparison of advantages, disadvantages, and limitations of various devices is discussed in Table 1.

Table 1. Comparative analysis of wearable devices: advantages, disadvantages, and limitations in health monitoring

Wearable Device Type	Advantages	Disadvantages	Limitations
Fitness Trackers	Track physical activity, steps, and calories burned. Encourage healthy behaviors through goal setting. Often affordable and user-friendly.	Limited functionality compared to smartwatches. May not provide comprehensive health data (e.g., heart rate variability).	Battery life can be short. Data accuracy may vary across devices.
Smartwatches	Multi-functional (notifications, apps, health tracking). Integrate seamlessly with smartphones. Can monitor heart rate, ECG, and other metrics.	More expensive than basic fitness trackers. Can be bulky and less comfortable for all-day wear.	Limited battery life, especially with heavy use. May require frequent updates for optimal performance.
Health Sensors	Provide specialized data (e.g., glucose monitoring, ECG). Can offer insights into chronic health conditions.	Often require medical prescriptions or professional oversight. Can be costly and complex to use.	May have limited compatibility with other devices. User engagement can be low due to complexity.
Wearable Health Monitors	Continuously monitor vital signs and health metrics. Real-time alerts for health issues (e.g., arrhythmias).	May require technical knowledge to interpret data. Privacy concerns regarding sensitive health information.	Dependence on accurate calibration and device maintenance. Limited integration with healthcare systems.
Smart Clothing	Offers unique data collection (e.g., posture, muscle activity). Often designed for comfort and usability during exercise.	Typically, more expensive due to advanced technology. Limited market availability and variety.	Data may not be as actionable as with other devices. Requires regular washing and care to maintain functionality.

3 THEORETICAL FRAMEWORK

User acceptance of a new technology for identifying factors that may influence users has been analyzed using several authors who have developed different models and frameworks. There is a perfect amount of literature that shows that intention is an essential factor in the acceptance of health services [5], [18], [19], [21], [22]. UTAUT is considered the most adopted model for the exploration of technologies for health based on credible and validated robustness of technology adoption, acceptance, and use in the literature. UTAUT, which in 2003 was developed by Venkatesh et al., based on the study of eight previous models in information systems usage behavior [23]. It has four exogenous variables: performance expectancy, social influence, effort expectancy, and facilitating conditions; two endogenous variables: behavioral intention to use technology and use behavior; and four moderators: gender, age, voluntariness, and experience [24]. The various combinations of these constructs and moderating factors showed an important increase in predictive efficiency of 70% compared to previous TAM model rates [25]. The researchers Nanyombi and Ejiri conducted the adoption of the mobile tracking system in health facilities across the Kayunga district health facilities. They realized from their study that the factors of performance expectancy, effort expectancy, and social influence came out positively—strongly predicting the system’s adoption [26]. Another study applied UTAUT to examine Saudi citizens’ adoption of telemedicine apps during the COVID-19 pandemic [27]. The study shows a positive influence of the mentioned attributes on behavioral intention to adopt telemedicine apps. Therefore, behavioral intention in the present study explains the users’ motives for accepting wearable devices and associated apps as a predictor.

However, UTAUT posits no exogenous individual variables. Even though it is an epitome model that tests multiple factors, it doesn’t analyze individual characteristics, which may help more in the understanding of the phase of acceptance and use of the technology [28]. This study, therefore, uses personal innovativeness in IT and health information-seeking as individual factors. The study dropped the social influence construct because it will only focus on the technological and individual perspectives. Besides, the moderators from the UTAUT model are dropped at this stage since this study focuses on current users of wearable devices and their apps in Saudi Arabia. External factors such as socio-economic conditions, cultural attitudes towards technology, and government policies play a significant role in wearable technology adoption. In Saudi Arabia, for instance, the increasing emphasis on digital health initiatives and investments in healthcare infrastructure can drive acceptance and usage.

The UTAUT model is adequate for assessing technology acceptance but may overlook specific cultural and contextual factors relevant to countries such as Saudi Arabia. In addition, it primarily focuses on individual-level determinants, potentially missing external influences such as social norms and economic conditions.

3.1 Hypotheses development

Technological-Related Factors. Technological-related elements are those technological features related to the application. Among these are the components of performance expectations, facilitating conditions, and effort expectancy.

Performance expectancy emerged as a significant predictor of the user acceptance of health technologies. It was defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” [23]. The research of Hoque and Sorwar (2017) has employed the UTAUT model in the

context of mobile health technology adoption in the case of elderly patients; according to the findings, the performance expectancy has been able to explain a significant amount of behavioral intention variance to use the technology. In other words, mobile health technology acceptance will be driven by perceived usefulness and expected performance gains [29]. An equally outstanding systematic review conducted by Khechine et al. (2014) integrated various studies employing the UTAUT framework in a health environment [22]. This systematic review concluded that, in most studies, performance expectancy emerged as a significant predictor of technology acceptance, thus explicitly explaining how perceived enhancement in performance contributed significantly to the attitude and behavioral intention of the user to use the health information system. Most probably, performance expectancy would present the usefulness and value of the app by reviewing the meaning of different terms of performance expectancy in and from the measurement items in various studies. Moreover, when the application can meet users' needs, obtaining benefits and priorities will result in a higher level of adoption and acceptance. A hypothesis presented accordingly is as follows:

H1: performance expectancy positively influences the users' intention to accept wearable devices and associated.

Aside from performance expectancy, effort expectancy also plays a vital role within the UTAUT framework and has already been deeply tested in the healthcare context. It has been defined as "the degree of ease associated with the use of the system." It reflects the perceived facility of use and mental effort in interacting with a particular health technology, partly influencing the individual to intend to adopt and then use it. For example, Gagnon et al. (2012) presented a study about the determinants of healthcare professionals' adoption of telemedicine technologies [21]. Among their most important results was that effort expectancy positively influenced behavioral intention; hence, the systems should be designed in such a manner that the adopted technology requires the most minor effort by the users to make them focus on their work with as little cognitive burden as possible [21]. For example, a systematic review by Garavand et al. (2016) isolated effort expectancy as one uniformly constant predictor of technology acceptance across all healthcare contexts, from hospitals to clinics and, further away, in telemedicine applications. It would, hence, be wise of healthcare organizations to invest in and focus more on developing technologies that are perceived to be easy to learn and use. By considering this fact and the other meanings of effort expectancy, ease of use, and complexity in different theories, it is reasonable that effort expectancy would give a straight measurement of the satisfaction of its users. As a result, it may influence the usefulness of the application. Therefore, effort expectancy would significantly affect the attention to accept wearable devices and associated apps. From the above discussion, the following hypothesis is formed:

H2: Effort expectancy positively influences the user's behavior intentions to accept wearable devices and associated apps.

Facilitating conditions are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system" [23]; this is a significant factor that has been studied in the context of technology adoption in the healthcare setting. Facilitating conditions in the health sector include the availability of resources, infrastructures, and different forms of support

required by the end-users to ensure proper utilization of the new technologies. In a study performed by Rho et al. [31], the adoption of telemedicine services was investigated among healthcare providers in South Korea. The authors found in their results that the facilitating conditions are the perceived behavior control in terms of giving technical support and equipping the necessary tools, which significantly and positively influenced the healthcare professionals' intention to use the telemedicine system [31]. A more recent systematic review was done by AlQudah et al. [32], synthesizing existing literature on the application of the UTAUT model in various healthcare settings. The review concludes that facilitating conditions are one of the chief determinants of technology adoption. This is an implication of organizing for organization and technical support in enabling the user to use new health information systems [32]. Hoque and Sorwar also conducted a study in 2017 on factors that influenced the adoption of mHealth by the elderly [29]. The research validated the appropriateness of the UTAUT model in mHealth services for older people in Bangladesh. From these results, it is more likely that the availability of resources, services, and immediate assistance given to the users by developers or providers would influence most of the valuable parts of the wearable devices and associated apps. Therefore, the hypothesis tested is outlined below:

H3: Facilitating conditions have a positive influence on the behavior intention of the user in accepting wearable devices and associated apps.

Individual Factors. Individual factors represent the user's interest in information technology and health concerns. In this research, we have taken personal innovativeness in IT and sought health awareness and advice for presenting individual aspects. Personal innovativeness in IT has been part of previous adoption studies related to technology, and very few studies have been conducted on healthcare technologies. However, seeking health information is a new vision and contribution because few studies have been undertaken to check on its effect on adopting health applications.

As the literature indicates, another significant factor likely to influence acceptance of health technologies is the individuals' health information-seeking behavior. Health information-seeking refers to actively pursuing health-related information from various sources, including the Internet, healthcare providers, and social networks. Previous studies have documented that individuals substantially engaged in seeking health information are more likely to be receptive to accepting new health technologies. For example, Lee et al. examined mobile health app adoption among older adults [33]. They found that the participant's intention to use mobile health apps can be understood from their health information-seeking orientation about their motivation to take the initiative in seeking health information. In another example, Deng et al., using a systematic review of existing literature, synthesized factors of consumer acceptance of telehealth services [34]. It also indicated that the more active consumers were in searching for health information, the more likely they were to adopt telehealth technologies because they could see the possible benefits of such technologies in accessing and managing their health. The findings of this study implied that designs and implementations of new health technologies in healthcare organizations must be made by directly applying the users' health information-seeking behaviors since those with a more potent orientation towards the active seeking of health information will be more prone to adopting the technology. Therefore, this way to push relevant health information and recommendations from

a trusted resource might have increased the number of users of wearable health devices. Thus, the hypothesis developed was the following:

H4: Health information-seeking has a positive influence on users' behavioral intentions regarding the acceptance of wearable devices and associated apps.

Another individual factor found to be influential across the acceptance of health technologies is personal innovativeness in information technology (PIIT). Agarwal and Prasad defined PIIT as the "willingness of an individual to try out any new information technology" [35]. Individuals higher on the level of PIIT are more willing to adopt and experiment with new technologies in general and, by extension, those within the healthcare domain. A study by Haug et al. indicated that the use of mobile devices implies that the older adults of the research population are open to adopting new technologies and, therefore, may increase their skills. Older adults who use mobile phones do not search for new applications but limit their use to one definite way [36]. In line with this, Hoque et al. performed research on physicians' acceptance of e-health [37]. They concluded that PIIT was one of the principal factors since more innovative individuals were more willing to accept such technologies initially. This is because more innovative users are more likely to perceive more significant benefits and ease of use for new technologies and, thus, be more willing to use them [37]. Recently, Huang et al. examined factors affecting the acceptability of AI-based healthcare chatbots using a study [38]. The authors concluded that PIIT was a significant predictor of intention in using the chatbot. It placed this person-specific characteristic as integral to the use of health technology [38]. Hence, for healthcare organizations keen on diffusing new health technologies among their members, it would be an excellent strategy to aim at higher levels of PIIT among potential users because they can become opinion leaders and thus act as role models to influence the rest. The adoption of technology in society is influenced by the pioneering nature of individuals in the population who are more enthusiastic about adapting to technology. Therefore, the presence of innovative persons may help to ensure the adoption and use of wearable devices and associated apps; as such, people will act like change agents towards the course of wearable devices and associated app acceptance. Therefore, the following hypothesis is formulated:

H5: Personal innovativeness in IT positively influences behavior intentions for accepting wearable devices and associated apps.

Behavioral Intention and Use Behavior. A very central focus in research on health technology acceptance lies in understanding factors that influence users' behavioral intention to use a given technology and their actual use behavior. Behavioral intention is defined by Ajzen as "the strength of an individual's willingness to use a technology" and is conceptualized as a strong predictor of subsequent use behavior [39]. Use behavior, on the other hand, is the actual adoption and utilization of the technology [39]. According to Venkatesh et al. [23], these two constructs are closely linked. Behavioral intention is generally viewed as a significant determinant of a person's use behavior [45].

Contextually, behavioral intention and use behavior are two significant outcome variables in the context of health technologies, where a rise in their measures is always welcome and better comprehended by healthcare organizations. For example, the research concluded by Hoque et al. [37] showed that the factors of performance expectancy, effort expectancy, social influence, and personal innovativeness

significantly influenced the behavioral intention to use e-health. The results of this study will provide an increased acceptance of new technologies for physicians for their improvement. Similarly, the study by Yin et al. [40] indicated that the enabling condition was central to the adoption of the wearable intelligent medical device. Observations made during the findings mediated the effects of danger expectancy, perceived expense, expectation of health, perceived ease of use, and social impact on users' behavioral intention. Understanding factors influencing behavioral intention and use behavior will likely be helpful for healthcare providers or system designers who seek to encourage target user adoption and continued use of novel health technologies. As such, the following hypothesis is formulated:

H6: Behavioral intention to accept will positively influence the use behavior of wearable devices and associated apps.

Based on the above hypotheses, the following research model is designed in Figure 1.

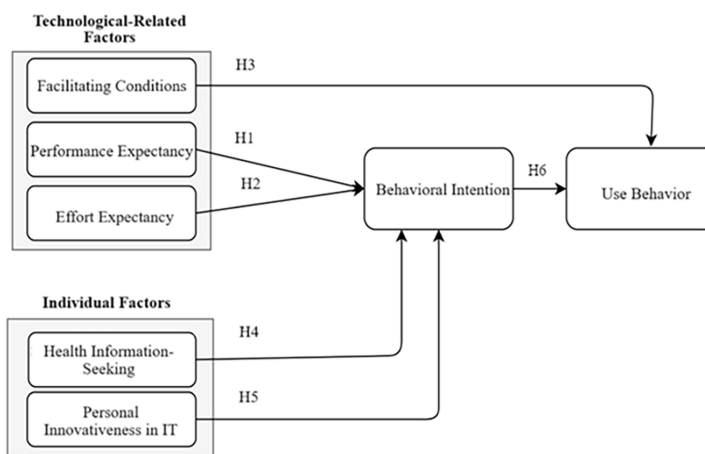


Fig. 1. Research model

4 RESEARCH METHODOLOGY

This study follows a predominantly quantitative approach by collecting numerical data regarding the users of wearable devices and associated apps. Previous tools and measures were also validated. It administered the survey in English and translated it into Arabic afterward. As a result, it is one of the most common methodologies for scaling responses in a survey design. A five-point Likert scale was used, in which one would mean strongly disagree with five as strongly agree. The online program was distributed via social networking. Inclusion and exclusion criteria are applied so that an eligible respondent for the research can be retrieved. Participants who should be included must be over 18 years old and have previously used wearable devices and their associated apps. The questionnaire has 243 actual participants. After incomplete response deletion, 218 responses were used in this data analysis. This applies the Partial Least Square technique for testing and validating the conceptual model and relation toward the hypotheses. The PLS technique is one of the statistical analyses based on structural equation modelling [41], [42]. Among the most popular software applications for PLS-SEM is the SmartPLS software [42]. This tool is also applicable and very useful in this study, given the support that PLS-SEM brings,

by which formative and reflective constructs can be tested simultaneously in the model [41]. In this research, SmartPLS 4 software was applied.

This study's sample size, though adequate for PLS-SEM, may limit generalizability to the broader Saudi Arabian population. The use of online surveys could introduce sampling bias by excluding individuals with limited Internet access, and self-reported data might lead to social desirability bias. Despite careful translation, the bilingual survey may also result in slight interpretation differences. Expanding sample diversity and survey distribution methods in future research could address these limitations.

5 DATA ANALYSIS

This study adheres to ethical standards by ensuring informed consent is obtained from all participants prior to data collection. It prioritizes participant privacy and confidentiality, implementing stringent data security protocols to protect personal information. These measures not only comply with ethical guidelines but also promote trust and integrity in the research process. The data analysis of the work is discussed in a subsequent section.

5.1 Descriptive analysis

Descriptive analysis indicates that 53% of the participants are of male gender, while 47% are females. Most of the age groups are distributed over the range of 25 to 34 years, with a percentage of 41%; the rest are distributed with a rate of 33% for 18 to 24 years and 17% for 35 to 44 years. Concerning the educational backgrounds of the participants, 61% do have a bachelor's degree, nearly 14% have a degree from high school, and 12% have a master's degree. A full description of participant demographics can be seen in Table 2.

Table 2. Participants' demographics

Variable	Description	Frequency	Percentage
Gender	Male	116	53%
	Female	102	47%
Age	18–24	72	33%
	25–34	88	41%
	35–44	37	17%
	45–49	18	8%
	60 and above	2	1%
Educational level	Less than High school	3	1%
	High school	30	14%
	Diploma	16	7%
	Bachelor	133	61%
	Master	27	12%
	PhD	8	4%

5.2 Reliability and validity assessment

The first analytical step is to test the internal consistency, convergent validity, and discriminant validity [43]. That internal consistency is achieved with a recommended value of 0.70 for Cronbach’s alpha [43]. To examine convergent validity, AVE and composite reliability approaches are considered, where the appropriate AVE values shall be 0.50, and the CR value shall be more significant than AVE [44]. Discriminant validity could be determined through the square root AVE of each construct, which should be greater than any correlation between latent variables, as shown in bold in Table 3 [43], [44]. High factor loading of all the reflective factors and weight of the formative construct items at p-values < 0.05 [44]. Table 3 demonstrates the reliability and validity of appealing results.

Table 3. Reliability and validity assessment

	AVE	CA	CR	BI	EE	FC	PE	PIIT	SEEK	UB
BI	0.775	0.903	0.932	0.88						
EE	0.689	0.85	0.898	0.527	0.83					
FC	0.659	0.742	0.852	0.422	0.664	0.812				
PE	0.666	0.834	0.888	0.495	0.608	0.492	0.816			
PIIT	0.674	0.839	0.892	0.528	0.468	0.449	0.35	0.821		
SEEK	0.7	0.858	0.903	0.587	0.584	0.513	0.485	0.449	0.837	
UB	0.638	0.813	0.876	0.637	0.559	0.485	0.523	0.467	0.585	0.799

Notes: AVE: Average Variance Extracted, CR: Composite Reliability, C Alpha: Cronbach’s Alpha. BI: Behavioral Intention, EE: Effort Expectancy, FC: Facilitating Conditions, PE: Performance Expectancy, PIIT: Personal Innovativeness in IT, SEEK: Health information-seeking, and UB: Use Behavior.

5.3 Structural model testing

As per the results, which are represented in Table 4 and Figure 2, all the hypotheses are accepted, except H2, whereby the effort expectancy toward behavioral intention is unrelated since this has a P value of >0.05. To all the dependents construct s, R² = 0.474, which indicates 47% variance to behavioral intention, and R² = 0.463, which is 46% to use behavior.

Table 4. Hypotheses testing

	Path	Path Coefficient Mean	STDEV	T Statistics	P Values	Supported?
H1	PE → BI	0.186	0.085	2.173	0.030*	Yes
H2	EE → BI	0.102	0.079	1.298	0.0195	No
H3	FC → Use	0.267	0.058	4.532	0.000**	Yes
H4	SEEK → BI	0.316	0.083	3.813	0.000**	Yes
H5	PIIT → BI	0.273	0.065	4.198	0.000**	Yes
H6	BI → UI	0.528	0.051	10.289	0.000**	Yes

Notes: STDEV: Standard Deviation. BI: Behavioral Intention, EE: Effort Expectancy, FC: Facilitating Conditions, PE: Performance Expectancy, PIIT: Personal Innovativeness in IT, SEEK: health information-seeking, and UB: Use Behavior. Significant ** at P < 0.01, * at P < 0.05.

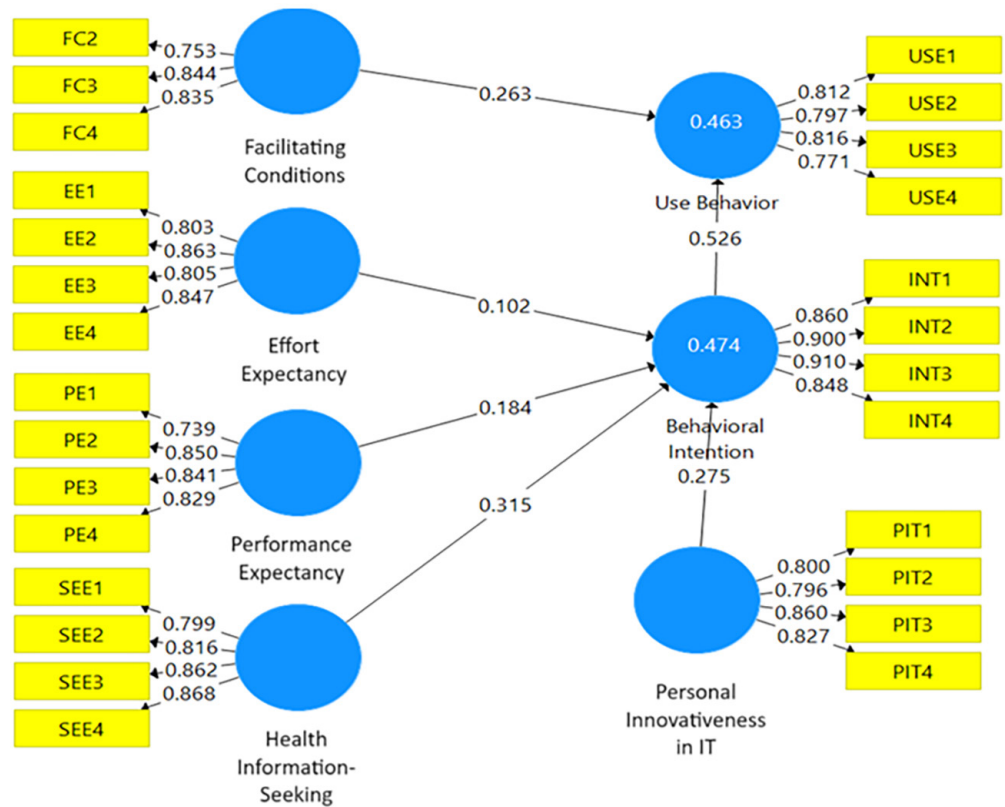


Fig. 2. Path testing

The study addresses explicitly the Saudi Arabian context through detailed demographic insights (refer to Table 2) and rigorous empirical validation (refer to Table 3). Our findings reveal unique cultural dynamics influencing wearable technology adoption—such as significant impacts from health information-seeking and personal innovativeness (refer to Table 4)—that differ from general UTAUT assumptions. Notably, effort expectancy (H2) was insignificant, suggesting ease of use is less crucial due to high-tech familiarity. These culturally relevant insights substantiate the study’s novel contributions and underscore the applicability of our results in Saudi healthcare.

6 DISCUSSION AND CONCLUSION

This study applies behavioral intention to explain patients’ motivations for using wearable devices and associated apps in Saudi Arabia according to the UTAUT model. Figure 2 below illustrates the path order of significance among the factors that significantly affect behavior intention, health information-seeking, and personal innovativeness in IT, respectively, as well as bringing the performance expectancy. As expected, the results confirmed the individually proposed factors to have supreme influence. In fact, it is even significantly more significant than the technology-related factors. This means that the potential users of wearable devices and associated apps are interested in receiving health information and recommendations from reliable sources. Moreover, it shows that personal innovativeness toward IT plays an essential role in the behavioral intention of Saudi patients to accept wearable devices and associated apps. Previous literature, also in line, has shown that the personal innovativeness of

IT may be necessary [28–35]. For use behavior, behavioral intention has the most significant effect on use behavior, followed by facilitating conditions, and has previously influenced the health technology adoption and acceptance literature [37], [39].

These results, in the context of IT factors, show that performance expectancy significantly influences behavior intention, which goes in line with earlier literature stating a positive influence of these factors on both behavior and purpose and intention and behavior of use [22], [26], [37]. These results are also consistent with findings concerning the positive influence of facilitating conditions on the use behavior in [29], [31], [32]. Although our data do not support this hypothesis, previous research studies confirm some large and significant impact of effort expectancy on the intention to adopt and accept health technologies [24], [26].

The findings highlight significant practical implications for healthcare providers and technology developers in Saudi Arabia. Healthcare providers can influence these insights to educate patients on the benefits of wearable devices, promoting active lifestyles and encouraging engagement with personal health data. By aligning health advice with the functionalities of wearables, they can enhance patient willingness to adopt these technologies.

A comprehensive policy framework is essential to promote the adoption of health technology in Saudi Arabia. This should include public awareness campaigns to educate citizens on the benefits of wearable technologies, alongside investments in digital health infrastructure to enhance access and connectivity. Clear regulations ensuring data security and privacy will help build trust among users while providing incentives for healthcare professionals to facilitate the integration of these technologies into patient care.

Contribution of the study: It deepens our understanding of factors that influence the development of new applications in health industries in the adoption of health information systems and wearable devices and associated apps. What is more important is that the elicitation of such a study is an essential finding in the building of research fields. It allows the government, the healthcare provider, and the application developers to take a reboot and review their development plans. However, not all aspects of the technological and individual factors have been included in the research model. Although it was conducted within the context of Saudi Arabia, related implications of the results could possibly be generalized to other developing countries where a similar cultural and socioeconomic context prevails. Cultural values, religious beliefs, and social norms may have profound influences on the perceptions of people about and intentions toward health technologies in distinct national and regional environments. During the acceptance of health technology, unique cultural and contextual factors affecting different countries should be considered so that strategies by the healthcare providers and system designers can be targeted towards building acceptance and ensuring sustained adoption of new health technologies within their target population to enhance health outcomes and community well-being better.

For technology developers, the study emphasizes the need to create culturally relevant and user-friendly wearables that cater to the specific preferences of Saudi consumers, such as incorporating Arabic language options and familiar design elements.

To promote and support the effective adoption of wearable technologies, stakeholders such as healthcare providers, technology developers, and policymakers should focus on enhancing user education about the benefits of these devices, ensuring interoperability with existing healthcare systems, and addressing privacy concerns through transparent data policies.

Future research could be expanded on the identified factors by exploring additional technological and individual elements that impact health technology adoption.

Comparative studies across various cultural and socioeconomic contexts can enhance the understanding of global trends in health technology adoption. By identifying best practices and effective strategies, this research can contribute to a more comprehensive framework for promoting health technology acceptance and improving health outcomes worldwide.

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