Continued use intention of wearable health technologies among the elderly: an enablers and inhibitors perspective

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Continued Use Intention of Wearable Health Technologies among the Elderly: An Enablers and Inhibitors Perspective

Abstract

Purpose Wearable health technologies (WHTs) show promise in improving the health and well-being of the aging population because they promote healthy lifestyles. They can be used to collect health information from users and encourage them to be physically active. Despite potential benefits of WHTs, recent studies have shown that older people have low continued use intention towards WHTs. Previous work on this topic is disjointed, and new theoretical viewpoints are required.

Design/Methodology/Approach We propose an enablers and inhibitors perspective to model factors influencing continued use intention of WHTs among the elderly. In order to test the model, we collected data from Chinese elderly (N = 295) who had prior experience using WHTs.

Findings Our results show that social value is the strongest enabler of continued WHT use, and emotional and epistemic values and device quality also increase use continuance. Inertia and technology anxiety were identified as significant inhibitors. A post hoc importance performance map analysis revealed that while emotional value is a highly significant predictor of continued WHT use, existing WHTs do not stimulate such value in our sample.

Research limitations/implications The research findings illustrate the importance of incorporating user resistance in technology acceptance studies in general and wearable health technology usage studies in particular. This study contributes by providing an integrative model of technology continued use intention for the elderly along with practical implications for policymakers.

Originality/Value A limited number of prior studies have taken both enablers and inhibitors into account when explaining continued WHT use intention among the elderly. This paper fills this research gap and contributes to the WHT literature by considering both enablers and inhibitors in the same model. Moreover, this study contributes to the ongoing research on WHT and more broadly, gerontechnology use among the elderly.

Keywords: Wearable health technology, elderly, aging population, gerontechnology, use intention, continued use.

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1. Introduction

Today, humans live, on average, longer than during any other era in the observable history. Declining mortality rates have resulted in the presence of more elderly people in the general population than ever before (Talukder et al., 2020a). All countries are experiencing growth in the number of elderly people compared to the rest of their populations. In 2019, 703 million people (9%) worldwide were over 65 years old, and this number is predicted to roughly double by the year 2050 (United Nations, 2019). With the continued growth of the elderly population, there has been an increasing demand for the health management of elderly people, and this provides a marketing opportunity for companies that create products for them. This aging population poses several challenges for societies, and one of them is the provision of health services and support for the elderly (Czaja and Lee, 2007; Hoque and Sorwar, 2017). Wearable health technologies (WHTs) show promise in addressing these challenges.

WHTs refer to sensor-utilizing technologies that monitor and record users' health in terms of physical activity and heart rate among other aspects (Papa et al., 2018). They are also typically used to transmit and connect this health data with other services and to give users feedback regarding their acute health conditions (Kekade et al., 2018), encouraging healthy behaviors such as physical activity (Laato et al., 2020b). WHTs have several potential benefits for the elderly including decreased hospitalization and mortality rates, improved psychological well-being and support for a healthier overall lifestyle (Kekade et al., 2018; Lee and Lee, 2018). The solutions have potential to curb diseases related to aging, such as dementia, diabetes and cataracts (Kekade et al., 2018; Willett et al., 2006). Additionally, WHTs can improve the quality of doctor-patient interactions by sharing real-time physiological data, which can significantly decrease medical costs by reducing the number of required visits to hospitals (Gao et al., 2016; Roman et al., 2015). Furthermore, WHTs can offer doctors accurate sensor-based longitudinal data, which can be more reliable than self-reported information from the patient. For these reasons, people in general are increasingly using WHTs (Malwade et al., 2018). Therefore, WHTs offer a solution to the increasing demand for elderly care, supporting the independence of the elderly and improving their overall quality of life (Srizongkhram et al., 2018).

In the field of gerontechnology, which deals with technology for the elderly, there have been studies that address the initial perceptions, attitudes, concerns and use intentions of the elderly regarding WHTs (e.g., Teh et al., 2017; Talukder et al., 2020a; Kekade et al., 2018). The majority of these studies focus on initial technology acceptance and adoption, and studies predicting continued use have received less attention. Furthermore, most of the studies focus either on potential use benefits and adoption enablers or barriers and use inhibitors. We propose that these two types of factors should be investigated together. Accordingly, we aim to examine previous literature and explain WHT use continuance in the elderly using an enablers and inhibitors perspective. We theorize a model tested with data collected from elderly people (N = 295) in China. The findings demonstrate that continued use intention of WHTs is the result of several influencing factors, some of which increase continued use intention and some that discourage it.

The rest of the study is structured as follows. First, previous literature on WHTs and their use among the elderly is reviewed. This is followed by a theory section in which we describe the enablers and inhibitors perspective as well as the theory of consumption values (TCV) that is used as a theoretical viewpoint in this work. The proposed research model and related hypotheses are then presented followed by the methods and results. In the discussion, both theoretical and practical implications of the results are discussed, and the limitations and proposed directions for future work are presented.

2. Background

2.1. Wearable healthcare technologies

The field of science most concerned with WHTs for the elderly is gerontechnology, a multi-disciplinary field combining gerontology and technology (Charness and Jastrzembski, 2009; Pyae, 2020). There are multiple different kinds of WHTs, and new ones are designed constantly (Lindberg et al., 2016). Exemplar devices are listed in Appendix A. WHTs enable the monitoring of heart rate, body temperature and number of steps taken among many other functions and can be used to share this information for further analysis and monitoring (Talukder et al., 2019). These devices typically, but not always, provide visual, auditory and force feedback to users, reminding them, for example, when it is an optimal time to move. WHTs can be combined with other applications such as dietary tracking and exergames (Laato et al., 2020a). WHTs can either be worn around the wrist like a wrist watch or around the arm like a band. Smartphones are not typically considered to be WHTs because they are held, not worn. Despite this, they can offer similar functionality such as counting steps taken and tracking user movement via a satellite navigation system. Typically, WHTs are used to interface with smartphones via Bluetooth or other types of wireless connections so that the smartphone can be used to view, manage and transmit the data collected by the WHTs. As such, WHTs can be seen as sensor-based data collection devices that promote a healthy lifestyle.

WHTs give users novel information about their physical health and guide them towards healthier lifestyles; hence, the use of WHTs is advisable (Talukder et al., 2019). However, factors, such as privacy concerns with regards to the data that the devices collect, inhibit the use of these devices. For example, large-scale physical activity studies have been conducted by using real world empirical data collected from WHT users (Althoff et al., 2016), and it is possible that this data is used for personalized advertisements and other purposes that not all users agree with. Regardless, WHTs remain an exciting area of technological innovation that has received a growing amount of attention over the past few years due to the population-level physical benefits they bring (Gao et al., 2015). WHTs offer individuals a tool for monitoring their personal health and obtaining long-term information that would otherwise not be available. As such, WHTs can be lifestyle intervention devices that proactively help reduce negative outcomes related to aging. Understanding WHT users is important for developing optimal solutions.

2.2. WHT adoption and continued use intentions

Despite the apparent benefits of WHTs, a significant portion of people do not continue using them. Ledger and McCaffrey (2014) found that the use of WHTs declines by more than 50% within six months after the first use. In another longitudinal study on Fitbit devices by Shih et al. (2015), 25% of the participants stopped using the Fitbit after the first week, and cumulatively, half of the participants had stopped using the Fitbit device by the second week of the study. Previous studies have identified several factors that can explain these findings. These factors can be broadly conceptualized as enablers such as (i) usefulness, (ii) ease of use, (iii) social influence, (iv) compatibility, (v) hedonic motivation and (vi) enjoyment (Lee and Lee, 2018; Nascimento et al., 2018; Talukder et al., 2019) and inhibitors, such as (i) status quo bias (SQB) including sunk costs, transition costs and inertia and (ii) technology anxiety (Tsai et al., 2019; Talukder et al., 2020b; Ahmad and Khalid, 2017). Most previous studies have either examined only enablers or only inhibitors. However, in order to have a balanced and in-depth understanding, both need to be investigated at the same time.

Appendix B summarizes the extant literature on gerontechnology adoption and use. In addition to general studies on WHT use and adoption (e.g., Teh et al., 2017; Talukder et al., 2019), there are studies on the use of specific technologies (e.g., smartwatches) (Hong et al., 2017), and the results of these studies align with those of previous studies on general gerontechnology acceptance (Le Deist and Latouille, 2016; Talukder et al., 2020a). Researchers have mostly investigated the adoption and use of WHT using the technology acceptance model (TAM) and related models such as the unified theory of acceptance and use of technology (UTAUT) and the theory of planned behavior (TPB). A significant number of previous studies did not use any overarching theory. The TAM and UTAUT are parsimonious and employ only a limited number of factors (mostly enablers) to predict the adoption and use of WHTs. Therefore, in the research, there is a lack of conceptualizations that examine enablers and inhibitors in the same model, and this has resulted in an unbalanced understanding of the situation.

Furthermore, as noted in Appendix B, there has been limited research on the continued use of WHTs among the elderly. Prior information system (IS) literature has found that the long-term viability of a product or digital service depends on its continued use rather than its initial acceptance (Bhattacherjee, 2001; Islam et al., 2017).

3. Theoretical Foundation

3.1. The enabler-inhibitor perspective

The long-term use of technologies and customer retention do not depend solely on the technology but on a wide variety of factors (Talukder et al., 2020a). In this paper, the enabler-inhibitor perspective (Cenfetelli, 2004; Luftman et al., 1999; Kannabiran and Dharmalingam, 2012) was adopted to explain continued use intentions of WHTs in the elderly. The enablers are factors that either encourage or discourage use, depending on valence (Cenfetelli, 2004). Cenfetelli (2004) further argues that there are some factors that uniquely discourage use (but do not encourage use) and are distinct from enablers. These factors are called inhibitors.

The presence of enablers and inhibitors is supported by the two-factor theory of job satisfaction (Herzberg, 1966), which suggests that satisfaction is not the opposite of dissatisfaction. Furthermore, it follows from Herzberg (1966) that satisfaction and dissatisfaction are predicted by different unlinked sets of factors. The same logic applies to, for example, trust and distrust (Lewicki et al., 1998). According to the two-factor theory, the motivator factors cause job satisfaction, but their absence may contribute little to job dissatisfaction. Similarly, the hygiene factors cause job dissatisfaction, but their absence does not cause job satisfaction. Applying the ideas of the two-factor theory to this context implies that factors that discourage the use of WHTs may be unipolar in nature. This supports Cenfetelli's (2004) view on the presence of uniquely negative factors (i.e., inhibitors).

In the current study, the enabler-inhibitor perspective was adopted for four reasons. First, previous IS research that has focused mostly on enablers and inhibitors has received little attention (Islam et al., 2020). However, inhibitors can exist independently from enablers and behave differently from enablers in influencing adoption and rejection (Cenfetelli and Schwarz, 2010). Second, according to Baumeister et al. (2001), "bad is stronger than good", meaning the presence of inhibitors can outweigh the effects of the enablers. Third, inhibitors may attract users' attention faster, as they are negative in nature (Islam et al., 2020). Finally, by investigating both enablers and inhibitors simultaneously, we uncover the key factors that influence continued use intention of WHTs in the elderly. This allows us not only to identify managerial implications that encourage the use of innovative healthcare technology but also implications that may discourage their use.

3.2. The theory of consumption values

In order to identify the enablers, we adopted the TCV (Newman and Nollen, 1996; Sheth et al., 1991; Turel et al., 2010) that posits that the consumers' attitudes towards products and services is the result of several values. These values or value components are typically divided into, for example, social, epistemic, emotional, functional and conditional values. The values are modeled to be positivistic, meaning that their presence increases positive attitudes and willingness to use a product or service, but a lower value appeal does not impact use adaptation and continued use intention negatively (Chang et al., 2014; Yang and Lin, 2017). The consumption values have been found to have a unique effect depending on the product or service in question (Sheth et al., 1991). Rather than providing a predefined set of factors and constructs (as the TAM and UTAUT do), the TCV offers a framework for context-specific theorization (Davison and Martinsons, 2016). Therefore, the TCV provides researchers the flexibility to employ a wide variety of relevant constructs to the theoretical model. The TCV has also been used to explain how consumption values contribute to users' adoption of online services (Omigie Newman et al., 2017) and location-based services (Yang and Lin, 2017) and their perceived use frequency of social networking sites (Chen and Sharma, 2013).

The TCV also suggests that the relative importance of value components varies from context to context, thus indicating the relevance of its application to specific platforms (Omigie Newman et al., 2017). Therefore, it makes sense to contextualize the value components (as in Sheth et al., 1991) to fit features of continued use intention of WHTs in the elderly. Based on the pertinent literature, the values are contextualized into specific value elements in WHTs in the next section. In addition, we draw from the work of Cenfetelli (2004) to theorize the effects of inhibitors on continued use intention and based on the study by Herzberg (1966), posit that the inhibitors have unique effects that are distinct from those of the enablers.

4. Research Model and Hypothesis

4.1. Enablers of wearable healthcare technology

Following the enablers and inhibitors perspective (Cenfetelli, 2004), we defined enablers as beliefs (e.g., perceived usefulness and ease of use) regarding the design and functionality of WHTs that, depending on valence, can either encourage or discourage their use. Drawing from the TCV (Sheth et al., 1991), the impacts of functional value (decomposed into quality and convenience dimensions), social value, epistemic value and emotional value were applied for the analysis from the perspective of enablers.

4.1.1 Functional value

Sheth et al. (1991) described functional value as one of the primary drivers of the purchasing behaviors of consumers. It can be defined as the perceived ability of a product or service to have functional, utilitarian or physical purposes that result from attributes such as durability, reliability and price (Sheth et al., 1991). In order to capture the functional value of WHTs, we employ two concepts: device quality and convenience value. Here, device quality describes the durability, reliability and comfort of the WHTs from the user's perspective. Device quality has been identified as one of the most important functional values in previous studies (Sweeney and Soutar, 2001; Yuen and Chan, 2010). The other functional value, convenience value, deals with the performance of the device and how it can be used. Convenience value has been postulated to constitute mainly of time-saving ability and psychological comfort (Pura, 2005). For example, WHTs can provide access to a wide variety of healthcare facilities (i.e., real-time doctor-patient communication) and display the users' real-time health-data as well as encourage and advise them in pursuing a healthier lifestyle. In addition, WHTs can assist users in keeping up with health and physical activity (Hoffmeister and Oudghiri, 2004). These functionalities can improve the user's quality of life (Yurkiewicz et al., 2018). As both the quality and convenience dimensions of the functional value are positive, we propose the following two hypotheses.

H1. Device quality has a positive relationship with the continued use intention of WHTs.

H2. Convenience value has a positive relationship with the continued use intention of WHTs.

4.1.2 Social value

In the context of this study, social value refers to the perceived social benefit or respect that is gained from using WHTs (Sheth et al., 1991). Social value associates users of the service with a social group. It involves aspects such as social image, identification, social self-concept, expression of personality, and pursuit of social class membership (Pura, 2005; Sweeney and Soutar, 2001). Therefore, the social value derived from using WHTs can be linked to factors such as social respect and appreciation of others. Similar aspects are discussed in, for example, gratification theories that discuss fashion, status and sociability (Leung and Wei, 2000). According to such theories, the use of certain clothing or fashion items allow people to express their identification with a specific group. WHTs may thus be status symbols, products that communicate belonging to a certain group or inspire respect among peers. Prior research has demonstrated that social image can influence behavioral intentions such as the adaption to and use of new technologies (Hsu and Chen, 2007; Lin and Huang, 2012). Therefore, we hypothesize that:

H3. Social value has a positive relationship with the continued use intention of WHTs.

4.1.3 Epistemic value

Epistemic value is the perceived utility derived from a new product's ability to (1) arouse curiosity, (2) provide novelty or (3) satisfy a desire for knowledge (Sheth et al., 1991). New experiences can be considered as the main source of epistemic value. Epistemic value is also related to the desire for knowledge (Sheth et al., 1991), sense of satisfaction, personal growth and actualizing personal potential (Phang et al., 2006). While epistemic value has been shown to be a powerful predictor of the adoption of new technologies (Lin and Huang, 2012; Rahman et al., 2021), it remains unclear whether it plays a role in the continued use intention of WHTs. At some point, the novelty of any WHT will wear out; however, a new WHT that provides epistemic value once again could be acquired. In fact, the more immersed users are with WHTs, the more they may be able to see epistemic value in new products. While epistemic value might not boost the continued use intention of a single WHT, it can have a positive overall relationship with WHTs in general. Therefore, we propose the following hypothesis:

H4. Epistemic value has a positive relationship with the continued use intention of WHTs.

4.1.4 Emotional value

Emotional value refers to "the perceived utility that results from a product or service that provokes feelings or affective states" (Sheth et al., 1991). According to Panksepp (2011), emotions are part of human reasoning, and they guide our thoughts and behavior. Mackay and Mackay (1999) argued that the appeal of a product or a service is an amalgam of rational and emotional factors, and emotions play a part in every purchasing decision. In this context, emotional value refers to the subjective influence of WHTs on emotions or psychological conditions (Sheth et al., 1991). The emotional value thus represents emotions such as playfulness, fun, pleasure, excitement and enjoyment aroused through the use of WHTs. Enjoyment acquired from the use of the product/service can increase the emotional value for users (Wang et al., 2013; Rahman et al., 2021). Emotional value, such as pleasure and playfulness, may also encourage the use of emerging technologies (Cordella and Bonina, 2012; Wang et al., 2013). Therefore, we propose that the elderly who find the WHT enjoyable and emotionally fulfilling are more likely to have higher continued use intentions. Thus, the following hypothesis is proposed.

H5. Emotional value has a positive relationship with continued use intention of WHTs.

4.2. Inhibitors of wearable healthcare technology

Inhibitors are factors that contribute to the discontinuation of use of a service and based on the two-factor conceptualization (Herzberg, 1966), are uniquely negative factors that discourage continued use

(Cenfetelli, 2004). Three inhibitors were employed in this study: (1) inertia, (2) perceived risk, and (3) technology anxiety. Two factors influencing inertia were employed: (i) sunk costs and (ii) transition costs. According to Cenfetelli (2004), inhibitors influence information technology (IT) use both directly and indirectly via mediators. Therefore, sunk costs and transition costs are indirect inhibitors of continued use intention of WHTs. These factors can be relevant especially when surveying older people, as technology anxiety and the willingness to avoid risks and change habits have been correlated with age (Brooks et al., 2018; Talukder et al., 2020a). In the following section, these inhibitors are described in detail.

4.2.1 Inertia

Users persist in using an incumbent system either because they have always done so in the past or because it may be too stressful or emotionally taxing to change (Samuelson and Zeckhauser, 1988). This inertia results in a lowered use adoption of new products (Tsai et al., 2019) but can also be a hindering factor in use continuance, especially among the elderly. The concept of inertia can also be approached from the perspective of SQB, which explains why people continue to use a particular technology even when they have access to a superior technology (Samuelson and Zeckhauser, 1988; Polites and Karahanna, 2012). Therefore, inertia can be explained by rational decision-making, cognitive misperceptions and psychological commitment (Samuelson and Zeckhauser, 1988). When people tend to rely heavily on their past behaviors, they fail to realize the advantage of new behaviors. This in turn biases users' perceptions on adopting a new behavior, which in this case, is the use of WHTs, in the future. Individuals experiencing inertia tend to avoid information on alternative opportunities and continue to rely on past behaviors (Rahman et al., 2021; Talukder et al., 2020b). For example, older people may prefer to visit hospitals to access and use healthcare services instead of relying on WHTs. Therefore, we propose that:

H6. Inertia has a negative relationship with continued use intention of WHTs.

Another concept related to SQB is sunk costs, which refers to decision resistance as a result of users justifying their continued previous system use due to previous commitments (Lending and Straub, 1997). Therefore, sunk costs fallacy occurs when users forego the optimal decision solely due to the fact that they have already committed resources to a non-optimal solution (Tsai et al., 2019; Hsieh, 2016). Sunk costs may have a significant impact on decision making when adopting technologies that require learning to some degree (Cunha and Caldieraro, 2009). They may lead to resistance to not only adopt but also to continue the use of WHTs because users do not want to void their investments in earlier solutions (Kim and Kankanhalli, 2009). The greater the investment in the status quo alternative, the more strongly that alternative will be retained (Samuelson and Zeckhauser, 1988). Therefore, we argue that the impact of sunk costs might also be observed during the continued use stage of WHTs. Based on this, we proposed that:

H7. Sunk costs have a positive relationship with inertia.

Transition costs are another component of inertia. Transition costs include transient expenses and permanent losses associated with change (Kim and Kankanhalli, 2009). As the transient expenses and permanent losses increase, users are more likely to be reluctant to implement the new technology (Kahneman and Tversky, 1979). Transition costs are also a critical factor when consumers consider the continued use of a new technology as it always takes time, effort and cognitive resources to fully adapt to new technologies (Tsai et al., 2019). Hsieh (2016) described that transition costs may have a negative impact on patients' attitudes towards the use of modern online health services. Transition costs are especially significant among the elderly, as even with some initial experience with WHTs, this population has lived a majority of their lives without these devices. Thus, compared to younger generations, their transition costs regarding the use of WHTs are predicted to be significant (Hong et al., 2013). We propose that together with sunk costs, transition costs are a major predictor of inertia, which negatively impacts continued use intentions of WHTs among the elderly. Thus, we postulate that:

H8. Transition costs have a positive relationship with inertia.

4.2.2 Perceived risk

Perceived risk refers to the customer's perception of the risks associated with any purchase (Dowling, 1986). Perceived risk is the ambivalence that consumers have before purchasing any product or service, and the knowledge of this risk leads to an unfavorable attitude that typically results in a negative effect on a user's intention to use the product (Polites and Karahanna, 2012; Talukder et al., 2019). According to PricewaterhouseCoopers (PwC) (2014), 82% of WHT users were anxious that wearable devices would compromise their privacy. Typically, users consider trade-offs between risks and benefits when they are asked to share personal information to organizations (Gao et al., 2015). This tension between privacy risks and personal benefits has been shown to play an important role in WHT use adoption (Talukder et al., 2020a). Hence, we propose that perceived risks also play a role in continued use intention of WHTs as people may continuously reevaluate the risks and benefits of using these devices (Li et al., 2016). We define perceived risk as an individual's conviction that they will suffer a loss while seeking an outcome (Warkentin et al., 2002). WHT use may intensify users' privacy apprehensions over the possible mismanagement of personal health-related information (Li et al., 2016). Therefore, individuals' continued use intentions of WHTs would be negatively affected by the existence of related privacy risks (Xu et al., 2009). Thus, we propose the following.

H9. Perceived risk has a negative relationship with continued use intention of WHTs.

4.2.3 Technology anxiety

Technological anxiety centers on consumers' capacities and desires to use IT (Ahmad and Khalid, 2017). It is an emotional component of technology adoption that deals with the adverse response to IT use. While a WHT is optimized for all population groups, many people have minimal understandings of IT and are terrified of using it. Technological anxiety stems from the failure or loss of self-confidence to control and use a technology successfully (Oyedele and Simpson, 2007). Previous research has found that anxiety can have a negative effect on behavioral intentions towards IS use (Talukder et al., 2020a) particularly during the initial acceptance period (Tsai et al., 2019). However, similarly to inertia, especially among the elderly, technology anxiety could carry over to the use continuance phase. For example, perceived usefulness has been suggested to have an influence on continued use beyond the initial acceptance phase, whereas, perceived ease of use is suggested to impact only initial acceptance (Bhattacherjee, 2001). We argue that if elderly users are afraid of or nervous about using the WHT, it tends to have a negative influence on their continued use intentions (Dyck and Smither, 1994). Therefore, technology anxiety is considered to be an important factor. Hence, it is hypothesized that:

H10. Technology anxiety has a negative relationship with continued use intention of WHTs.

The ten hypotheses proposed to investigate the continued use intention of WHTs, are listed in Figure 1.

[Insert Figure 1 Here]

5. Methodology

5.1. Instrument development

All the measurement items used in this study were derived from prior published literature and adopted to the context of WHTs. The items were measured on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). After the initial questionnaire was drafted, two information systems researchers were invited to scrutinize the logical consistency, contextual applicability, grammatical accuracy and question lucidity of the developed items. Based on the received suggestions, changes were made to enhance the understandability and contextual appropriateness of the questionnaire items, and a few grammatical errors were fixed. The survey was initially developed in English but was later translated to the native language of the participants (Mandarin Chinese). The survey was translated to Chinese by a researcher and then re-translated back to English by another researcher. The re-translated English items were compared to the original items. Some inconsistencies were found in some items, and the two researchers collaborated to revise them to ensure that the translated survey matched the original one. After this, data collection began. All the measurement items and their sources are presented in Appendix C.

5.2. Sampling and data collection

Since the objective of this study is to investigate the factors affecting continued use intention in the elderly, we decided to focus on studying people aged over 65 specifically. To this end, we recruited people from China who had used WHTs at least once in their life. Experienced users are important for this study sample because they can understand the research context clearly and provide informed responses. A non-probability convenience sampling technique was applied in the data collection process due to the lack of an appropriate sampling frame. This approach of collecting data is flexible, inexpensive and saves time (Ruhl, 2004; Sekaran, 2006). It allows the researcher to obtain basic data and reach the required sample size in a relatively fast and inexpensive way (Kothari, 2004). A sample obtained this way can enable researchers to collect suitable data and information that would not be possible using other sampling techniques (i.e., random sampling, snowball sampling), which require more formal access to lists of populations (Bujang et al., 2012). Furthermore, the non-probability convenience sampling technique is the most widely applied sampling technique in research involving elderly people (e.g., Talukder et al., 2020b; Talukder et al., 2020a; Lazaro et al., 2020). Following this approach, the data for this study was collected through in-person meetings in the first quarter of 2019 from people in the following cities in China: Wuhan, Xinyu and Ningbo. We selected these cities, as their population, socio-economic condition, and culture belong to the same cluster. For example, the number of elderly in Wuhan is 1.94 million, 21.43% of the total population (Wuhan Municipal Bureau of Statistics, 2019), whereas 1.56 million elderly people live in Ningbo, 25.6% of the population (Zhejiang Provincial Bureau of Statistics, 2019). Although home and location surveys take longer, they offer higher rates of response compared to other methods, such as telephone or online surveys (Malhotra, 2008). Furthermore, the personal meetings allowed the participants to ask for clarification if some items were unclear.

Altogether, 327 people participated in the study. Before proceeding with the survey, oral consent was obtained from the participants. Among the 327 obtained questionnaires, 32 questionnaires were eliminated due to missing and incomplete responses, and the resulting 295 questionnaires were used for further statistical analysis. Out of the respondents, 63% were male and 37% were female. A majority of the respondents had completed at least a bachelor's degree (54%), and 55% of the respondents had been using WHTs for 1 to 3 years. The most preferred WHT technology among the respondents were smart health watches, pedometers and wearable fitness trackers. Details of the respondents are displayed in Appendix D.

5.3. Data Analysis

The collected data was analyzed using a partial least squares (PLS)-based structural equation modeling approach (PLS-SEM) in SmartPLS 3.2.8 software[1]. PLS-SEM was used as it employs an exploratory approach to the estimation of the model and is a causal-predictive approach to SEM. This approach permits investigators to measure both the explanatory and predictive capability of the model (Shmueli et al., 2019). PLS-SEM focuses on improving the prediction of the endogenous constructs and not on the model fit (Hair et al., 2016). Besides these advantages, PLS-SEM provides a nuanced analysis of the hypothesized model, which enables a holistic understanding of the phenomenon under investigation.

According to Hair et al. (2017), PLS-SEM should come up with two steps, which are called the measurement model and the structural model. First, the measurement model was assessed through running the function (PLS Algorithm), and by checking outer loading (Factor Loading), Cronbach's Alpha, average variance extracted (AVE), and composite reliability (CR), discriminant validity measurement, and the Heterotrait-Monotrait ratio (HTMT) (Henseler et al., 2009). Second, the structural model is estimated through collinearity statistics (Inner VIF), R^2 value (explained variance), F^2 value (Effect Size), Q^2 (predictive relevance), and statistical significance of the structural path coefficients (Hair et al., 2017). Post hoc analyses were then conducted, and using the importance performance map analysis (IPMA) (Hair et al., 2016), the importance of each independent construct in explaining the performance of the dependent variable (continued use intention of WHTs among the elderly) was determined.

[1] Ringle, C. M., Wende, S. and Becker, J.M. 2015. "Smartpls 3," Boenningstedt: SmartPLS GmbH, http://www. smartpls. com.

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6. Results

6.1. Measurement model assessment

The measurement model was assessed by examining the reliability, convergent validity and discriminant validity of the constructs (Hair et al., 2006). The Cronbach's alpha value and composite reliability should be 0.70 or more to ensure reliability of the research constructs (Hair et al., 2006). The average variance extracted (AVE) value should be more than 0.50 to confirm convergent validity of the constructs (Hair et al., 2016). Thus, the criteria for construct reliability and convergent validity were fulfilled in this study as the values were greater than the mentioned thresholds (see Table I). Likewise, items loading values larger than 0.70 were considered as good indicators of reliability. Appendix C shows that all the item loading values exceed the recommended threshold.

[Insert Table I here]

To measure discriminant validity, we determined whether the values of the square roots of the AVE for each construct were larger than the correlation values between any two constructs (Henseler et al., 2009). As shown in Table II, diagonal (**bolded**) represent the square root of the AVE for each variable; these values are larger than the corresponding correlation coefficients, demonstrating that the measurement model fulfilled the mentioned criteria for discriminant validity (Fornell and Larcker, 1981). Secondly, the discriminant validity was measured based on the heterotrait–monotrait (HTMT) ratio of correlations (Henseler et al., 2015). As shown in Table III, all HTMT values were below the threshold value of 0.90, which confirms the discriminant validity of the measurement model (Henseler et al., 2015).

[Insert Table II and III here]

As the data collected was cross-sectional, common method bias (CMB) may cause false relationships among the hypothetical relationships (Fuller et al., 2016). Harman's single-factor test was conducted with principal axis factor analysis to assess CMB (Harman, 1976). Our test outcomes showed that 34.08% of the total variance, which is well below the recommended 50 percent, was triggered by a single construct (Podsakoff et al., 2003). However, because of the increasing amount of dispute with the validity of Harman's single-factor test (Lowry and Gaskin, 2014), CMB was revalidated by applying other accepted methods. First, the correlation (as shown in Table II) among the constructs was tested, and it was identified that there was no correlation larger than 0.90 (Bagozzi et al., 1991). Secondly, CMB was tested using a common factor method. When the common factor was added to the model, the R^2 value for the endogenous constructs did not significantly increase (< 0.08), and this reduced the concern about the common method variance problem (Tehseen et al., 2017). Hence, CMB was not a concern for this study.

6.2. Structural model results

Before assessing the structural model, it is crucial to address the collinearity issue for each set of predictors in the structural model. To measure and assess the degree of collinearity, a variance inflation factor (VIF) is used (O'brien, 2007). A multi-collinearity issue exists when the largest VIF is greater than five (Hair et al., 2016). Table IV shows a multicollinearity diagnostic through VIF which indicates that there is no evidence of significant multicollinearity among the studied exogenous constructs. Hence, collinearity is not a critical problem in this study. After that, a bootstrapping approach with 5,000 sub-samples is employed to test all the path relationships in the model (Hair et al., 2017). Table IV and Figure 2 illustrate the results of the hypotheses testing. It shows that device quality (*H1*: $\beta = 0.139$, $p < 0.05$), social value (*H3*: $\beta = 0.261$, $p < 0.01$), epistemic value (*H4*: $\beta = 0.108$, $p < 0.05$), and emotional value (*H5*: $\beta = 0.143$, $p < 0.01$) are positively related to continued use intention. However, convenience value (*H2*: $\beta = 0.023$, $p > 0.05$) is found not significant.

In addition, the results indicate that inertia (*H6*: $\beta = -0.115$, $p < 0.05$) and technology anxiety (*H10*: $\beta = -0.226$, $p < 0.01$) are negatively related with continued use intention. Nonetheless, perceived risk (*H9*: $\beta = -0.062$, $p > 0.05$) is found not significant. Likewise, we find transition costs (*H8*: $\beta = 0.296$, $p < 0.01$) significantly influence inertia, however, sunk costs (*H7*: $\beta = 0.008$, $p > 0.05$) is not significant on inertia towards continued use intention of WHT. In summary, H1, H3, H4, H5, H6, H8, and H10 are supported, while H2, H7, and H9 are not supported. A total of 60.8% of the variance in continued use intention is above 26%, which indicates that the model is substantial (Cohen, 2013). The effect size (f^2) of all other path relationships is substantial, indicating their importance to the endogenous variables. The model is also found to possess predictive relevance as the Stone-Geisser Q^2 values are above zero (Henseler et al., 2009). Further, Standardized Root Mean Square Residual (SRMR) is below the recommended value of 0.08, and the Normed Fit Index (NFI) value is 0.841, lower than the recommended 0.90. To further test out-of-sample predictive power, we follow the guidelines set by Shmueli et al. (2019) using the PLS predict method. Table V shows that the majority of the values of Root Mean Square Error (RMSE) and mean absolute error (MAE) for PLS estimation are lower than those of the linear regression model (LM) models. Given the fact that PLS estimation has less prediction errors, the model can be said to have a medium predictive power (Shmueli et al., 2019).

[Insert Figure 2 here]

[Insert Table IV and V here]

6.3. Post hoc analysis

To better understand future WHT use intention among the elderly, we conduct IPMA in SmartPLS in addition to traditional PLS analysis. According to Ringle and Sarstedt (2016), "*The IPMA gives researchers the opportunity to enrich their PLS-SEM analysis and thereby, gain additional results and findings*." The objective of IPMA is to identify constructs that are of comparatively high importance but perform reasonably low in determining the endogenous construct (Hair et al., 2016). Total effects on the endogenous variable measure the importance of the predecessor exogenous variables, while the performance is determined by the average latent variable ratings (Ringle and Sarstedt, 2016). Performance levels have been rescaled to a range of 1 to 100 (Hair et al., 2016).

Table VI shows the results of IPMA analysis. A priority chart is created (see Figure 3) by plotting the performance and importance values. We can see, for example, that the performance of emotional value (EV) is the lowest of all variables despite its high importance score. On the other hand, device quality (DQ), inertia (INT) and convenience value (COV) have relatively high performance scores but low importance scores compared to other variables. The most important finding from the IPMA analysis is that emotional value and epistemic value should be highlighted as they are important but perform poorly in predicting future WHT use by the elderly. Thus, future work on increasing engagement with WHTs in the elderly should specifically focus on these factors.

[Insert Figure 3 here]

[Insert Table VI here]

7. Discussion and Implications

7.1. Key findings

Our structural model results highlight four significant enablers for continued use intention of WHTs among the elderly: (1) device quality, (2) social value, (3) epistemic value, and (4) emotional value. The fact that convenience value (which is similar to perceived ease of use) played no significant role is surprising as it encompasses the practical health benefits of the device. One way to explain this finding is that prior literature has found that perceived ease of use loses its importance as users move from initial acceptance to continued use (Bhattacherjee, 2001; Islam et al., 2017).

With regards to the inhibitors, (1) technology anxiety and (2) inertia negatively influenced continued use intention of WHTs, and transition costs significantly contributed to inertia. Despite the inclusion of elderly people who already had experience using WHTs, technology anxiety and inertia still played a significant role in continued use intention. This leads to a discussion about a technology divide, as older people experience trouble adjusting to the digital age. In contrast to the findings of previous studies (Hsieh, 2016; Kim and Kankanhalli, 2009), our results indicate that elderly people are not interested in investing their money, time and effort to switch to WHTs due to typical health monitoring habits and strong inertia. The results also show that perceived risks were not significant. This aligns with previous findings on, for example, exergames (that can also include WHTs), which have shown that continued use intention is not impacted by privacy concerns (Hamari et al., 2019). However, this finding is in contrast with those of other studies (e.g., Gao et al., 2015; Saa et al., 2018). One explanation for this situation was proposed by Bhuasiri et al. (2016) who argued that privacy risks lose significance to users who trust the service provider. One conclusion of these findings is that the elderly in our sample were more worried about their well-being than about the security of their personal information (Talukder et al., 2020a).

The post hoc IPMA revealed emotional value to be of great importance in explaining continued use intentions of WHTs among the elderly, yet it performed the poorest of all the independent variables. Epistemic value also behaved similarly but not to the same extent as emotional value. These findings suggest that companies developing WHTs for the elderly and health intervention campaigns aimed at boosting engagement with WHTs in the elderly should focus on increasing the emotional value appeal of their products. More precisely, focus should be given to making WHTs feel better on an emotional level by making them comfortable to wear and adding functionality that boosts positive emotional experiences in their users (Lin and Huang, 2012). There might be some trade-off between adding emotional value and supporting a healthy lifestyle, as a healthy way of living often includes doing things that have long-term and not short-term gratification, such as moving constantly. The issue with delayed gratification is that WHT users might not intuitively connect well-being to the use of WHTs as the connection is not explicit.

7.2. Theoretical contribution

This study has four major theoretical implications. First, an enablers and inhibitors perspective has been provided to explain continued use intention of WHTs in the elderly. This work contributes to the understanding of both positive and negative factors influencing technology use intentions (Tsai et al., 2019). Previous research regarding the use of technology mostly emphasizes either the positive effects of different consumption values (e.g., Chen and Chan, 2014; Le Deist and Latouille, 2016) or the negative effects of SQB, anxiety and risk (e.g., Gao et al., 2015; Talukder et al., 2020a). Our model offers a more comprehensive way of understanding users' perceptions by taking into account both positive and negative factors.

Second, our findings also contribute to the ongoing research on WHT and more broadly, gerontechnology use among the elderly (e.g., Chen and Chan, 2014; Le Deist and Latouille, 2016; Talukder et al., 2020a; Talukder et al., 2020b) by identifying six factors (four enablers and two inhibitors) that directly impact continued use intentions of WHTs. Our TCV and enablers-inhibitors based model adds to the existing body of literature, which employs mainly TAM derivative models. Most WHT research studies that have been conducted using responses from elderly individuals have investigated initial acceptance (e.g., Fang and Chang, 2016; Kekade et al., 2018; Talukder et al., 2020a). However, this study investigated continuance intentions. Our findings demonstrate that TCV is an alternative theoretical framework that is useful and can be adopted by researchers to investigate continued use of WHTs. This kind of an approach can help in the designing of effective and engaging WHTs as well as optimal health-intervention strategies (Eldredge et al., 2016).

Third, some interesting findings were noticed when this work was compared to previous studies on general WHT usage. Studies on other age groups have shown slightly different results. Rupp et al. (2018) investigated the effect of perceived usability and motivational affordances on continued use of fitness technology, which is similar to WHT usage. While we did not measure motivational affordances explicitly, the concept is similar to the convenience value and the way it was measured. Surprisingly, according to our findings, the impact of convenience value on continued use intention was not significant. It would be difficult to compare these two findings without bias, but this observation encourages future research into the differences in perception of the practical value of WHTs among older and younger people.

Finally, this research was carried out using IPMA in order to analyze the significance of factors in determining the continued use intention of WHTs among the elderly and also to define the efficiency of these factors (Ringle and Sarstedt, 2016). IPMA showed that a number of essential factors (e.g., emotional value and epistemic value) have greater significance but lower performance than others. Such factors require extensive management focus with regards to the allocation of resources in order to facilitate the continued use intention of the WHT. No previous study has conducted such an analysis specifically on data of WHT use intention. Therefore, this study contributes to WHT research by identifying the relative significance of consumption values in addition to the SEM results.

7.3. Practical implications

We uncovered four significant enablers for future WHT use, which all have implications on WHT design and can be valuable to practitioners. First, the device quality value indicates that a high production quality and consistent performance of the WHT are important to the users (Lin and Huang, 2012), so designers should focus on these aspects when creating WHTs. Second, social value was a strong predictor of continued use intention of WHTs, meaning that focus should be given to the branding and social acceptance of WHTs, and functionality in the WHTs that facilitates healthy and positive communication between users should be included. Third, the epistemic value indicates that WHT designers should include novel, stimulating and curiosity arousing features in their devices and update them regularly to provide new positive experiences to customers. However, it was found that the elderly experience inertia, which negatively influences continued use intentions of WHTs. Hence, there is a trade-off between increasing epistemic value and reducing inertia, and designers should employ methods to increase epistemic value without a simultaneous increase in inertia. Fourth, the ability of emotional value to predict WHT continued use intention indicates that developers should include methods to boost positive emotional experiences for the users of their devices. The high importance of the emotional value was highlighted in the post hoc analysis; emotional value was significant for the users but had a low performance score. Thus, WHT designers should pay special attention to the emotional value dimension.

In addition to the enablers, inhibitors influence future WHT use intention. SQB was shown to play a major role, as transition costs influenced inertia, which, in turn, affected continued use intention. WHTs should be designed to align with the lives and customs of the elderly and not cause any extra cognitive or emotional load in order to reduce transition costs and SQB in general. Such designs could also reduce technology anxiety, which was found to be another significant predictor that negatively influenced continued use intentions of WHTs among the elderly. The findings are also important for governments, health officials and other stakeholders interested in increasing the population-level health of the elderly by engaging them with WHTs. For example, the social value of WHTs can be increased through advertisements that highlight that it is responsible and respectful to use WHTs.

7.4. Limitations and future work

Our findings have limitations that need to be taken into account when interpreting the results. First, the structural model was based on the theoretical viewpoints of the enablers and inhibitors (Cenfetelli, 2004) perspective as well as the TCV (Sheth et al., 1991). While we argue that this approach and subsequent conceptualization of continued WHT use intention in the elderly is justified and provides interesting and relevant results, we acknowledge that other viewpoints are still needed and may provide additional value to our findings. In addition, there are other potential enablers and inhibitors that were not examined in our study, such as perceived complexity and perceived loss of control, which can be the subject of future investigations. Second, the formulated structural model was tested with cross-sectional data obtained through a convenience sampling technique from three selected cities namely

Wuhan, Xinyu and Ningbo. Future research may use random sampling techniques to validate the findings of our study. Furthermore, as the data was collected using a cross-sectional survey, the results do not depict any possible change or trends that might occur in WHT use over time. Taking these limitations into account, our findings offer insights for WHT developers as well as health intervention designers on how to better engage and take into account the needs and desires of elderly users but should not be used as a representation of the entire global elderly population.

Our results call for further research into the role of emotional value in the use of WHTs. Emotional value was highly important yet scored poorly in the performance dimension in our IPMA analysis, and it could have potential with regards to engaging elderly users with WHTs. To this end, interventions using approaches that focus on emotions, such as affective neuroscience (Panksepp, 2011), and approaches that aim to engage users, such as gamification (Laato et al., 2020a), could be designed and studied. While WHTs for the elderly have been proposed to have population-level health benefits, our findings showed that the convenience value had a nonsignificant relationship with WHT use continuance. This surprising finding should be further investigated, as it seems to partially contrast the idea that functionality and a desire for a healthy lifestyle play a role in the use of WHTs. Another potential future research agenda is to explore technology readiness, its antecedents (specific to the aging population) and the level of technology engagement. Finally, as the enablers and inhibitors conceptualization of future WHT use was demonstrated to be effective, future research could also be directed towards understanding the dual outcomes of WHT use.

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Appendix A Some of the currently popular types of WHTs organized by category

Type of WHT	**Typical products**	**Typical features and properties**
Smartwatches and smart bands	Apple Watch, Fitbit Versa, Microsoft Band, Huawei Band, Beurer activity band	Satellite navigation, gyroscope, pedometer, connections options, display, body temperature sensors, heart rate sensors, force feedback (rumble and sounds) and many others
Smart rings	Amazon Echo Loop, Oura Ring, NFC OPN	Same features as smartwatches and smart bands but typically in a more limited form due to their small size
Wearable sensors	Scanadu Tricorder, smart bandages, EEG sensors	Measurement of heart rate, body temperature and movement
Other wearable devices	Pokémon GO +, Garmin HRM-dual belt, Poké Ball™ Plus, Google Glass	May contain accelerometer, Bluetooth connection, rumble features, and buttons for input and control

Appendix B The extant and recent literature on technology adoption, use and acceptance by older people

Author(s)	**Topic**	**Sample**	**Theory**	**Findings**
Chen and Chan (2014)	Gerontechnology acceptance	1012 participants aged over 55 in Hong Kong	Senior technology acceptance model (STAM)	STAM explains 68% of the variance in technology acceptance. Individual attributes are better predictors of use than attitudinal factors.
Le Deist and Latouille (2016)	Acceptability conditions for tele monitoring gerontechnology	12 experts and 12 elderly (first phase), 264 participants over the age of 65 (second phase)	No overarching theory	Perceived usefulness as well as ease of use are among the most significant factors predicting gerontechnology acceptance.
Park et al. (2019)	Effect of cognitive ability on	120 participants over the age of	No overarching	Elderly individuals with high cognitive capabilities and

	gerontechnology acceptance among the elderly	60.	theory	functioning are more likely to try, adapt to and continue using gerontechnology. Age is not a particularly accurate predictor of use adaptation.
Talukder et al. (2020a)	Antecedents of WHT acceptance among the elderly	325 respondents aged 65–69	Unified theory of acceptance and use of technology	Hedonic motivation, social influence, functional congruence, self-actualization and performance expectancy positively predict WHT acceptance. Technology anxiety and distaste for change negatively predict WHT acceptance.
Teh et al. (2017)	Gerontechnology use adoption	60 participants with an average age of 66.2 years	Technology acceptance model (TAM)	High power-poses connected to higher degrees of self-efficacy positively predict the adoption of gerontechnology.
Ku et al. (2020)	Middle-aged and elderly people's continuous use behavior of wearable technology	150 respondents from Taiwan	The theory of planned behavior and flow theory	Attitude, subjective norms, perceived enjoyment and concentration have positive effects on continuous use behavior.
Zhang et al. (2020)	Adoption of wearable blood pressure monitor devices by older adults	212 older adults with hypertension from a remote rural area in China	Adherence to wearable devices	Lower lifestyle compliance, lower medication compliance and higher total hypertension compliance are significant predictors for adherence.
Farivar et al. (2020)	The intentions of seniors to use wearable devices	Surveyed 280 and interviewed 50 seniors aged over 65	Cognitive age, perceived complexity and subjective well-being	Perceived complexity, subjective well-being and cognitive age negatively influence the intention to use WHTs.
Lazaro et al. (2020)	Adoption of smartwatches among older adults	Surveyed a total of 76 older adults aged 50 to 74	TAM	Prior experience, affective quality and technology-related anxiety influence ease of use, and older adult's attitude and accessibility positively affect their intention to use smartwatches.

Fang and Chang (2016)	The psychological perception and perceived readability of wearable devices among the elderly	24 Taiwanese individuals were surveyed and interviewed	No overarching theory	Personal attributes of gender, smart device use and requirement for medical care affect psychological perceptions and user attitudes.
Kekade et al. (2018)	The usefulness and actual use of wearable devices among the elderly population.	31 studies were reviewed, and 233 survey data were collected	Security and privacy concerns, and willingness to pay towards intention to use.	Only a few elderly people were using wearable devices at the time of the study. However, more than 60% of elderly people were interested in the future use of wearable devices for healthcare purposes.

Appendix C Measurement Items

During the survey, the respondents were given examples of wearable healthcare technology. These were Wearable Fitness Trackers, Smart Health Watches, Wearable ECG Monitors, Wearable Blood Pressure Monitors, Biosensors, etc. They were also informed what the traditional healthcare system means in the items. It means for example face to face meeting with doctors to measure blood pressure, heart rate, etc.

Construct	Corresponding Items	Items Sources	Items Loadings
Device quality	DQ1. The wearable healthcare technology has consistent quality. DQ2. The wearable healthcare technology has is well made DQ3. The wearable healthcare technology has an acceptable standard of quality DQ4. The wearable healthcare technology would perform consistently	Lin and Huang (2012); Sheth et al. (1991)	0.857 0.818 0.860 0.859
Convenience value	COV1. I save time when I transact with wearable healthcare technology. COV2. I value the ease of using wearable healthcare technology. COV3. Using the wearable healthcare technology makes my life easier	Pura (2005)	0.778 0.853 0.791
Social value	SV1. Using wearable healthcare technology has improved the way others perceive me. SV2. The wearable healthcare technology is used by many people that I know. SV3. Using wearable healthcare technology would make a good impression on other people.	Lin and Huang (2012); Sheth et al. (1991)	0.822 0.819 0.763

Epistemic value	EPV1. I would use wearable healthcare technology to test new ways of doing things. EPV2. I would use wearable healthcare technology to try new technologies. EPV3. I would use wearable healthcare technology out of curiosity.	Lin and Huang (2012); Sheth et al. (1991)	0.855 0.844 0.799
Emotional value	EV1. I am comfortable with wearable healthcare technology. EV2. The wearable healthcare technology gave me a positive feeling. EV3. Using wearable healthcare technology would make me feel good.	Lin and Huang (2012); Sheth et al. (1991)	0.870 0.777 0.922
Inertia	INT1. I will continue using conventional medical channels because they are part of my life. INT2. Even though conventional medical channels do not have effectiveness, I will still use them. INT3. I am already used to these conventional medical channels.	Tsai et al. (2019); Samuelson and Zeckhauser (1988)	0.877 0.864 0.830
Perceived risk	PR1. Using wearable healthcare technology will steal my private information. PR2. If I used wearable healthcare technology, I would feel psychologically uncomfortable. PR3. I assume that the use of wearable healthcare technology is dangerous because of privacy and safety issues. PR4. I feel that wearable healthcare technologies may have detrimental implications.	Khayer et al. (2020); Shareef et al. (2011)	0.835 0.846 0.825 0.846
Technology anxiety	TA1. I feel afraid to use wearable healthcare technology. TA2. I feel nervous about using wearable healthcare technology. TA3. I feel uncomfortable with wearable healthcare technology.	Tsai et al. (2019); Talukder et al. (2020a)	0.856 0.876 0.884
Sunk costs	SC1. I have put so much time studying how to use conventional medical tools. SC2. I expended a lot of resources studying how to use conventional medical tools. SC3. I have expended time and money on conventional medical tools that cannot be used with wearable healthcare technology.	Brockner et al. (1982); Tsai et al. (2019)	0.927 0.841 0.895

Transition costs	TC1. I am not interested to use wearable healthcare technology because downloading and running the latest technology would be a challenge. TC2. It takes me a lot of time and commitment to change to wearable healthcare technology. TC3. In general, switching to wearable healthcare technology is challenging.	Tsai et al. (2019); Rahman et al. (2021)	0.838 0.860 0.851
Continued use intention	CUI1. I plan to use wearable healthcare technology in the future. CUI2. I intend to use wearable healthcare technology in the future. CUI3. I will use wearable healthcare technology in the future.	Rahman et al. (2021); Nascimento et al. (2018)	0.715 0.924 0.910

Appendix D Demographic profile of the respondents

Descriptions		**Frequency**	**Percentage**
Gender	Male	186	63.05%
	Female	109	36.95%
Education	Diploma	46	15.59%
	Bachelor's degree	159	53.90%
	Master's degree	84	28.47%
	Doctoral degree	6	2.03%
WHT using experience	Less than 1 years	76	25.76%
	1 to 3 years	161	54.58%
	4 to 6 years	46	15.59%
	More than 6 years	12	4.07%
Preferred WHT	Smart health watch	43	14.58%
	Pedometer	105	35.59%
	Wearable Fitness Trackers	75	25.42%
	ECG Monitors	24	8.14%
	Wearable Blood Pressure Monitors	17	5.76%
	Biosensors	8	2.71%
	Others	23	7.80%